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**From income to well-being?
(An analysis of stakeholder and community perceptions of the
efficacy of horticultural programmes in Kerala and their effects
on access to fruits and vegetables)**

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Declaration of own work

I, Darlena Marie David, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.



Abstract

Background

The effect of horticulture programmes – which can potentially contribute to higher supply, distribution and access to micronutrient-rich fruits and vegetables — in communities experiencing high rates of non-communicable diseases remains underexplored.

Research questions

This study analyses stakeholder and community perceptions of the contextual and historical factors that shaped the horticulture programmes in Kerala, India (between 1993 and 2012), and stakeholder and community perceptions of impacts of horticulture programmes on fruit and vegetable access in the food environment. It also suggests implications for future policies and research.

Methods

A qualitative study was conducted in Kerala, India. Fieldwork done between April and September 2012 included a witness seminar with 27 stakeholders, 30 semi-structured oral history interviews, and focus group discussions with parents and teachers in 12 school sites selected as a proxy for socio-economic status in four panchayats of Alappuzha and Pathanamthitta districts. Analysis and interpretation of data involved transcription, translation and analysis through coding with NVivo 10 software.

Findings

My findings showed that rationales offered by stakeholders about maximizing both income and human development generated a creative tension that ushered in a wave of agricultural revival intensifying and expanding fruit and vegetable farming and improving marketing. This agricultural revival may have arrested declining fruit and vegetable availability. However, there is little evidence that horticulture programmes have increased dietary diversity in Kerala.

My findings also showed that the local food environment — how and what food was grown, distributed and marketed — determined what was available, affordable and desirable. Nutrition-sensitive and equity-oriented horticulture programmes that prioritized consumption rather than those that emphasized income may have facilitated fruit and vegetable access. Low socio-economic groups mostly considered fruits a luxury. Investments in subsidy-enabled interventions, such as the market intervention to control

price rise, increased affordability. Additionally, these effects showed heterogeneity of equity impact across groups.

Crosscutting issues included democratization (including focus on women's empowerment), responsive and participatory governance and gender bias. My research suggests that gender bias hampered access to resources, obstructed nutrition input in food-system decisions, and limited the role of nutrition professionals in policy making and academic institutions. Effective horticulture programmes valued collaboration, coordination, and convergence. They were led by empathetic leaders who advocated for policies that improved the lives of marginalized people. The findings of the witness seminar and interviews suggest that silo-like structures, leadership changes, inexperience in public health nutrition combined with resistance and technocratic pride may have negatively impacted the food environment.

Interpretation

This study, while confirming the key role of horticulture programmes to nourish people and improve the food environment, also draws attention to the fact that availability, affordability, and equitable access to nutrition-rich fruits and vegetables depends on an enabling environment that encompasses discourses and programme models. It supports the view that increasing production, without attention to barriers to access, affordability and acceptability, may not achieve nutrition security.

While enabling environments have spread farmer-centric agriculture reforms, Kerala's nutrition status may have been negatively impacted by gender and socio-economic inequalities. However, my research showed that a discourse that fosters a movement for food sovereignty has the potential to herald a more nutrition-sensitive form of agriculture.

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Abbreviations

BMI	Body mass index
CEO	Chief Executive Officers
F&V	Fruits and vegetables
GDI	Gender Development Index
GLV	Green leafy vegetables
GoI	Government of India
HDI	Human Development Index
HIC	High-income country
HORTICORP	Horticulture Product Development Corporation
HPA	High production area
HS	High School
HSS	Higher Secondary School
ICDS	Integrated Child Development Services
ICMR	Indian Council of Medical Research
JLG	Joint liability group, formed in 2010 on the basis of the guidelines from the National Bank for Agriculture and Rural Development (NABARD) is a group of 4–10 women farmers.
LDF	Left-democratic-front government
LIC	Low-income county
LMIC	Low-and middle-income country
LPS	Lower Primary School

MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Scheme
MKSP	Mahila Kisan Sashaktikaran Pariyojana (Women Farmers' Empowerment Project) seeks to empower women in agriculture, enhancing their participation and productivity, and also create and sustain agriculture based livelihoods of rural women.
MPCE	Monthly Per Capita Consumption Expenditure
NABARD	National Bank for Agriculture and Rural Development
NFHS	National Family Health Survey
NNBB	National Nutrition Monitoring Bureau
NRHM	National Rural Health Mission
PDS	Public Distribution System
PRI	Panchayati Raj Institution
RDA	Recommended dietary allowance
RKVY	Rashtriya Krishi Vikas Yojana (National Agriculture Development Scheme) launched in 2007).
SHG	Self-help Group
SHM	Kerala State Horticulture Mission
UMIC	Upper Middle-income Country
UMICs	Upper Middle-income Countries
VFPCK	Vegetable and Fruit Promotion Council Keralam
WHO	World Health Organization

Glossary

Avial	A mixed-vegetable dish with coconut
Ayalkkoottam	Neighbourhood Group (NHG)
Cent	Cent is a measurement of land. (100 cents = 1 acre)
Cheera	Amaranthus or amaranth
Ooty vegetables	Refers to traditional English vegetables such as carrots and cabbage popularly known by the name of a hill-station established by the British in the early 19th century. Also called cool-season or English vegetables
Hartal	A mass protest often involving a total shutdown of workplaces, offices and shops. Also called bandh.
Kanji and payar	Rice congee traditionally eaten with a side dish of mung beans (green gram).
Karshaka koottayma	A farmers collective and self-help group
Kinnow	A high yielding mandarin hybrid cultivated in Punjab
Krishi Bhavan	Panchayat-level agriculture office
Lakh	According to the Oxford Dictionary a lakh (also lac) refers to a hundred thousand.
Mezhukku purattiyath	A stir-fry of vegetable with spices
<i>Naadan</i>	Local or 'country' or 'desi' as opposed to English fruits and vegetables
Naattukootam	A people's assembly

Onam	The most important festival in Kerala is a harvest festival which takes place in the Malayalam month of Chingam, or August-September according to Gregorian Calendar to welcome the return of the legendary King Mahabali, under whom Kerala is believed to have experienced equity and prosperity. The festival lasts for 10 days and is celebrated by people of all communities. The Onam feast is vegetarian.
Panchayat	Panchayats are the lowest rung of local self-government institutions in Kerala.
Sabarimala	A 41-day Hindu pilgrimage and fast (Mandala vratham) during December–January (Vrichikam). Pilgrims and those who keep the fast are allowed to eat only vegetarian food.
Sambar	A popular South Indian lentil-based, mixed-vegetable dish with eaten with rice or idlis, dosas, etc.
Swaasraya Karshaka Samithi	Farmers' field centres comprising about 10 or 15 self-help groups that did collective marketing
Theeyal	A vegetable curry with a tamarind-flavoured roasted coconut gravy
Thoran	A dry side-dish with vegetable/s and coconut served with steamed rice
Vipani	Markets organized by a farmer-cluster of several groups of farmer SHGs
Vishu	Marks the Malayalam New Year. It is celebrated on the first day of the month of <i>Medam</i> in the Hindu calendar and in the middle of April in the Gregorian calendar.

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Chapter 1. Introduction

Low fruit and vegetable (F&V) intake is a leading risk factor for chronic disease globally. Diets with too few fruits and vegetables (Dahlgren *et al.*, 2006, Nugent, 2011) contribute to a higher prevalence of undernutrition, micronutrient deficiencies, obesity and non-communicable diseases (Ramachandran, 2006, Sesikeran, 2009, World Health Organization, 2004). The WHO Regional Office for Europe has estimated that about a third of cardiovascular disease is related to unbalanced nutrition and could be prevented through eating a diet with a higher proportion of fruits and vegetables (Finnish Ministry of Social Affairs and Health and European Observatory on Health Systems and Policies, 2006, Karelina and Fritschel, 2011). In India and other low and middle-income emerging economies changes in consumption patterns, increasing urbanization, and globalization are fuelling rates of non-communicable diseases (NCDs) (Chadha *et al.*, 1990, International Assessment of Agricultural Knowledge, 2008, Reddy, 2007). In 2005, 53% of all deaths were attributed to nutrition-related non-communicable diseases — including cardiovascular diseases, diabetes, and several cancers (Joshi *et al.*, 2006, Leeder *et al.*, 2004, Reddy, 2007, Reddy *et al.*, 2005).

Nutritional status in India has not kept up with the gains in economic growth or per capita GDP (which increased over 600% since 1990, and about 2.5 times since 2005)(World Bank, 2018). Undernutrition still exists and over-nutrition has increased (Headey *et al.*, 2011). The prevalence of anaemia, (a good indicator of undernutrition and lack of dietary diversity) among adult women has increased from 50%-57% (1998 to 2006) (Economic and Social Department of the Food and Agricultural Organization, 2002, International Institute for Population Sciences and ORC MACRO, 2000) while the proportion of women who are overweight or obese rose from 11% to 15 % (1998 to 2006).

The size of India's vegetable production — India is the second largest producer of vegetables in the world (Government of India, Ministry of Agriculture & Farmers Welfare, 2017, Planning Commission, 2007). The value of India's horticulture export (which includes fruits and vegetables) increased from Rs. 29, 723 million in 1991-92, to Rs. 64, 450 million in the next decade, to Rs. 10,36,996 million in 2016-17 (Government of India, Ministry of Agriculture & Farmers Welfare, 2017, Planning Commission, 2007). Even with such high production, a high proportion of population consumed inadequate F&V, less than five daily servings of fruits and vegetables (Ministry of Health and Family Welfare, 2011). Table 1 shows that the intake of fruits and vegetables in India in the late

1990s was just a little more than a quarter of the WHO's recommendations (Planning Commission, 2007).

Table 1: Intake levels of fruits and vegetables in India

	WHO recommended goal per day	ICMR recommended dietary allowance, per day	Actual daily intake in India in 1980s	Average actual daily intake in India -1998
Vegetables		280g	92g	
Fruit		90g	46g	
Vegetables and Fruits	400g	370g	138g (including tubers)	120-140 (not including tubers)

Source: (Department of Women and Child Development, 1998)¹

The per capita availability of fruits and vegetables in India (Table 1) has been consistently less than RDA.

Table 2: Availability of fruits and Vegetables

Years	Availability in (grams)
1991	219
2000	273
2010	354
2011	362

Source: IFPRI (2015)

Sathyamala in her doctoral thesis states that Aykroyd, then Director of Nutrition Research in India, reported in 1936 that poor families spent anything from 60% to 80% of their household budgets on food (Sathyamala, 2010). Eighty years later, the Prospective Urban Rural Epidemiology (PURE) study reported that households in LMICs spent about half of their income on food, and associated increased F&V costs relative to household income, and low purchasing power with lower consumption (Miller *et al.*, 2016). In 2011-12, the richest (urban) consumers in the top 5 % spent 61 times more on fresh fruits, than the bottom (rural) 5% a mere 3.99 rupees (Chakravarty, 2017). The richest 5% urban Indians spent 3.8 times more on vegetables. Urban consumers (40-50th percentile), spent 2.16 rupees more monthly on fresh fruits and 1.28 rupees more on vegetables than rural consumers (Chakravarty, 2017).

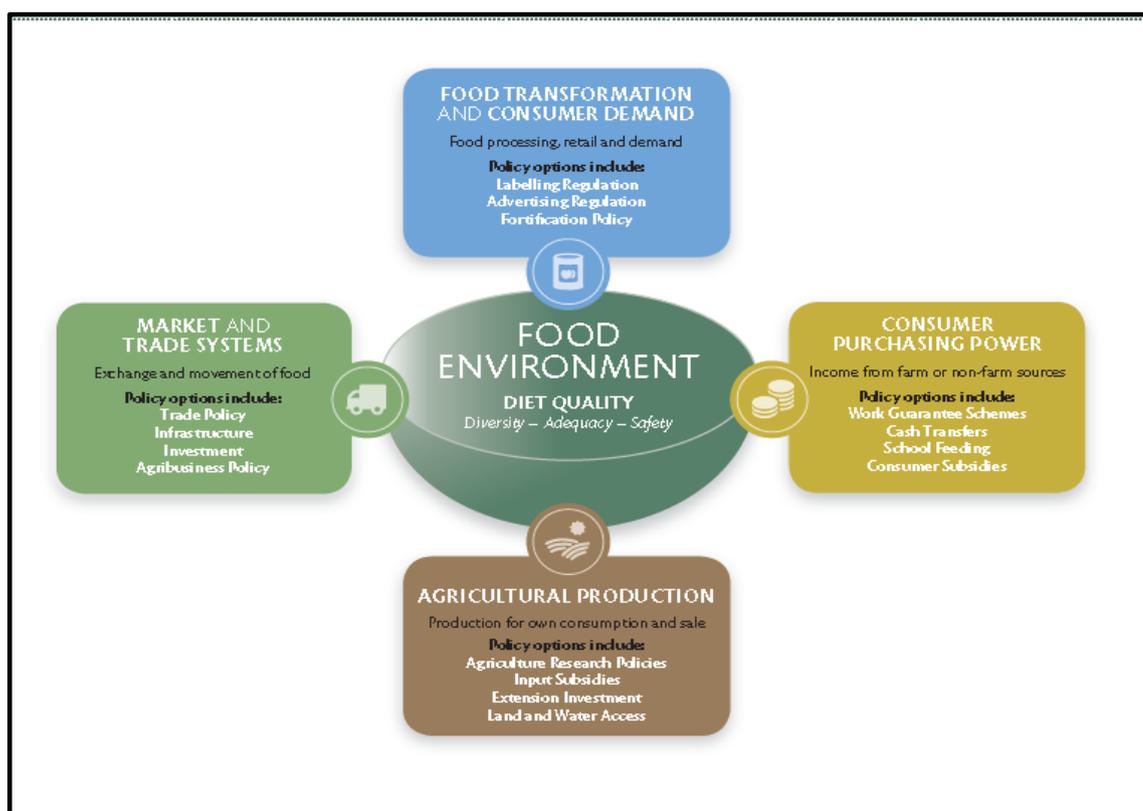
¹ India nutrition profile 1998, quoted in Diet, Nutrition and the Prevention of Chronic Diseases: Report of a Joint WHO/FAO Expert Consultation (World Health Organization and Food and Agricultural Organization, 2003).

This disconnect between GDP growth and nutrition status is explained by a growing body of evidence that points to the influence of social determinants of health — in particular political, economic and social policies — on the health of individuals and populations. As consumption patterns change in societies undergoing nutrition transition accompanied by increasing rates of non-communicable diseases, there is an urgent need to research the effects of all policies and programme development on social determinants of diets (Commission on Social Determinants of Health, 2008, Dahlgren and Whitehead, 1991, EuroHealthNet and Aufklärung, 2006, Potvin and Jones, 2011, Whitehead and Dahlgren, 2006). Policies that affect access to resources necessary for good health — including nutritious food and opportunities to be physically active — can contribute to the increasing rates of obesity and non-communicable diseases and create widening health inequalities (Headey and Hoddinott, 2016, Kyprianou, 2005). These policies can impact health through their effects on F&V production, distribution and prices — leading to diets with too few fruits and vegetables (Dahlgren *et al.*, 2006, Nugent, 2011). This can lead to a decline in health across generations, and contribute to a higher prevalence of undernutrition, micronutrient deficiencies, obesity and non-communicable diseases (Ramachandran, 2006, Sesikeran, 2009, World Health Organization, 2004). Economic growth that increases the income of already affluent groups — who have greater access to resources and can avoid some of the risks, diseases and the negative consequences of poor health — while underfunding public services, can create widening health inequalities (Headey and Hoddinott, 2016, Kyprianou, 2005).

Diet-related inequalities are created at different levels through markets and policies (high level), which might be mediated by local bureaucracy, programmes and retailers (intermediate level) to affect individual access (individual level). Therefore policies in favour of commodity markets, and price speculation, or civil servants unwilling to distribute food stocks, can also contribute to famines (Chernomas and Hudson, 2009), or create conditions for high morbidity rates for disadvantaged groups (Chernomas and Hudson, 2009, Sen, 2001).

Food systems that advance well-being need coordination across multiple sectors that do not ordinarily work together (Global Panel on Agriculture and Food Systems for Nutrition, 2017).

Figure 1 : Conceptual framework of links between diet quality and food systems



Source: (Global Panel on Agriculture and Food Systems for Nutrition, 2014)

According to Shrimpton and colleagues, silo-like organizational structures and weak coordinating bodies pose barriers to multi-sectoral collaboration (Shrimpton *et al.*, 2016). While Babu and colleagues state that achieving sustainable nutrition improvement in India requires a strategy that incorporates all sectors (Babu *et al.*, 2015), Gillespie and colleagues recognize “conflicting agendas in all directions” as challenging the horizontal and vertical coordination necessary for nutrition (Gillespie *et al.*, 2013, pp. 557). Such coordination is undermined by fragmentation and *diverging goals*, competing stakeholder, agency and departmental priorities, and gaps in inter-sectoral and inter-departmental *coordination* which pose barriers to nutrition (Gillespie *et al.*, 2013, Pingali *et al.*, 2017, Thow *et al.*, 2016). Babu and colleagues clarify that nutrition, which is underdeveloped even in the health sector, has become “nobody’s business” (Babu *et al.*, 2015).

As consumption patterns change, it is vital for future research in societies undergoing nutrition transition and high rates of non-communicable diseases in low and middle-income economies to focus on the roles played by policies and programmes that affect food systems — especially agriculture policies and programmes that impact local availability and affordability of nutritious food (World Health Organization, 2004) and

change food consumption patterns (Dahlgren *et al.*, 2006, Nugent, 2011). Therefore, I am proposing to study the effect of horticulture programmes — that promote production and distribution of micronutrient-rich fruits and vegetables — on the availability and access to diverse, nutrient-dense food (Dahlgren *et al.*, 2006, Nugent, 2011, World Health Organization, 2004).

1.1. The Rationale

There is a need to understand how agricultural policies and horticulture programmes which encourage cultivation of fruits and vegetables, affect the food environment in low and middle-income countries. While agricultural policies and horticulture programmes which encourage cultivation of fruits and vegetables could contribute to higher intake of affordable year-round supply of diverse, locally acceptable, nutrient-rich fruits and vegetables, there has been little focus on diverse, nutrient-dense foods that are most commonly missing or lower than needed in diets (Keats and Wiggins, 2014, Siegel *et al.*, 2014). WHO advises governments to examine food and agricultural policies for potential health effects on the food supply and suggest that national food and agricultural policies must be consistent with protecting and promoting public health (World Health Organization, 2004).

Evaluations of agriculture programmes signal that programmes and policies to increase F&V output may not promote improved nutrition, and those that favour commodity markets and export crops, may make it difficult for the local population to meet their nutritional needs (Kadiyala, 2004, Thow *et al.*, 2011). It is especially important to understand why, and how, horticultural programmes influence the pathways to nutritional status in low and middle-income countries (World Health Organization, 2004).

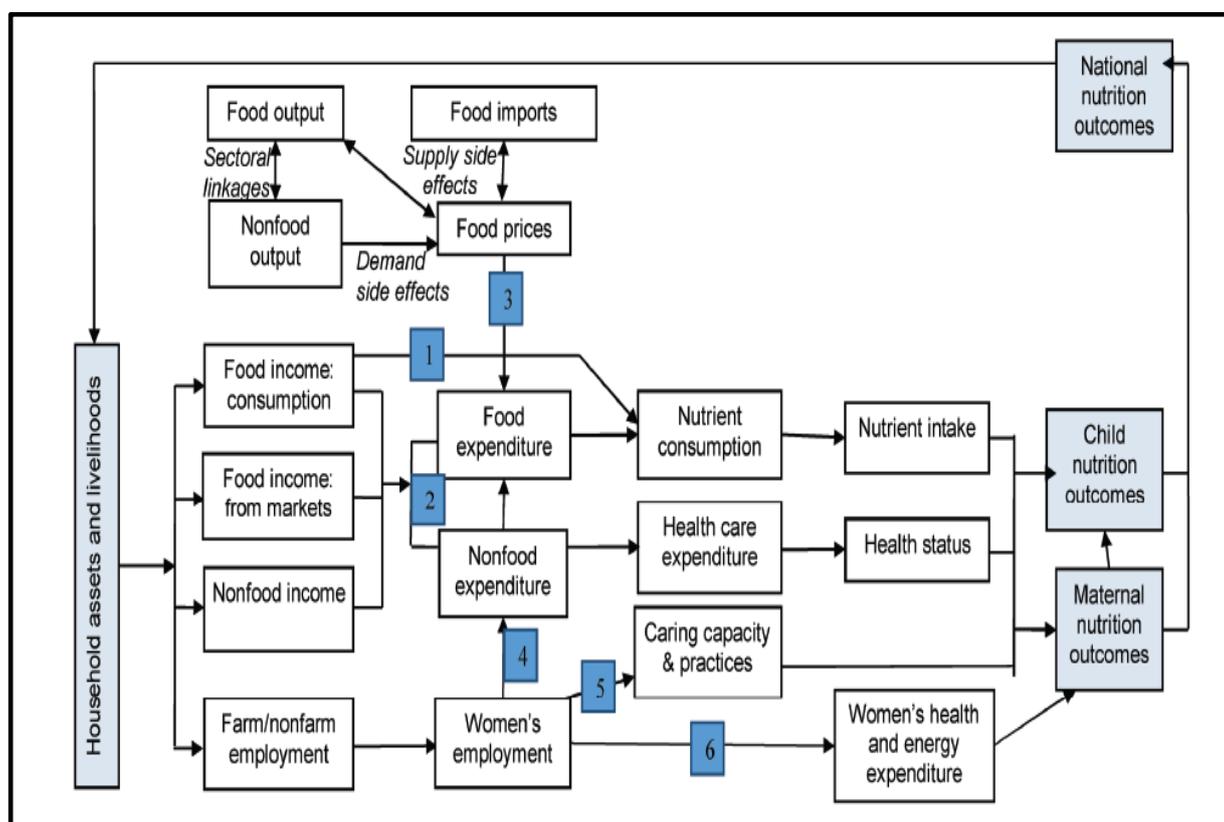
An examination of the food environment — the interface that mediates one's food acquisition and consumption with the wider food system — allows us to understand possible policy effects of agriculture policies and programmes on access to fruits and vegetables (Turner *et al.*, 2017). This thesis therefore seeks to investigate the diet and nutrition implications of agriculture policies and programmes in low and middle-income countries, through perceptions of stakeholders and communities in Kerala, India about the access to fruits and vegetables in their food environment. This thesis also aims to examine the role of horticulture programmes in transforming the food

environment pathways, through facilitating access or by creating barriers to healthy food.

1.1.1. Conceptual framework

I use the Tackling the Agriculture–Nutrition Disconnect in India (TANDI) framework (Gillespie and van den Bold, 2017) to explore how Kerala’s horticulture programmes affected agriculture-nutrition pathways. The TANDI framework, which links agricultural livelihoods and nutrition outcomes, show pathways by which the agriculture sector affects the food environment to impact nutrition outcomes (Gillespie *et al.*, 2012, Gillespie and van den Bold, 2017). Three pathways are of particular interest: pathway 1: fruit and vegetable cultivation for consumption; and pathway 3: the effects of agriculture and welfare policies and food prices on consumption; and pathway 4: effects that influence the empowerment of women and their control over nutrition-relevant decisions and resources.

Figure 2: The TANDI framework conceptualizing pathways and links between agricultural livelihoods and nutrition outcomes



Source (Gillespie and van den Bold, 2017)

I use the TANDI framework together with the more inclusive UNICEF global framework on child nutrition and development (Figure 3) (Black *et al.*, 2013) adapted in

the 2013 Lancet Nutrition. The UNICEF framework focuses on both the drivers of nutritional status at different levels, and sectoral responses that can prevent and respond to these drivers, (Gillespie and van den Bold, 2017). I will use these frameworks to examine how Kerala's socio-economic conditions and context, capacity, resources and governance played a role in building an enabling environment² supporting nutrition-sensitive agriculture.

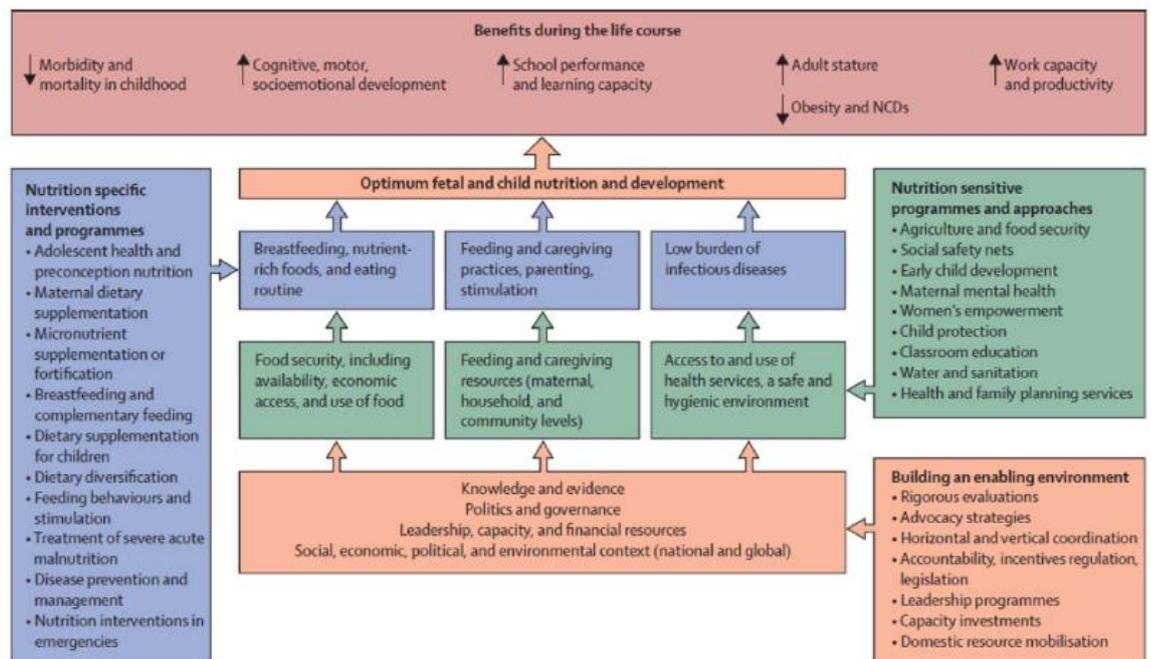


Figure 3: UNICEF's conceptual framework on child nutrition and development.

Source: (Black et al., 2013)

To inform my thinking about this project I referred to Dahlgren and Whitehead's social model of health (Dahlgren and Whitehead, 1991), and a conceptual framework developed by Friel and colleagues of the social determinants of inequalities in obesity (Friel *et al.*, 2007) at key points in the thesis.

1.1.2. Aims, objectives and research questions

The overall aim of this research is to examine the perception and understand the nuanced experiences, interpretations and rationales of stakeholders and community members about the contextual and historical factors that shaped the horticulture programmes in Kerala, India (between 1993 to 2012), and to explore impacts (including

² Through advocacy strategies, coordination, accountability, incentives, legislation, leadership programmes, capacity investments and resource mobilisation.

the pathways of impact) on the food environment in terms of fruit and vegetable access. Using Kerala state in India as an example, this thesis explores the impact of production or income generation-oriented horticulture programmes in a developing country context in transforming the food environment to encourage or to create barriers to fruit and vegetable access.

Objective 1: Perceptions and underlying interpretations of stakeholders

To document perception of the context and process that shaped the development of horticulture programmes in Kerala, India (between 1993 to 2012), I conducted a historical review that included (i) a ‘witness seminar’ (ii) and interviews with policy makers, experts and programme implementers that sought to answer the following questions:

- (1) What are the rationales and discourses and shaped the horticulture programmes?
- (2) What are the stakeholders’ perceptions of the implementation of the horticulture programmes?
- (3) What are the stakeholders’ perceptions about the impacts of the horticulture programmes including unintended consequences, trade-offs and lessons for the future?

Objective 2: Perceptions of community members.

To understand the experiences and impressions of community members about the impacts of horticulture programmes on the food environment — on availability, affordability and access to fruits and vegetables; and to understand heterogeneity of impact across groups, I sought to answer the following questions:

1. What are the perceptions of community members about supplies, production and prices of fruits and vegetables in their food environment? I further subdivide the main question into:
 - (1.a) How do these views differ among Kanjikuzhi, Aryad, Naranganam and Kottangal panchayats?
 - (1.b) How do these views differ among community members from government, aided and private schools (proxy for different income-groups)?

Table 3: Study objectives and methods

OBJECTIVES	QUESTIONS	METHODS	SOURCES
<p>Overall Aim: To examine the perception of stakeholders and community members about the contextual and historical factors that shaped horticulture programmes in Kerala, India (between 1993 and 2012), and to explore impacts on fruit and vegetable access in the food environment (including the pathways of impact).</p>	<p>What is the perception of development and impact of Kerala’s horticulture programmes on fruit and vegetable access in the food environment, and the contextual and historical factors that shaped this?</p>	<p>1. A historical review through a witness seminar and follow up with in-depth interviews. 2. Focus groups</p>	
<p>Objective 1) To document perception of the context, and process that shaped the development of Kerala’s horticulture programme and their impacts, and to explore perceptions of the goals of horticulture programmes.</p>	<p>What are stakeholders’ perceptions of factors that shaped Kerala’s horticulture programmes; their impacts; and their perceptions of goals of horticulture programmes?</p> <ol style="list-style-type: none"> 1. What rationales and discourses shaped the horticulture programmes? 2. What are the perceptions of stakeholders about the implementation of the horticulture programmes? 3. What are the stakeholders’ perceptions about the impacts of the horticulture programmes including unintended consequences, trade-offs and lessons for the future? 	<ol style="list-style-type: none"> 1. A historical review through a witness seminar. 2. Follow up with in-depth, private oral history interviews (in-person or skype, if face-to-face is not possible). 	<ol style="list-style-type: none"> 1. Witness seminar with key stakeholders — policy makers, implementers, academics experts, and activists from agriculture/horticulture; nutrition and food policy; gender; health; and rural development and poverty eradication. Including and representatives of non-governmental organizations. 2. Follow-up interviews with policy makers, implementers, and experts from agriculture/horticulture; nutrition and food policy; gender; health; rural development and poverty eradication. <p>N= 25-30</p>
<p>(2) To understand the impacts of horticulture programmes on the food environment, by seeking to understand the experiences and impressions of community members about their food environment — their perceptions of availability, affordability and access to fruits and vegetables; and to understand heterogeneity of perceptions across groups.</p>	<p>What are the perceptions of community members about supplies, production and prices of fruits and vegetables in their food environment?</p> <ol style="list-style-type: none"> 1. How do these views differ among Kanjikuzhi, Aryad, Naranganam and Kottangal panchayats? 2. How do these views differ among community members from government, aided and private schools (proxy for different income-groups)? 	<p>Focus groups</p>	<p>Focus groups with community members in four panchayats in Pathanamthitta and Alappuzha districts (parents, or/and teachers from local schools or from local Kudumbashree units). (N=12, n=3).</p>

Systematic Review

I did a systematic review to explore the policy-level drivers of diet in low and middle-income countries (such as economic, agriculture, trade and social welfare policies) and to uncover the pathways by which these policy-level determinants affect diet. The systematic review sought to answer the following questions:

1. What are the key policies and upstream determinants that drive diet?
2. By what pathways do these policies and upstream determinants, affect diet or influence changes in diet (as measured by data on nutrition, food consumption patterns, and food production or food price)?

Table 4: Systematic review — questions and methods

OBJECTIVES	QUESTIONS	METHODS	SOURCES
(1) To identify key policy-level drivers of diet in low and middle-income countries and in India. And, a. To understand the pathways by which these policy level determinants affect diet.	(1) What are the upstream policy level, drivers and determinants of diet in low and middle-income countries? a. What are the key policies and upstream determinants that drive diet? b. By what pathways do these policies and upstream determinants affect diet or influence changes in diet, nutrition, food consumption patterns, food production or food price?	Systematic Literature Review	Databases, grey literature, government websites etc.

1.2. Methods

To begin to fill the gap in understanding how agricultural policies and horticulture programmes that encourage fruit and vegetable cultivation affect the food environment in low and middle-income countries, I propose to integrate findings derived from a historical review and qualitative analysis of perception of stakeholders and communities about the evolution and impact of the horticulture programmes in Kerala on fruit and vegetable access in the food environment (Campbell *et al.*, 2000, Campbell *et al.*, 2007, Craig *et al.*, 2008). This is to enable a richer and deeper, nuanced understanding of the experiences, interpretations and discourses that have shaped horticulture programmes, and impacted the food environment (Mason, 2002, O’Cathain *et al.*, 2007), as well as to understand the heterogeneity of impact across groups (Buttenheim, 2009). I describe these methods in Chapter 3 on pages 52 to 77.

1.2.1. Significance

The findings of this study will be of relevance to low and middle-income countries with high rates of nutritional deficiencies and NCDs. It will draw conclusions about the potential relationship between horticulture programmes, nutrition (through diets) and equitable access to fruits and vegetables.

1.3. Organization of the Thesis

Chapter 2 provides a review of literature on several issues relating to policy-related drivers that affect supply and consumption of fruits and vegetables in low-and middle-income (LMIC) countries. I lay out the significance of social determinants of diet and how these contribute to undernutrition, micronutrient deficiencies, obesity and non-communicable diseases. I examine how agriculture policies and programmes impact peoples' diet and nutritional status through a broad variety of changes in fruit and vegetable supply, prices and expenditure. Further, I acknowledge that improved supplies and high production are insufficient to improve consumption, and provide evidence of the key role prices play in purchase decisions. I present evidence that a focus on food environments is necessary to facilitate healthier diets, dietary diversity and narrow diet-related equity gaps. Finally I examine the concepts of food security and food sovereignty and conclude that food production associated with the food security model — in which food is an economic commodity might be unable to curb hunger and malnutrition, while agriculture policies, reforms and programmes based on a food sovereignty model promote domestic consumption, nutrition security and dietary diversification.

Chapter 3 presents the objectives, research questions and methods used to gather and analyze the data collected for this thesis. I argue that this examination of stakeholder and community perspectives through qualitative methods such as a witness seminar, oral history in-depth interviews, and focus group discussions will, through multiple perspectives of experiences and interpretations, enable a richer, deeper and nuanced understanding of the factors that shaped horticulture programmes and the food environment in Kerala.

Chapter 4 provides an introduction to the historical and contemporary context of Kerala and the social changes including the programmes and projects have contributed to the development of horticulture in the state. Further, I acknowledge the puzzling dichotomy Kerala's in Kerala's development — between unhealthy nutrition and food

consumption patterns, and nutrition-related non communicable diseases and patriarchal on the one hand, and the rising fruit and vegetable production and growth in gross domestic product on the other. I also examine the evidence about the gender paradox in Kerala, with its high Gender Development Index (GDI), as well as consistent gaps in women's agency, public participation and decision-making.

Chapter 5 examines from perspectives of stakeholders who took part in a witness seminar, the mixed impact of Kerala's horticultural programme, which conserved and revived agriculture on the food environment. I argue that the market-driven approach has shown minimal impact on increasing fruit and vegetable access or dietary diversity and conclude that the social determinants of diet that operate within the food system, such as inequality, education, gender, rural and urban differences, class and caste continued to impact people's food consumption patterns and access to resources. I argue that while policy dissonance accounts for much of the gap between agriculture and Kerala's nutrition and health needs, proponents of the well-being approach seek to build an enabling environment for nutrition, with food sovereignty as a precondition for nutrition security.

In Chapter 6, I continue to examine the evolution (the context, processes, characteristics), and impact of Kerala's horticultural programme on fruit and vegetable access in the food environment, from the perspectives of a mixed group of twenty-five stakeholders, including policy makers, implementers, and experts from agriculture/horticulture; nutrition and food policy; gender; health; rural development and poverty eradication.

Chapter 7 explores community perceptions about fruit and vegetable supplies, production and prices in the food environment from the insights and experiences of 12 focus group discussions of community members from local government, aided and unaided, private schools in four panchayats in Alappuzha and Pathanamthitta districts in Kerala. I present these findings on food for people, including disparities and social gradients and localization of food systems.

Chapter 8 provides an integrated overview of findings from perceptions of both stakeholders and community members about fruit and vegetable access in the local food environment. The findings reveal how horticultural programmes in Kerala enabled an environment for nutrition, through democratization and the building of people-centered institutions; and through fostering the knowledge and skills of farmers. I further

summarize the findings on localization of food systems, and impact of supplies, production and prices on fruits and vegetables as food for people.

Chapter 9 discusses the public health implications of horticulture programmes in the context of low and middle-income countries undergoing nutrition transition. I argue that the evolving rationales for horticulture reveal a gradual move toward food sovereignty, especially in panchayats with Kudumbashree and panchayat-wide, collective farming initiatives, which were more likely to have localized food systems with fewer disparities. Finally this chapter points out that the Kerala experience (even though limited by policy and programme dissonance, neglect of nutrition and gender bias), suggests that horticulture programmes can succeed in easing people's lives when: there is a politically active population, women enjoy some autonomy, governance tends to be responsive and participatory, and government agencies have administrative vigour and capacity. I conclude the thesis by reinforcing the need to shift to agriculture and horticulture policies that respond to local nutrition needs, and promote nutrition security and dietary diversification and argue that with nutrition related NCDs in Kerala becoming an emergency, the focus must be on prioritizing nutrition security, dietary diversity and growing 'better' food rather than 'more' food.

Chapter 2. Overview of Literature

2.1. Introduction

In the previous chapter, I introduced why, in the context of a global shift toward unhealthy diets and increasing diet-related chronic diseases, there is considerable interest in understanding the relationship of 'upstream' determinants that shape our social environment. This chapter attempts to draw together several issues that relate to the policy-related drivers that have impacted supply and consumption of fruits and vegetables in low-and middle-income countries.

In this chapter I summarize the literature that examines how the social determinants of diet affect peoples' opportunity to eat a healthy diet by impacting their daily living conditions, their food environments and food consumption patterns. To do this I provide an overview of social determinants of diet and dietary change and how agriculture policies and programmes modify the *food environment* pathway and impact peoples' food consumption patterns.

Section A lays out the significance of the social determinants of diet. In Section B, I provide an analysis of nutrition-positive food environments that promote equitable food systems and nutrition-negative food environments that widen diet-related inequalities. In Section C through key findings from a systematic review, I describe the role of agriculture policies and programmes in LMIC countries in modifying diet and nutrition through a broad variety of changes in peoples' food consumption, expenditure and in nutritional status. The review supports the view that improved supplies and high production may not always improve consumption. The review further points to evidence of how some agriculture policies fostered self-reliant reforms nurtured food environments that facilitated healthier diets, improved dietary diversity and attempted to close diet-related equity gaps, while some export-friendly policies and programmes created barriers to healthy diets through hostile food environments. Finally in Section D I examine the concepts of food security and food sovereignty. I conclude that food production associated with the food security model — in which food is an economic commodity — might be unable to curb hunger and malnutrition, while agriculture policies, reforms and programmes based on a food sovereignty model — one that responds to local nutrition needs — promote domestic consumption, nutrition security

and dietary diversification. Furthermore, these agriculture policies may even help to bridge the continuing and widening gap of micronutrient deficits.

2.2. Section A: Social determinants of diet

Marmot and colleagues in the Whitehall study showed a social gradient — a steep inverse association between social class and mortality from a wide range of diseases (Marmot *et al.*, 1991). Further, Shepherd and Wilkinson and Marmot clarify how social determinants of health affect food and nutrition. In their book *The Solid Facts* Wilkinson and Marmot conclude that external economic, cultural and social environment — including marketing and economic variables, impact diet (Shepherd, 1999, Wilkinson and Marmot, 2003). These social, cultural and economic factors operating within the food system impact people's daily living conditions and food consumption patterns (Friel *et al.*, 2015, Tian *et al.*, 1996). Friel and colleagues argue that these 'complex and multifactorial' (Darmon and Drewnowski, 2008, pp. 1111) factors, systematically and unequally, distribute drivers of unhealthy eating at a societal, community and individual level. The intersection of social determinants of health influences people's living conditions and causes social stratification which determines the quantity and quality of resources they receive, and who stays healthy or become ill. Thus these social determinants of food access affect peoples' opportunity to eat a healthy diet and their abilities to be healthy. Ultimately the social determinants of diet impact what, when, where and how much different social groups eat (Friel *et al.*, 2015).

Studies in Brazil and Australia identified poorer, less educated people (own or maternal education) with precarious working and living conditions as likelier to be food insecure, eat unhealthy diets and have more diet-related diseases (Friel *et al.*, 2015, Lenz *et al.*, 2009, Olinto *et al.*, 2011). Scholars in Britain have found that the poor diet and low levels of calcium, iron, magnesium, folate and vitamin C clustered in lower socioeconomic groups were associated with economic aspects of the food environment and dietary behaviour (James *et al.*, 1997). Another study in Europe found low values of vitamin D and iron in lower socioeconomic groups (Novakovic *et al.*, 2014).

Drewnowski and Darmon³ as well as Mackenbach⁴ and colleagues argue that this is because food costs and high prices prevent access to nutrient-dense diets leading to

³ Based on studies in Europe and North America

⁴ A systematic review based mostly on studies conducted in the USA, UK, Brazil and Australia. The systematic review also included one study each from Mexico, New Zealand, Finland, Canada, Hong Kong and France.

lower consumption of F&V by low-income groups (Darmon and Drewnowski, 2008, Mackenbach *et al.*, 2019). Similarly, a recent systematic review found higher responsiveness of lower socioeconomic groups to food prices (Mackenbach *et al.*, 2019). Scholars have identified the negative impact of lower food budgets on F&V consumption (Darmon and Drewnowski, 2008, Giskes *et al.*, 2002) and associations between less healthy adult diets and lower household income (Brug, 2008). Therefore scholars have posited that food prices and diet quality costs are likely, with decreasing social position, to lead to a stepwise or linear decrease in diet quality (Darmon and Drewnowski, 2008, Mackenbach *et al.*, 2019). With healthier foods and more nutrient-dense diets often costing more, affluent and higher SES groups are associated with consuming greater variety of fresh F&V (Darmon and Drewnowski, 2008, Giskes *et al.*, 2002).

Gender exclusion also affects F&V consumption. Studies have found that South Asian women were likelier to eat insufficient F&V and that men consumed F&V more often than women (Kanungsukkasem *et al.*, 2009). They found fruit being eaten more often in Southeast Asian sites than in South Asian sites (Kanungsukkasem *et al.*, 2009). Giskes and colleagues who revealed consistent evidence of dietary inequalities concluded that there is low F&V consumption — especially fruit consumption among lower socioeconomic groups and disadvantaged groups (all measures: intakes, frequency of consumption or meeting recommendations) (Giskes *et al.*, 2010).

2.3. Section B: Food environments

We saw in Chapter 1 (see page 18) that the food environment connects the individual and household food sources with the wider food system (Turner *et al.*, 2017). Ease and proximity of access (distance, time, space and place, daily mobility, and modes of transport) to sources of healthy food influence diet quality (Darmon and Drewnowski, 2008, Darrouzet-Nardi and Masters, 2017, Herforth and Ahmed, 2015). Thus, examining the food environment — for availability (quality and diversity), affordability, accessibility, desirability of foods to community members — provides clues to understanding whether actions and policies across the food system have fostered nutrition-enabling or nutrition-hostile environments.

2.3.1. Enabling environment for nutrition

According to Gillespie and colleagues, an “enabling environment” for nutrition is the “political and policy processes that build and sustain momentum for the effective implementation of actions that reduce undernutrition” (Gillespie *et al.*, 2013, pp. 553). Shrimpton and colleagues suggest there are three linked themes crucial to building and sustaining an enabling environment for nutrition — politics and governance, knowledge and evidence, and capacity and financial resources (Shrimpton *et al.*, 2016). Politics and governance included vertical and horizontal coherence within and among sectors and stakeholders, positive contributions from the private sector and civil society, and strengthening accountability. Further, in a study with stakeholders in Nepal, Webb and colleagues identified three key domains for nutrition governance. These domains were commitment — a personal willingness to act; capability; and collaboration among colleagues and between levels of administration which according to Webb and colleagues was critical for governance (Webb *et al.*, 2016). Gillespie and Van den Bold described knowledge and evidence as generating, framing, and communicating nutrition-relevant data and they saw capacity as extending from the individuals, to organizations and then to system-wide capacity (Gillespie and van den Bold, 2017). Investments in connective infrastructure (paved roads, telecommunication networks, networks for distribution) are examples of such system-wide capacity strengthening of markets (Pingali, 2015). Railroad investments in India⁵ by lowering transportation costs allowed surplus regions to feed deficit regions, thus helping to reduce price rises, maintain real incomes, reduce mortality during famines⁶ and end peacetime famine (Burgess and Donaldson, 2017).

Policies that put control locally — that focus on developing necessary institutions that ensure broad-based and diverse socioeconomic participation are essential for creating enabling environments for nutrition (Pingali *et al.*, 2017, Pingali and Sunder, 2017). Participatory governance, especially local participatory processes, is helpful in making governance responsive to people’s needs and aspirations. Mansuri and Rao argue that a responsive state-enabled participation — promoting civic action through bureaucratically managed development interventions (Mansuri and Rao, 2013b), and decentralization which builds participatory governance by devolving or transferring power and resources from national governments to subnational elected governments,

⁵ By 1919 railroads were reaching most corners of India many decades before independence in 1947.

⁶ Burgess R, Donaldson D. Can openness mitigate the effects of weather shocks? Evidence from India’s famine era. *American Economic Review*. 2010 May 1; 100(2):449–53.

has become integral to Kerala's development discourse (Isaac and Franke, 2002, Riedl and Dickovick, 2014, Törnquist, 2000, Williams *et al.*, 2012).

Local food systems with direct farm-to-consumer marketing increases access to fruits and vegetables (Global Panel on Agriculture and Food Systems for Nutrition, 2016a). Therefore, incorporating home-grown local produce in school meals, restaurants and workplaces and growing F&V in home, community and school gardens would improve access especially for low-income groups (Kamphuis *et al.*, 2006).

Economically attractive retail F&V outlets in convenient locations is another recommended strategy to increase F&V access (Global Panel on Agriculture and Food Systems for Nutrition, 2016a). In Nepal optimal diets were a quarter less expensive in the plains which had more markets, than in the mountains (Biehl *et al.*, 2016). Darrouzet-Nardi and Masters calculated that gains for mortality associated with nearness and access to food markets in Nepal were similar to raising one quintile of household wealth, while gains for child height was similar to being two quintiles higher in local wealth distribution (Darrouzet-Nardi and Masters, 2017). In Benin, better access to markets was linked with higher availability of on-farm biodiversity and facilitated the purchase and sales of food biodiversity, contributing to diet diversity of mothers (Bailey, 2016). When there is limited time, convenience and ease of access can reduce the burden on women's time (FAO, 2011, FAO, 2013, Glanz *et al.*, 1998, Herforth and Ahmed, 2015, Herforth and Harris, 2014). Kerala's large PDS network is an example of a government-supported network of subsidized retail outlets that can potentially increase access to F&V (on page 93) (Government of Kerala (GOK), 2012a). F&V access accompanied by nutrition knowledge helps to diversify diets (Bailey, 2016, Global Panel on Agriculture and Food Systems for Nutrition, 2016a).

The action in 2001 by the Indian Supreme Court requiring provision of meals in primary schools is an example of increasing food access (Global Panel on Agriculture and Food Systems for Nutrition, 2016a, Global Panel on Agriculture and Food Systems for Nutrition, 2016c). Even within a low-income neighbourhood in the United States, easy access to sources of healthy food was associated with a higher F&V intake of fruit and vegetables and produce bought at farmers' markets was likelier to be consumed (Darmon and Drewnowski, 2008, Gustafson *et al.*, 2013, Herforth and Ahmed, 2015).

2.3.2. Disabling environments for nutrition

Limited F&V access in addition to easy access to unhealthy foods can lead to low F &V intake (Technical Staff World Health Organisation (WHO), 2014). According to the Rome Declaration on Nutrition, lack of food contributes to malnutrition:

The lack of access at all times to sufficient food, which is adequate both in quantity and quality which conforms with the beliefs, culture, traditions, dietary habits and preferences of individuals in accordance with national and international laws and obligations.

- Rome Declaration on Nutrition, Second International Conference on Nutrition, 2014 (FAO and WHO, 2014, pp. 2)

Widening inequalities in F&V access have decreased the share of F&V in household budgets of low-income people (Bailey, 2016). Class and caste status also contributes to F&V access. Low F&V intake associated with low socio-economic status is often due to lack of access when markets are located far away⁷ and cost too much money and time to reach (Herforth and Ahmed, 2015, Technical Staff World Health Organisation (WHO), 2014, World Bank, 2007). Studies in low and middle-income countries reveal that unavailable or expensive transportation impacts access to F&V (Dei, 1992, Gavan and Chandrasekera, 1979, Honfoga and van den Boom, 2003).

Lack of effective marketing, transportation, and nutrition knowledge and rural/urban disparities as well as existing inequalities can decrease access to F&V and diet diversity (Bailey, 2016, Dei, 1992, Florentino *et al.*, 1992, Gavan and Chandrasekera, 1979, Honfoga and van den Boom, 2003, Ivanova *et al.*, 2006, Rahman *et al.*, 2011).

2.4. Section C: How policy-related determinants affect diet in low and middle-income countries — a look at agriculture

I summarize findings from a systematic review I carried out as part of my PhD, to act as background to the primary data collection of studies in low-and middle-income countries for reported dietary change, policies influencing dietary change, and pathways by which policies affected a broad variety of changes in diet and nutrition. The systematic review was conducted according to widely accepted methodological standards for systematic reviews. The protocol of the review is on page 296. The

⁷ In the US, such places are termed food deserts.

objectives of the review was to identify key policy-level drivers of diet in low and middle-income countries and in India and to understand the pathways by which these policy level determinants affect diet. The review sought to answer the following specific questions. (1) What are the upstream policy level, drivers and determinants of diet in low and middle-income countries? (2) By what pathways do these policies and upstream determinants affect diet or influence changes in diet, nutrition, food consumption patterns, food production or food price? A narrative synthesis was used to bring together evidence on how policies may be affecting the food environment from studies with diversity of settings, interventions and outcome measures.

The study identified 39 published and unpublished studies in English from 1942 to 2012, from 19 databases⁸ searched from the inception of records until May 2014. These studies used longitudinal and repeated cross-sectional data from 23 low-and middle-income countries (Bangladesh, Brazil, Bulgaria, Burkina Faso, China, Côte d'Ivoire, Egypt, Fiji, Ghana, India, Indonesia, Mali, Mauritius, Mexico, Nigeria, Pakistan, Philippines, Samoa, Sri Lanka, Thailand, Togo, Tunisia, and Uganda).

Evidence from 26 of the 39 studies included in this systematic review suggests that agricultural policies and reforms modified food environments by either facilitating or creating barriers to nutrition-rich food. The pathways from policies and programmes to nutrition included production, food prices, total expenditure and availability. The overall aim of the policy and/ or programme, whether it was meant to increase or stimulate exports, or whether it was meant to increase nutrition-rich foods in people's diet affected all the pathways.

2.4.1. A note on the definition of food consumption

It is important to clarify that the term 'food consumption' holds multiple meanings. Economists define total food consumption "as food expenditures plus the value of own consumption plus the net value of food gifts given and received" (Laraki, 1989, pp. 400) and disregarding "the end-use of what was purchased" (FAO and The World Bank, 2018, pp. 1). Nutritionists interpret 'food consumption' as 'eating' — the end-use of food — whether purchased, gifted or grown (FAO and The World Bank, 2018). To nutritionists, 'food consumption' goes beyond purchase, to 'eating'. I use the phrase 'food

⁸ Anthropology Plus, BIOSIS preview, CAB abstracts, Cochrane Library, Econlit, Embase, Global Health, GreenFILE, IBSS, Index to theses, IndMED (peer reviewed medical journals published from India), INFLIBNET (doctoral dissertations submitted to the Indian universities), Medline, New York Academy of Medicine Grey Literature Report, North American Dissertation Abstracts, Popline, Web of Science and IMSEAR (WHO).

consumption’ to encompass concepts and data that include, acquisition, expenditure, and intake. Economists and nutritionists may use different data sets. Nutritionists use descriptive and quantitative dietary records to assess short-term or long-term intake of individuals such as 24-hour recalls, diet records such as food records or diaries, and food-frequency questionnaires (FAO, 2018). Nutritionists also use biochemical markers that reflect nutrient intake such as measures of plasma levels of vitamins or concentration of hemoglobin for assessing anaemia. To understand the effect of income and prices on diet on households, economists may use nationally representative household consumption and expenditure surveys, such as household budget surveys, income and expenditure surveys or ‘multi-purpose’ or ‘integrated’ household surveys, such as the Living Standards Measurement Study surveys, or a well-implemented food diary considered to be the gold standard for food expenditure data collection (FAO and The World Bank, 2018).

The findings from the systematic review revealed that agriculture, trade, welfare and economic policies were the primary policies that influenced diets in LMIC countries. Below I report the findings of the review on the pathways by which agriculture programmes and policies influenced changes in food production, prices and consumption.

2.4.2. The pathways of supplies and high production may not improve consumption

While many agricultural reforms had positive impacts, some had negative dietary and nutrition security impacts (Sircar, 2002). It was found that focus on specific crops can lead to lower availability and higher prices for other crops. For example, prioritizing rice, wheat, potatoes, oil seeds or cash crops such as high value fruits and vegetables, or rubber was associated with low food production by smallholders⁹ leading to reduced availability of F&V, tubers and millets for local use (Adamu, 1989, Dei, 1992, Gavan and Chandrasekera, 1979, Itharattana, 1996, Wang and Zhang, 2004). High production of a few crops constrained dietary diversity as people tend to consume what is available, especially if it was affordable. Structural changes in Bulgaria — command to market economy, collectivized farming to household responsibility -- and removing subsidies in and the neglect of food production in household gardens in coastal Bangladesh (Fuglie,

⁹ According to Itharattana about half of the food crops cultivated by small holders were for domestic consumption and the rest sold locally, unlike export crops cultivated in large farms or plantations.

1991, Rahman *et al.*, 2011) caused sharp decline in fruit (Bulgaria: from 53.2 g to 35.5 g, a drop of 18 g) and vegetable consumption (Ivanova *et al.*, 2006, Rahman *et al.*, 2011). Bangladesh lost vegetable diversity (32 vegetables in one location became extinct) and there was lower vitamin A and iron intake (90% of vitamin A, 50% of iron) (Rahman *et al.*, 2011).

Production programmes that focused on preventing hunger are also implicated in limiting agriculture to fewer types of crops. Such programmes that focus on preventing hunger may affect F&V consumption. For example, the Green Revolution and public distribution system in India, a supply-side food security initiative to prevent hunger and famine, promoted higher consumption of rice and wheat and transformed cropping patterns away from nutritious crops (Kumar *et al.*, 2009, Pinstруп-Andersen and Jaramillo, 1989, Ramachandran, 2008, Sarkar *et al.*, 2012).

Export-friendly agriculture policies changed cropping pattern in Pakistan, Uganda, and Thailand as the focus shifted from food for people, to food for export, showing increased production of sugar, rubber, chillies, etc. (Itharattana, 1996, Khaliq Uz, 2011, Simler, 2011, Thow *et al.*, 2011). For example, there has been a steep growth in potato production, leading to higher consumption and substitution as a staple. There was higher potato demand, led by growing fast food franchises and popularization of French fries, accompanied by marketing to maximise returns, (Ivanova *et al.*, 2006). In China since 1986 with the dismantling of the commune system and liberalization, Chinese imports of frozen potatoes increased 85-fold, and between 1991 and 2007 the average potato consumption doubled — 14kg to 34 kg per person per year (Scott and Suarez, 2012, Wang and Zhang, 2004).

Enhanced production and domestic distribution allowed these crops to remain cheap, which also may have promoted their consumption (Fuglie, 1991, Gavan and Chandrasekera, 1979, Itharattana, 1996, Scott and Suarez, 2012). Interestingly Pakistan's higher production of chillies, onions and tomatoes between 1979 to 2010 was also associated with increasing monthly chilli consumption (12,1028%, between 1987 and 2005) (Khaliq Uz, 2011). Production fluctuations also had negative dietary consequences (Babu *et al.*, 1993, Dei, 1992, Pinstруп-Andersen and Jaramillo, 1989, Sarkar *et al.*, 2012).

Some supply-side initiatives which result in higher production, do not increase affordability or consumption (Ackah and Appleton, 2007). Even as production increased of high value F&V in Ghana, Thailand, India and China, there was evidence of lower

vegetable availability (Dei, 1992, Wang and Zhang, 2004). A study from China reported lower average daily intake of dark and light leafy vegetables but slight increase in fruit intake, especially in rural areas (Zhai *et al.*, 2014). The higher vegetable production in Thailand between 1970 and 2003 (1,934,000-3,236,000 tonnes per year) neither increased vegetable affordability nor consumption. James and colleagues proposed that the increase was associated with increased exports (39 times greater than in 1970, from 12,000 to 475,000 tonnes and that vegetable availability dropped from 48 kg to 42 kg/caput/yr (James *et al.*, 2010). In the years 1995 to 2003, vegetable consumption in Thailand decreased from 113.4 g to 23.1 g, five times lower than it had been less than ten years previously (James *et al.*, 2010). Similarly Khaliq Uz points out that between 1987 and 2005 lentils and other pulses registered high growth but low consumption in Pakistan while onions and tomatoes saw modest growth (35.25% and 24.14%), but other vegetables registered barely any growth in production (6.54%)(Khaliq Uz, 2011).

Dei and colleagues in Ghana, Wang and Zhang in China and Itharattana in Thailand concluded that shifting cropping patterns reduced land and resources for producing healthy food for local consumption while helping farmers' (generally male) income soar and led to further expansion of these profitable crops (Dei, 1992, Itharattana, 1996, Wang and Zhang, 2004). The neglect of nutritious food production — low investments and eliminating subsidies, or not making inputs (seeds, and fertilizers) affordable, or not mitigating seed and fertilizer shortages (Dei, 1992, Gavan and Chandrasekera, 1979, Honfoga and van den Boom, 2003) changed cropping patterns (Khaliq Uz, 2011, Thow *et al.*, 2011) and decreased consumption of healthier foods (Dei, 1992, Honfoga and van den Boom, 2003, Ivanova *et al.*, 2006, Rahman *et al.*, 2011).

2.4.3. The pathway of price affected purchases

In Bulgaria, India and Nigeria, the poor spent a higher proportion of budget on food (Ivanova *et al.*, 2006, Njoku and Nweke, 1994, Ramachandran, 2008, Sharma *et al.*, 2006). The rising urban and export demand that led to higher production and fuelled F&V price increases, and farmer profits, also put them out of the reach of poor consumers (Fuglie, 1991, Itharattana, 1996, Khaliq Uz, 2011, Rahman *et al.*, 2011, Simler, 2011, Wang and Li, 2008).

Several studies reported high prices of vegetables (especially GLVs), fruits and root crops (Hartini *et al.*, 2003, Honfoga and van den Boom, 2003, Ivanova *et al.*, 2006, Sharma *et al.*, 2006). Fruit remained a luxury in India (Ramachandran, 2008, Sharma *et*

al., 2006) while Hartini and colleagues concluded that the average fruit consumption in urban Indonesia decreased sharply due to high prices (Hartini *et al.*, 2003). In Thailand, F & V expenditure increased steadily from 19% to 24.3% from 1985 to 1993 (Itharattana, 1996). Dei's study of Ghana reported that food was unaffordable for urban workers reliant on the minimum daily wage (Dei, 1992).

High prices led to higher household expenditure and people substituting nutrient-dense F&V, pulses and traditional root crops with cheaper foods like rice, wheat, maize and potato (Gaiha *et al.*, 2012b, Khaliq Uz, 2011, Rahman *et al.*, 2011, Sharma *et al.*, 2006, Zhang *et al.*, 2008). Lower prices of palm, soybean and hydrogenated vegetable oils have led to and higher oil and fat consumption and displacement of healthier cooking oils (Gaiha *et al.*, 2012a, Thow *et al.*, 2011).

2.4.4. Pathways through which disparities are increased

The existing inequalities, production deficits, prices, marketing, transportation and nutrition knowledge exacerbated equity impact across groups, impacting food consumption inequalities (Mishra and Ray, 2011, Sharma *et al.*, 2006). Higher food prices widened intake and availability disparities (rice, vegetables, fruits, and dairy products) among lower income groups in India (Mishra and Ray, 2011, Ramachandran, 2008, Sharma *et al.*, 2006). A study in India also showed social gradients in F&V intake, increasing intake with increasing family income (Sharma *et al.*, 2006). While expenditure on vegetables increased for the lowest economic quintile (who spent 3.75 times more in 1993-94 than in 1977-78), it decreased for all others (Sharma *et al.*, 2006).

There were urban/rural and regional disparities in price and availability (Florentino *et al.*, 1992, Honfoga and van den Boom, 2003, Ramachandran, 2008, Sharma *et al.*, 2006). Other factors such as marketing deficiencies and unavailable or expensive transportation (Dei, 1992, Gavan and Chandrasekera, 1979, Honfoga and van den Boom, 2003, Ivanova *et al.*, 2006) also impacted F&V access. Transportation of food products to urban hubs (Florentino *et al.*, 1992) promoted an 'urban-biased' food supply, increasing rural prices and decreasing availability, depriving rural populations of nutrition security (Florentino *et al.*, 1992, Rahman *et al.*, 2011). Expenditure on vegetables increased in rural areas and decreased in urban areas, consequently fruit consumption was found to be much higher in urban areas (Ramachandran, 2008).

2.4.5. These pathways led to food substitution

High prices and increasing household expenditure led to substitutions as people consumed locally available¹⁰, cheaper foods. High consumption of processed cereals (flour, rice) was seen in Bulgaria and in India (Ivanova *et al.*, 2006, Ramachandran, 2008), while potato substituted for cereal in Tunisia (Fuglie, 1991) and for vegetables in China and India (high rural potato consumption) (James *et al.*, 2010, Ramachandran, 2008, Scott and Suarez, 2012, Simler, 2011, Wang and Zhang, 2004). In Bulgaria, there was steep decrease in consumption of fruit, meat, fish, eggs, milk and dairy foods, sugar, oil, butter and store-bought bread (Ivanova *et al.*, 2006). In Pakistan, people used available vegetables like potatoes instead of GLVs (Khaliq Uz, 2011).

Lower prices of foods that had high production led to substitution as even when food prices increased, prices of foods with high production increased the least (Ackah and Appleton, 2007). Lower prices of foods that had high production led to people using wheat, rice and potatoes. Wheat or rice became staples in Bulgaria and Nigeria (Ivanova *et al.*, 2006, Njoku and Nweke, 1994). There was a steep growth in potato consumption. Potato became a substitute for semolina in Tunisia (Fuglie, 1991), an affordable vegetable in China and India (high rural consumption), and a luxury food in China¹¹ and Thailand (James *et al.*, 2010, Ramachandran, 2008, Scott and Suarez, 2012, Simler, 2011, Wang and Zhang, 2004).

2.4.6. Agriculture policies also encouraged healthier diets

Agriculture policies encouraged healthier diets (Adamu, 1989, Florentino *et al.*, 1992, Gavan and Chandrasekera, 1979, Pinstrip-Andersen and Jaramillo, 1989) through agricultural self-sufficiency, import substitution, and protecting domestic markets (Itharattana, 1996). These measures increased availability and accessibility to nutritious food (Gavan and Chandrasekera, 1979, Itharattana, 1996, Scott and Suarez, 2012, Thow *et al.*, 2011, Wang and Zhang, 2004).

Other key reforms such as instituting public distribution systems (Chakrabarti *et al.*, 2016, Gavan and Chandrasekera, 1979, Kishore and Chakrabarti, 2015, Krishnamurthy *et al.*, 2017), value addition (Njoku and Nweke, 1994), investments for food crops in home, community and school gardens (Florentino *et al.*, 1992, Wang and Zhang, 2004),

¹⁰ The price of foods with high production increased the least.

¹¹ French fries were luxury food.

gender-friendly access to land (Dei, 1992, Wang and Zhang, 2004), producer-friendly marketing, and supporting investments in roads networks were reported as ensuring high production and distribution of healthy foods, even in the rural areas (Gavan and Chandrasekera, 1979, Wang and Zhang, 2004). These investments stimulated domestic demand (Adamu, 1989, Gavan and Chandrasekera, 1979, Khaliq Uz, 2011, Sarkar *et al.*, 2012) and spurred rural employment growth and higher income, especially for women (Adamu, 1989, Gavan and Chandrasekera, 1979, Sarkar *et al.*, 2012).

Ghana and Nigeria tried to substitute imports of processed rice with increased domestic production of root vegetables — yam and cassava (Ackah and Appleton, 2007, Adamu, 1989). In Fiji, agricultural investments were credited with increased availability of healthy root crops at lower prices (Thow *et al.*, 2011), and a study from Nigeria further associated investments with a subsequent return to healthier traditional diets (Njoku and Nweke, 1994). Increased dietary diversity (Gavan and Chandrasekera, 1979) and rise in equity followed (Gavan and Chandrasekera, 1979, Hartini *et al.*, 2003).

Increasing availability, access and nutrition awareness improved equity and dietary diversity

To improve dietary diversity, it is important to improve availability through increased production, storage and marketing systems; to increase affordability by taming food price inflation, and access and to promote awareness about the benefits of increased vegetable intake (Ramachandran, 2008). The reforms effectively helped narrow the nutrition inequity gap in the Philippines, where community-managed nutrition programmes counteracted the effect of economic crisis. In Thailand too there was rising nutrition equity, where individual dietary availability increased from 67 gm-86g as well as increased fruit intake — over 12 times from 6.1g to 77.1g (FAO Food Balance sheets, 1970-2003) (James *et al.*, 2010).

Social protection programmes that provide subsidised grains, such as Sri Lanka's public distribution programme and India's National Food Security Act (NFSA), have reduced calorie consumption inequalities (Gavan and Chandrasekera, 1979, Singh *et al.*, 2016). Targeted micro-nutrient supplementation programmes accompanying cash transfers to poor households were also likely to increase dietary diversity (Skoufias *et al.*, 2011). For example, Brazil's conditional cash transfer programme Bolsa Família

expanded food access and increased dietary diversity and family food expenditures¹² (Lignani *et al.*, 2011).

2.5. Section D: Food — from security to sovereignty

The articulation about food security which tasked governments with producing more food and distributing it more equitably and efficiently between countries arose and evolved in the context of famine-related deaths. The food sovereignty definition was articulated as structural adjustment policies of the 1990s ignored the interests of the “rural poor in rural agricultural areas” and widened rural-urban income inequalities (Patel *et al.*, 2007). La Via Campesina (LVC), or the International Peasant Movement¹³ (established in May, 1993), criticised ‘food security’ for being “technocratic and quantitative”, (Edelman, 2017, pp. 4) and only caring about adequacy of supplies (Desmarais *et al.*, 2014). Instead, LVC deemed food sovereignty initiatives to build equitable, just and ecologically sustainable food systems that address the root causes of hunger and malnutrition as a precondition for food security (Eddis, 2014, Patel, 2009). For LVC food sovereignty was a way to promote social justice and dignity. They opposed corporate driven agriculture and a global food system that rested and reinforced “a model of globalisation that reduces human relationships to their economic value” would destroy social relations and nature and would constitute a “massive violation of human rights” (Schanbacher, 2010, pp. ix). The First Global Forum on Food Sovereignty defined food sovereignty as:

... the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems. It puts the aspirations and needs of those who produce, distribute and consume food at the heart of food systems and policies rather than the demands of markets and corporations.

- Declaration of Nyéléni, the First Global Forum on Food Sovereignty, Mali, 2007 (Forum for Food Sovereignty, 2007, pp. 9)

¹² Unfortunately it also increased cereal, soft drink (doubled), sugar (doubled), hydrogenated fat and processed food consumption.

¹³ LVC aims to build unity, and solidarity between 182 organizations in 81 countries. These organizations include peasants, small and medium size farmers, landless people, rural women and youth, indigenous people, migrants and agricultural workers.

In many ways this statement is quite different from the definition of food security, at the World Food Summit in 1996:

Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

- The 1996 World Food Summit Plan of Action, para 1,FAO (FAO, 1996)

LVC critiqued the food security model which they said had commodified food as having failed to curb hunger and malnutrition (Eddis, 2014). Instead, LVC's articulation of the food sovereignty definition tried to place the needs and aspirations of those who produce, distribute and consume food at the heart of food systems and policies.

2.5.1. Historical evolution

To better understand the definitions, it is useful to look back at the changing nature of the food security definition. It began with the 1974 World Food Summit, convened by the General Assembly of the United Nations to eradicate the type of hunger that led to the famine-related deaths in the Sahel region from West Africa to Ethiopia in the late 1960s to the early 1980s. The Summit's objective was to help governments produce more food and to distribute it more equitably and efficiently between countries (Patel, 2009, United Nations, 1975). Their definition of food security was:

Availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices.

- World Food Summit, 1974 (United Nations, 2017, pp. 2)

Nine years later in 1983 the definition further evolved as FAO, reflecting Amartya Sen's work on 'entitlements' (Edelman, 2014), emphasized demand — consumption and access by vulnerable people, so that:

...all people at all times have both physical and economic access to the basic food that they need.

- FAO (FAO, 2003, pp. 27)

Thirteen years later, in the 1996 World Food Summit, Jacques Diouf, then FAO's Director issued an idealistic call for the best of human values to prevail against poverty, scepticism, cynicism, egoism by halving the number of hungry people by the year 2015. That Summit moved closer to the ultimate goal of "food for all" broadening the definition to include the ability of "all people, at all times" to access "sufficient, safe and nutritious food that meets their dietary needs and food preferences".

Patel attributes this broadening to concerns around nutrition, social control, and public health, to the inclusion of the phrase 'food sovereignty' by La Via Campesina in the NGO Forum Statement, 'Profit for few or food for all: Food sovereignty and security to eliminate the globalisation of hunger'. In contrast to notions of food security which avoided mention of social control of the food system, 'food sovereignty' upheld the 'right of nations and peoples to control their own food systems, including their own markets, production modes, food cultures and environments' (Wittman *et al.*, 2010, pp. 2). This concept of food sovereignty goes back to the Mexican agrarian reform of the 1930s (Edelman, 2017). The phrase itself originated from the National Food Program (Programa Nacional de Alimentación, PRONAL) a 1983 Mexican government programme 'to achieve food sovereignty,' through production and consumption policies to control the food chain and limit imports of essential "foods, inputs and technology as well as capital".(Edelman, 2014, Edelman, 2017).

2.5.2. Food Sovereignty—key elements and philosophical underpinnings

The crucial flaw in the food security paradigm according to LVC was a lack of concern about the "social and economic conditions" and processes "under which food ends up on the table" (Patel *et al.*, 2007, pp. 90). Instead LVC articulated the concept of 'food sovereignty' as a counter narrative that emphasizes peoples' right to participate in decision making and define their ecologically sustainable and culturally appropriate food, and a bottom-up, grass-roots democratization of food systems based on the "politicized and grounded knowledge" (Levkoe *et al.*, 2018, pp. 3) of farmers and indigenous peoples (Eddis, 2014, Forum for Food Sovereignty, 2007, Jones *et al.*, 2015). Fairbairn calls food sovereignty a 'counterframe' to trade-based food security based on availability and access (Fairbairn, 2010, pp. 26).

Food sovereignty according to the International Forum for Food Sovereignty in Mali in 2007 has six pillars. It (1) focuses on food for people, (2) builds knowledge and skills, (3) works with nature, (4) values food providers and transforms gender relations,

(5) localizes food systems and (6) finally, puts control locally. A seventh pillar, declaring that food is sacred was added later. (Desmarais *et al.*, 2017, Forum for Food Sovereignty, 2007, Jones *et al.*, 2015, Lee, 2007, Park *et al.*, 2015).

Food sovereignty was to be based on “genuine agricultural reform, mutual dependence and local, small-scale community prosperity” (Schanbacher, 2010 , pp. xiv) distinct from the “neoliberal ideas of competition, liberalisation and economic growth” (Eddis, 2014, online paper for the Food We Want project at penhanetwork.org). The philosophical underpinnings of the food sovereignty narrative are also articulated in the six key elements of LVC’s 1996 Nyéléni Declaration. The latter include strengthening family farmers and local and regional food systems; reversing the concentration of wealth and power through agrarian reform and establishing farmers’ rights; reorienting agriculture toward agroecology; strengthening states’ capacity for ensuring food security (suspending structural adjustment programs, guaranteed economic and political rights, and policies to ‘improve the access of poor and vulnerable people to food products and to resources for agriculture’), deepening peoples’ participation at all levels, and guaranteeing the right to food. It further sought priority of food sovereignty over macroeconomic policies and trade liberalization (Edelman, 2014).

Women’s rights and the struggle to transform gender relations are seen as central to food sovereignty (Desmarais *et al.*, 2017, Patel, 2012, Wittman *et al.*, 2010). The Women of La Via Campesina Manifesto from the 2013 LVC Jakarta conference confirms gender justice and access to land as pillars of food sovereignty (La Via Campesina, 2014, Park *et al.*, 2015):

Our heritage as food producers is critical to the future of humanity. This is specially so in the case of women and indigenous peoples who are historical creators of knowledge about food and agriculture and are devalued. What are we fighting for? A world where... recognition and respect of women’s roles and rights in food production, and representation of women in all decision making bodies; respect for local autonomy and governance with equal rights for women and men....

- (Forum for Food Sovereignty, 2007, pp. 8)

According to Pingali and colleagues, empowering women in their roles as not only food producers but as decision-makers is required (Pingali *et al.*, 2013). Such reshaping gender relations included challenging power inequalities and supporting “new

social relations free from oppression and inequality between men and women” (Forum for Food Sovereignty, 2007, pp. 9). The movement considers women’s rights as of paramount importance to realize food sovereignty (Patel, 2012, Wittman *et al.*, 2010). However there was less clarity on how gender inequalities ought to be challenged and women’s rights affirmed (Park *et al.*, 2015). While acknowledging that policies that support women’s empowerment and education such as women-centred extension services and investment in peer-to-peer networks for inputs, credit, and information are crucial to ensure a more nutrition-sensitive food system (Pingali and Sunder, 2017), Cornwall highlights a lacunae in nutritional decision-making and women’s nutritional inequality. Rather than merely focussing on increasing women’s access to resources Cornwall urges that women and girls be put at the heart of development (Cornwall, 2012) and asks:

...not what women and girls can do for development, but what development might do for them.

- Cornwall, The Guardian, March 5, 2012 (Cornwall, 2012)

Thus we see that food sovereignty, with its focus on food for people instead of food for trade, recognizes concerns around nutrition, social control, and public health. Moreover, it acknowledges that the control of food systems, cultures and environments is vital to safeguard consumption of healthy and culturally appropriate food. By valuing farmers, the creators of knowledge about food and agriculture, it promotes social justice and dignity. Finally, the food sovereignty approach recognizes the struggle to transform gender relations and sees women as decision-makers at the heart of all development.

2.6. Discussion

This review shows that social determinants impact people’s daily living conditions and food consumption patterns and affect peoples’ opportunity to eat a healthy diet (Friel *et al.*, 2015, Shepherd, 1999, Wilkinson and Marmot, 2003). These social determinants that distribute the drivers of unhealthy eating — systematically and disproportionately — operated at all levels of the food system (Friel *et al.*, 2015, Tian *et al.*, 1996, Wilkinson and Marmot, 2003). Because nutrient-dense diets often cost more, there was a social gradient in diet quality with higher SES groups associated with consuming greater variety of fresh F&V (Darmon and Drewnowski, 2008, Giskes *et al.*, 2002). There was consistent evidence of dietary inequalities as disadvantaged groups and those with lower household income

who were more responsive to food prices and diet quality costs, consumed a less nutrient-dense diet (Darmon and Drewnowski, 2008, Giskes *et al.*, 2010, Mackenbach *et al.*, 2019). Gender exclusion also affected F&V consumption in South Asia (Kanungsukkasem *et al.*, 2009).

Several scholars have examined how the wider food system, through the food environment, connects individuals, households and communities to sources of healthy food (Darmon and Drewnowski, 2008, Darrouzet-Nardi and Masters, 2017, Herforth and Ahmed, 2015, Turner *et al.*, 2017). Scholars argue that the agriculture sector can improve nutrition outcomes (Friel *et al.*, 2015, Gillespie and van den Bold, 2017, Wilkinson and Marmot, 2003). The TANDI framework (Gillespie and van den Bold, 2017) conceptualizes pathways through which the agriculture sector, by facilitating enabling environments for nutrition may impact nutrition outcomes (Gillespie *et al.*, 2012, Gillespie and van den Bold, 2017). There is agreement that agricultural priorities need to focus on growing 'better' food rather than 'more' food (Gillespie and van den Bold, 2017, Willett *et al.*, 2019).

The increased production of food supplies associated with the food security model — in which food is an economic commodity — has been unable to curb hunger and malnutrition (Eddis, 2014). It is clear that agriculture production programmes that aim to improve F&V *supply*, do not always improve *consumption* of nutrient-rich diets, especially for disadvantaged groups (Dei, 1992, James *et al.*, 2010, Ramachandran, 2008, Sharma *et al.*, 2006, Wang and Zhang, 2004, Zhai *et al.*, 2014).

There is evidence that agriculture policies can facilitate dietary diversity in low- and middle-income countries and lead to narrowing rural-urban and other inequalities. This review also found that agriculture policies build an enabling environment for nutrition when they focus on food for people, transforms gender relations, localizes food systems and puts control locally (Dei, 1992, Hartini *et al.*, 2003, Njoku and Nweke, 1994, Ramachandran, 2007, Sharma *et al.*, 2006, Thow *et al.*, 2011). These factors usually associated with food sovereignty, which is deemed a precondition for food security, have the potential to improve nutrition by increasing F&V consumption and helping to bridge the continuing and widening gap of micronutrient deficits (La Via Campesina, 2016, Patel, 2009). Examining the food environment — for availability (quality and diversity), affordability, accessibility, desirability of foods to community members — provides clues to understanding whether actions and policies across the food system have fostered nutrition-enabling or nutrition-hostile environments.

There is as yet little research on how agriculture policies, programmes and reforms affect the food environment in low and middle-income countries, particularly in those areas where NCDs have become a particular challenge. Do they build enabling or hostile nutrition environments? Research is also needed to assess if supply-side programmes that purport to improve food supplies have also created an “enabling environment” for dietary diversity and nutrition security, or if they have modified crop choices and/ or distribution networks, or implemented other changes that have created barriers for vulnerable people to access healthy, nutritious and sustainable diets. More research is also needed to understand how profit-oriented agriculture policies, including horticulture policies that promote F&V cultivation for export or urban markets, influence changes in diet by favouring profitable crops at the expense of nutritious food crops for local use, raise prices, and/or reduce local availability.

2.7. Conclusion

This review shows that social determinants influence diet, often lead to widening inequalities in food consumption patterns. The findings of this review reinforce the need to shift from considering food as a commodity to considering food as a human right, and the need to shift from agriculture policies that focus only on macronutrients (wheat and rice) to agriculture and horticulture policies that respond to local nutrition needs, and promote nutrition security and dietary diversification. Agriculture policies based on food sovereignty and domestic consumption has the potential to improve availability, affordability and access to year-round F&V supply in local markets, thereby increasing fruit and vegetable consumption and helping to bridge the continuing and widening gap of micronutrient deficits.

Further research is needed in three areas:

1. Low-and middle-income countries should be encouraged to do more robust and ongoing research (both at the population level and at the individual level) to examine diet, nutrition and health implications of economic, trade, welfare, food and agriculture policies and programmes.
2. Research is also needed on the role of policies (especially agricultural and welfare and food policies) for transforming the food environment in ways that encourage access or create barriers to healthy food.
3. Low-and middle-income countries should:

- a. design, conduct, and evaluate policy and programme interventions promoting agriculture, especially fruit and vegetables for local use.
- b. analyse routinely collected household expenditure, nutrition and other surveys to monitor changes in diet.

While there has been a lot of research to understand the linkages between diet, obesity and chronic non-communicable diseases (NCDs) in high-income countries, the discussion on nutrition in low and middle-income countries is mostly confined to malnutrition. While there is evidence that higher prices of healthy food results in an increase in consumption of certain nutrients through foods such as wheat, rice and potatoes (which are relatively inexpensive and available in local areas), at the cost of other micronutrients obtained through fruits, vegetables and pulses, more research is needed on the linkages between poor monotonous diets and chronic diseases (NCDs) in low-and middle-income countries.

The rest of my thesis will aim to contribute evidence to help in understanding the effects of agriculture policies and programmes on food consumption by encouraging access or creating barriers to healthy food in the food environment in an LMIC country. In the next chapter I justify and describe the qualitative methodological approach of this thesis. I outline the objectives, research questions, and explain the stakeholder and community data collection and analysis that aims to provide a nuanced understanding of the factors that shaped horticulture programmes and the food environment in Kerala. The chapter also includes a reflection on my personal position.

Chapter 3. Methods

In this chapter, I will argue for the advantages of using a qualitative approach and lay out the methods used to gather and analyze the data collected for this dissertation.

3.1. Methodological approach

3.1.1. Why a qualitative approach?

I utilize a qualitative methodology comprising a witness seminar, oral history interviews and focus group discussions, to explore perceptions of access to fruits and vegetables in the food environment in a low middle-income country. Though observational approaches are recommended to capture perceptions of food availability, accessibility, affordability, desirability and convenience, there are few studies on the external food environment. Studies that have examined the personal food environment have mostly used quantitative measures (Aggarwal *et al.*, 2014, Turner *et al.*, 2017, page 2). As Merry explains, while numbers can help expose problems and track their distribution, the knowledge numbers provide is decontextualized, homogenized, and remote from local systems of meaning (Merry, 2016). Because meaning and experience is made through social interaction and context, empirical research to enhance knowledge and understanding of people's food environment interactions needs to capture data hidden from public view such as how people think, and attribute meanings to their behaviour and food environment, including differences between people, contexts and cultures.

Turner and colleagues (Turner *et al.*, 2017) highlight that qualitative techniques are increasingly valued in the drive to address pressing nutrition and food security problems and provide a depth of insight. Further they suggest that use of systematic and transparent qualitative and quantitative methods lends additional credence to converging results or suggest further exploration where they diverge (Coates *et al.*).

Such qualitative methods help develop "theoretical propositions or explanations out of the data," as the inductive mode is useful to explore and try to explain a particular phenomenon and move from the particular to the general (Mason, 2002, pp 180). Crystallization and triangulation using multiple types of data can open up a more complex and in-depth understanding of the phenomenon being studied (Tracy, 2010). This will enable a richer, deeper and nuanced understanding of multiple perspectives of

experiences, interpretations and discourses that have shaped horticulture programmes and impacted the food environment (Mason, 2002, O'Cathain *et al.*, 2007). It will also help to uncover the heterogeneity of impact (Buttenheim, 2009). Multiple methods allow for the triangulation of data that enhances the rigour of the research and help improve the validity of the data. This examination of stakeholder and community perspectives through qualitative methods such as a witness seminar, oral history in-depth interviews, and focus group discussions will enable a richer, deeper and nuanced understanding of the factors that shaped horticulture programmes and the food environment in Kerala.

Witness seminar and oral history interviews as methods to capture perspectives

The witness seminar, a contemporary form of historical research popularized by the Centre for Contemporary British History since 1986, and used from 1993 by the Wellcome Trust History of Twentieth Century Medicine Group is one key way I examine the influence of horticulture programmes on the food environment in Kerala (Berridge, 2010, Berridge *et al.*, 2006, Gorsky, 2013). The witness seminar method, an oral history group interview facilitated by a senior academic, allowed me to understand the perspectives of a broad range of witnesses (policy makers) as they discuss and debate issues surrounding F&V access and availability (Open University, 2011).

As a knowledge-sharing and evidence-gathering activity, this public oral history group interview method has at least two advantages. First, it has the potential to facilitate a respectful and scholarly exploration of the research question by creating a safe space for key witnesses to share their personal perspectives and memories of policy making. It promotes interaction among the witnesses and between witnesses and other stakeholders who form the audience. This interaction is often extremely valuable as many political decisions are taken because of what the people involved in making policies bring to the table (Berridge, 2010, Berridge *et al.*, 2006, Tansey, 2006). As medical historian (Loudon, 2002, pp. 1119) explains, "This is oral history at its best... because the participants tended to 'let their hair down' and talk more freely than they would have at a scientific meeting... They are, primarily, important historical records."

Second, the witness seminar allows collection of retrospective qualitative data with a participatory approach and includes interaction with other witnesses who were not involved per se in the policy making or programme design, but who are or were stakeholders. This combination of public, private and social memory gleaned through the oral history method can facilitate the understanding of policy processes at important junctures (Berridge, 2010, Gorsky, 2013).

I build on and adapt the witness seminar method as a formal approach to evidence-based public health research for assessing and improving the health consequences of projects and policies, or programmes such as transportation and land use (Lock, 2006) that do not necessarily have health as its primary objective. It is particularly useful to derive guidance within a Health in All Policies approach to decision-making in the context of a competitive policy environment, when health issues compete against other priorities such as economic growth.

To complement the public witness seminar, I use semi-structured interviews offered in a more private setting to continue exploring the perceptions of key-informants about factors that shaped Kerala's horticulture programmes, their perspectives on implementation, impacts, unintended consequences, as well as what they learned and their recommendations for policy. In the absence of written records or limited or non-existent published documents, such oral history interviews with key-informants who are accessible and have in-depth knowledge provide different perspectives.

There has been little historical work on the evolution of the horticulture programme and in particular there are no personal accounts of the people involved in spearheading the horticulture programme and those who witnessed its recent history (Rivera and Alex, 2004, Sulaiman and Hall, 2004, The Mid-Term Review Mission-European Union Mission in India, 2000). As Portelli has put it:

'Oral History is different from other tellings, in that it tells us less about events than about their meaning. It tells us not just what people did, but what they wanted to do, what they believed they were doing, and what they now think they did.'

- Alessandro Portelli: 'Form and Meaning in Oral History' Portelli (2006, pp. 67)

Oral history interviews reveal these personal perspectives and provide a clearer view into the shaping of the horticulture programme. These oral history interviews provide a historical analysis of agricultural programmes and policies that can help us understand how we reached the present circumstances and what strategies have been tried, successfully or unsuccessfully, in the past (Berridge, 2010).

Why I chose to do focus group discussions

I decided to use focus group discussions instead of a survey as a way to understand the perceptions of community members, on the effect of the horticultural programme (intended or otherwise), on access to fruits and vegetables and heterogeneity of impact within a social setting. In contrast to surveys, focus groups required less financial and other resources.

I sought to understand this information from community members in a social context — their attitudes, opinions, insights, impressions and experiences of access to fruits and vegetables that are important to them, those they buy, and those they grow (Massey, 2011). For example, the expectation is that community members whose children attend government schools (proxy for lower SES) may have limited F&V access when they perceive prices to be high. I also sought to understand not just what people thought but also why they had that particular view. Besides, the intensive group dynamic within the focus group would allow the myriad experiences of participants to lead to a deeper discussion that could produce complex responses (Mason, 2002). Also, in contrast to the in-depth interviews, which allowed me to probe more sensitive issues in depth, focus groups would allow me to understand the social context of F&V availability and access in a short span of time that would help me see emerging theoretical possibilities and patterns in the data (Basch, 1987, Emerson *et al.*, 2001, Maykut and Morehouse, 1994, Morgan, 1997).

3.2. Ethical approval

Ethical approval for this study, 'Agriculture and Nutrition: The effect of a horticulture programme on price and availability — a study of the Kerala experience', was obtained from the Observational/Interventions Research Ethics Committee of the London School of Hygiene and Tropical Medicine (LSHTM ethics ref: 6070/17, 28 November 2011. Ethical approval was also obtained from M S Swaminathan Research Foundation, Chennai for research in India and from the institutional review board (ethics committee) of the Medical Trust Hospital and Diabetes Care Centre, Kerala (MTH-DCC) for focus groups in the Pathanamthitta and Alappuzha districts.

3.2.1. Measures to safeguard the ethics of the research

Informed consent

The witness seminar included only those witnesses who agreed to provide recorded oral testimony. Witnesses were informed that they could check their transcripts and correct and amend anything they were unhappy with. Key informants signed the informed consent form either when we met for the interview or when they returned the form by email if the interview was being conducted by Skype.

All focus group discussion (FGD) participants were provided with a consent and information sheet (see page 329) before the focus group. Before the start of each focus group, I read aloud the information sheet and answered questions about the study. They were informed that the focus groups would be tape recorded and transcribed. I advised participants that participating in the study was voluntary and that they could withdraw without giving a reason at any time during the discussion. Each participant was then requested to sign the consent form.

Confidentiality

All data collected from interviews and community focus groups were anonymised and pseudonyms or generic labels were used.

3.3. Methods for Objective 1: Perception of stakeholders

3.3.1. Research questions for objective 1:

Perceptions of stakeholders on the context and process that shaped the development of horticulture programmes in Kerala, India (between 1993 and 2012):

- (1) What are the “discourses” and implicit and explicit rationales that shaped the design and implementation of the horticulture programmes?
- (2) What are the stakeholders’ perceptions of the design and implementation of the horticulture programmes? To what extent were these influenced by a desire to improve nutrition and health?
- (3) What are stakeholders’ perceptions of impacts of the programmes?
 - a. What processes facilitated or created barriers to availability, affordability and access to fruits and vegetables?

- b. Who contributed, who benefited and who lost?
- c. What are the unintended consequences, trade-offs, opportunities and challenges?
- d. What are stakeholders' perceptions of goals of a horticulture policy and learning for future policies?

3.3.2. Data sources and study tools

Data for Objective 1 were collected using a witness seminar and oral history interviews with key informants. Participants included policy makers, implementers, academics and experts, activists and representatives of non-governmental organizations — who seldom work together. Participants were deliberately selected to reflect a diversity of opinion. They included a range of government, academic and NGO stakeholders who had backgrounds in agriculture and horticulture, health, nutrition and food policy, gender issues, rural development and poverty eradication.

3.3.3. Planning and process for witness seminar and interviews

Witness seminar

The witness seminar (Chapter 5, page 107) had an informal steering group and a senior academic who would serve as the Chair. The Chair is crucial as facilitation is key to an effective witness seminar (Portelli, 2006). The steering group included S. M Vijayanand IAS, a member of the Kerala cadre of the Indian Civil Service with decades of experience in local self-government and poverty eradication initiatives,¹⁴ and Dr. K. N Harilal, a recent member secretary responsible for agriculture in the Kerala State Planning Board and an Associate Professor at the Centre for Development Studies. Due to other commitments and busy travel schedules we did not have any nutrition or health experts on the steering committee.

The selection of witness seminar attendees was by purposive sampling. These individuals were identified from previous contacts, or they were suggested by the

¹⁴ Though S. M Vijayanand IAS was transferred from Kerala to Delhi in the initial stages of planning, he introduced me to several high-level bureaucrats. These bureaucrats facilitated helped me access documents and introduced me to other state-level bureaucrats.

steering group, the Kerala State Horticulture Mission, or Thanal, an NGO that works on issues of pesticides and agriculture.

The steering committee expanded the scope of the seminar beyond the recollection of policies to include suggestions for policy recommendations for nutrition-sensitive horticulture. Therefore, the witness seminar was organised as a series of three panels. The programme, along with preparatory material for the witnesses on the panel and for the invited audience, was prepared by me in coordination with the Kerala State Horticulture Mission (SHM) which sent out formal invitations for the seminar.

To serve as the starting point, all participants were sent a background document that included a summary of the rationale for the seminar and a two-page note setting out the thematic sections of the seminar (in Annexure 5 on page 305) — namely the historical context, rationale and implementation of the horticulture programme; its impact and evaluation; its trade-offs; the role of horticulture in access to F&V in the food environment; and finally, the lessons for future policy. In addition, invitees selected to be witnesses were given a detailed overview of the reasons for the witness seminar and the areas they needed to address in their prepared remarks. Care was taken not to give too much information, as it might have distorted what they had to say. No slides or other visual material were used, so as not to disrupt the flow of the meeting.

The witness seminar was held at the Banquet Hall of the Government Guest House in Thiruvananthapuram, Kerala on July 19, 2012. Of the 35 invited attendees 27 attended, including panellists and audience members — 8 women and 19 men.¹⁵

¹⁵ The witnesses and the audience were almost all from Kerala, save for one panellist who made the journey from Bangalore at his own expense.

Table 5: Witness Seminar Schedule

Welcome & Introduction (10: 30 to 10:45)	Panel 1: Context, Implementation & Impact and Evaluation (10: 45 am to 12:30 pm)	Panel 2: Horticulture and Nutrition (1:30 pm to 2:30 pm)	Panel 3: Lessons for Future Policy: Challenges and Lessons (2:35pm to3:30pm)	Summing up and Conclusion (4:00 to 4:30 pm)
Dr. K. Prathapan, Mission Director, State Horticulture Mission, Kerala. Mrs. Darlena David Chairperson: Dr. K.N Harilal*	Panel members: Dr. K. Prathapan Dr. V.K. Sasidhar Shri. R. Hali Ms. P. Bindu Chairperson: Dr K.N Harilal	Panel members: Dr. T.G Vinodkumar Dr. S. Sivasankaran Shri. Varadachary S IAS Dr. Beela G.K Chairperson: Dr. M. Beena IAS	Panel members: Shri. Mullakara Ratnakaran MLA, Dr. K. Saradamoni Chairperson: Shri. R Sridhar	Shri. R Sridhar Darlena David

Table 6: List of theme-wise witnesses

	Agriculture (14)	Nutrition and food policy (4)	Health (6)	Gender (3)
1	Dr. K. Prathapan*	Dr. Mary Ukkuru*	Dr. T.G Vinodkumar*	Dr. Mridul Eapen
2	Dr. V. K. Sasidhar*	Dr. Shamsiya A.H	Dr. M. Beena IAS*#	Ms. Prema Nair
3	Mr. R. Hali*	Dr. Beela G.K*	Dr. S. Sivasankaran*	Dr. K. Saradamoni*
4	Ms. P. Bindu *	Mr. Varadachary S IAS*	Dr. Rajamohan K	
5	Dr. K.N Harilal#		Dr. Ramankutty V	
6	Mr. Jose Joseph		Mr. G. Dileepkumar	
7	Mr. Sridhar* #			
8	Mr. Mullakara Ratnakaran			
9	Dr. P. Rajasekharan Nair			
10	Dr. S. Usha			
11	Dr. R. P. Nair			
12	Mr. Gopalakrishnan Nair			
13	Dr. Sajan Kurian			
14	Dr. Gopimony			

NOTE: * = panellist, # = Chair

Table 7 Breakdown of stakeholders in the witness seminar according to role

	Policy makers					Implementers					Experts					All
	Agri-culture	Nutrition	Health	Gender	Total	Agri-culture	Nutrition	Health	Gender	Total	Agri-culture	Nutrition	Health	Gender	Total	
Female	-	-	-	-	-	1	-	1	-	2	1	3	-	3	7	9
Male	3	-	-	-	3	2	-	-	-	2	7	1	5	-	13	18
Total	3	-	-	-	3	3	-	1	-	4	8	4	5	3	20	27

Table 8 Breakdown of stakeholders in witness seminar according to expertise

	Agriculture	Nutrition	Health	Gender	Total
Female	2	3	1	3	9
Male	12	1	5	-	18
Total	14	4	6	3	27

Professor K. N Harilal, who chaired the seminar, modified the programme to accommodate speakers who had to leave early or who had to cancel at the last minute. The first panel was on horticulture programmes — context, implementation, impact and evaluation. This panel was chaired by K.N Harilal and included K. Prathapan (Horticulture Mission), V.K. Sasidhar (Kerala Horticulture Development Programme (KHDP)/ Vegetable and Fruit Promotion Council Keralam (VFPCCK), R. Hali (agriculture planner on the general context), and P. Bindu (Kudumbashree). This was followed by a panel on horticulture and nutrition chaired by M. Beena IAS, mission director of the National Rural Health Mission (NRHM) in Kerala, with T.G Vinodkumar, (Ayurveda *vaidyan*), S. Sivasankaran, (professor of cardiology), Sree Chitra Tirunal Institute for Medical Sciences and Technology, S. Varadachary IAS, retired civil servant interested in food policy issues, and Beela G.K, who had done work on horticultural therapy. The final panel was on lessons for future policy, chaired by R. Sridhar, from the NGO Thanal. Witnesses for this panel included Mullakara Ratnakaran, a former agriculture minister, and K. Saradmoni, a social scientist with experience in gender and agriculture. The witness seminar closed with a summing up of reactions to the seminar and a vote of thanks.

Oral history Interviews

Semi-structured oral history interviews (Chapter 6 on page 146) were conducted with 30 key stakeholders identified through purposive sampling and with input from the steering group that planned the witness seminar and others I contacted in Kerala. Most were or had been associated with the government's agriculture and health departments, and the agricultural university.

Some key-informants participated in the witness seminar while some were unable to attend. Others were suggested through informal conversations with experts in agriculture, nutrition, and health. Informants were contacted via either email or telephone, or in person. If they agreed to be interviewed, I sent a formal letter or email with information about objectives of the interview and assurances of confidentiality. To

serve as the starting point, all potential oral history interviewees were sent a two-page note setting out the issues to be explored:

1. Position and roles
1. Intent of the horticulture programme
2. Involvement and motivations
3. Programme fit with the then context (probe: economic, agricultural, trade and socio-political context)
4. Opportunities and challenges
5. Success, achievements and milestones
6. Who contributes? Who benefits? Who did not benefit?
7. What are the trade-offs? (Probe: what was gained, or lost?)
8. Future opportunity and challenge
9. Role of horticulture in nutrition and fruit and vegetable availability and affordability

The interviews followed these topics and questions were open-ended, although the interviewees were also probed for debate on issues around F&V availability, affordability, and the relationship between agriculture, nutrition and health.

I conducted oral history interviews¹⁶ from July to October of 2012. Most of the interviews were completed in July and August (eight in July and 19 in August), while three were done in September and October of 2012. I interviewed seven women (five in nutrition and two in gender issues); and 18 men (most from agriculture).

¹⁶ For the purposes of this dissertation I transcribed and analysed 25 of the 30 interviews. The analysis omitted responses to some questions, including questions about the relationship between agriculture, nutrition and health.

Table 9: Break-up of stakeholders interviewed according to expertise

	Agriculture	Nutrition	Health	Gender	Total
Female	0	5	0	2	7
Male	13	0	3	2	18
Total	13	5	3	4	25

Table 10: Break-up of stakeholders interviewed according to role

	Policy makers					Implementers					Experts					All
	Agri-culture	Nutrition	Health	Gender	Total	Agri-culture	Nutrition	Health	Gender	Total	Agri-culture	Nutrition	Health	Gender	Total	
Female	-	-	-	-	-	-	-	-	-	-	-	5	0	2	7	7
Male	6	-	-	-	6	2	-	-	2	4	5	0	3	-	8	18
Total	6	-	-	-	6	2	-	-	2	4	5	5	3	2	15	25

3.3.4. Data collection methods, translation and transcription

The witness seminar and oral history interviews were conducted in English and Malayalam. Two note takers documented the witness seminar for the Horticulture Mission and videography and audio recording were also done. The interviews were audio recorded using Zoom H2 Handy Portable Stereo Recorder and Olympus Digital Voice Recorder DM-420.

The seminar audio in English was transcribed by a community member in Kerala (September-November 2012), and re-transcribed when necessary, and then translated from Malayalam into English by me. I listened closely to the audio and watched the video recording several times to correct the errors in transcription. I coded both the transcript and audio using NVivo 10 (QSR., 2012). Where audio was coded, I translated the audio from Malayalam into English. The audio recordings of the interviews were transcribed verbatim. Those in Malayalam were translated from Malayalam to English. Transcriptions in English were done by a professional transcription provider, while volunteers from the Malayalam speaking community, an English professor in Kerala, and I transcribed and translated the Malayalam interviews.

I wrote field and analytic notes and sometimes audio recorded my impressions. I immersed myself in the data — listening to all the audio files, reading transcripts, field-notes, and making analytic memos of the interviews. I checked the audio against the transcription and/or translation. When I discovered errors in the transcription I listened

closely to what was said and re-transcribed the interviews. While listening to the interviews I continued writing reflective notes, which I also used for analysis.

3.3.5. Analysis

To analyse the data from the interviews, I imported both the audio (or, and video), Malayalam transcript when available and the translated English transcripts into QSR NVivo 10 for the witness seminar and QSR NVivo 11.0 for the oral history interviews and assigned each respondent a case number (QSR, 2015, QSR., 2012). I prepared the transcript of the interviews so that on import, NVivo 11 automatically coded themes generated from the interview questions.

I applied a five stage thematic framework approach (data familiarisation, identification of a thematic framework, coding and refining coding frame, charting by case and theme, and interpretation by typologies and associations) to analyse the qualitative data. I first analysed the witness seminar. After coding themes from the research questions, and the names of participants, I did open coding from the text and audio files. The following codes guided the analysis of the witness seminar: context, key contributors, beneficiaries and losers, unintended consequences, horticulture and its effect on F&V availability and access, relationships with non-communicable diseases and F&V consumption, and, finally, lessons for the future. To analyse the interviews I grouped the codes according to the themes that emerged during the analysis of the witness seminar: (1) development discourses, (2) perceptions of programme implementation, (3) perceptions of impact and evaluation, (4) unintended consequences and trade-offs, and (5) lessons for the future and recommendations for policy.

I ran reports on word frequencies. I coded the most heavily represented words. To understand the data further, I ran reports to see which codes were most and least frequent. I exported the coding structure and made post-it notes of all the codes. The codes and the underlying text relating to each theme were exported or copied to Microsoft Word. I then formulated higher level codes after reading and re-reading the coded text. This was an iterative process. I also queried the data to seek patterns. Then I created models in NVivo to understand thematic relationships and explain the data.

3.4. Methods for Objective 2: Perceptions of community members

The second objective of this research is to seek to understand community perceptions of the effect of horticultural programmes (perhaps unintended) on the food environment and to understand heterogeneity of impact across groups about perceptions of access to fruits and vegetables in the food environment, through focus group discussions conducted in two panchayats in Pathanamthitta district and two panchayats in Alappuzha district.

Research questions for objective 2:

2. What are the experiences and perceptions of community members about availability, affordability, and access to fruits and vegetables?
 - a. How do these views differ among different panchayats?
 - b. How do these views differ among different income-groups?

3.4.1. Data sources and study tools

Twelve focus group discussions were conducted with community members who were parents, and/ or teachers or from local Kudumbashree units from local government, aided and unaided private schools in four panchayats of two districts — Alappuzha (low-lying coastal area) and Pathanamthitta (mix of level and hilly terrain) — in the central Travancore region of Kerala. These two districts were chosen as Medical Trust Hospital had most links with schools there (see page 326).

Figure 4: Map of Pathanamthitta District

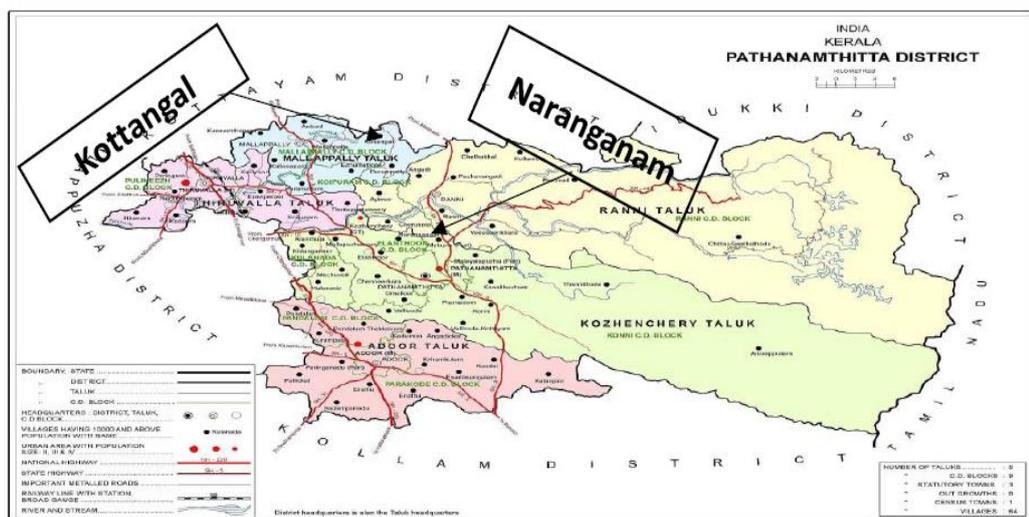
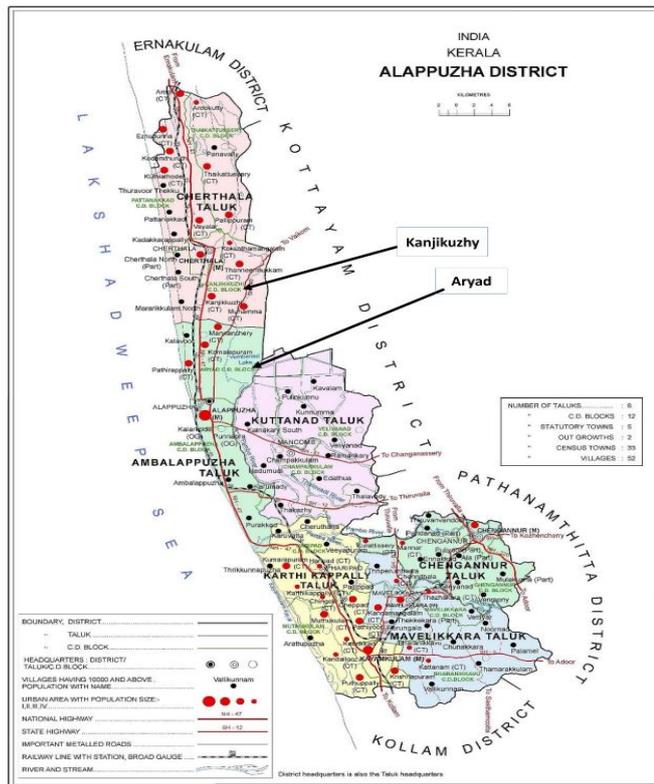


Figure 5: Map of Alappuzha District



3.4.1. Planning and process

Sampling strategy and selection

For the purposes of this research twelve focus group discussions were conducted with community members in two panchayats of Alappuzha district and two panchayats of Pathanamthitta district. The intention was to select panchayats where the horticulture programme was implemented through organized farmers groups promoted by VFPCK, Kudumbashree, or by the panchayat for at least five years. Attempts were made to get verifiable data on panchayat-level F&V production from the state and district agricultural departments. However, this was challenging. Of the four possible sources of data on F&V production, data from VFPCK on production by members of the VFPCK self-help groups was the only one available.

Horticulture programmes in most panchayats were implemented through organized farmers groups. In Pathanamthitta, I chose Naranganam panchayat (Elanthoor block) and Kottangal panchayat (Mallapally block) which had no VFPCK presence. The former had VFPCK’s market-oriented F&V farmers with larger land holding while the

latter had a lot of rubber cultivation. Data¹⁷ from Alappuzha district agriculture office was used to identify Kanjikuzhi — a panchayat in Alappuzha which had many self-help groups and small-holder farmers groups focused on food sovereignty. I excluded Cheriyanad panchayat, which had more commercial farming and was adjacent to Pathanamthitta district and had similar topography. The other panchayat selected was Aryad, a peri-urban panchayat close to Kanjikuzhi.

I decided to use separate focus groups within each panchayat, as a proxy for class, to help me understand the differences in perceptions of access between different socio-economic classes. This decision was based on studies in Himachal Pradesh and in Kerala (Kerala Sasthra Sahithya Parishad (KSSP), 2010, Sharma *et al.*, 2006), that food consumption and household expenses, especially on fruits, differed between social and economic classes. An earlier study pointed out that the education system in Kerala, divided into private unaided schools, private partially government-aided schools and government schools, was somewhat aligned with socio-economic classes. The children of parents in economic groups I and II (family income Rs. 1922, Rs. 3279) are mostly in government and private-aided schools, while Economic Group III (family income Rs. 6050) is evenly distributed in government, private aided and private unaided schools, while over 85% children from upper income group Economic Group IV (family income Rs. 14928) go to private unaided schools (Aravindan, 2008). Therefore in order for the sample to be socio-economically diverse, focus group discussions were conducted in three schools — a Government, a private-aided and a private-unaided school — in each of the four panchayats in Alappuzha and Pathanamthitta districts. Lists of private, aided and government schools in the selected panchayats were obtained from the district education authorities in Alappuzha and Pathanamthitta. There were four focus groups in each school category. Thank you to (Late) Ranjit Kuruvilla for funding a part of the field work.

Focus group guidelines

I developed a focus group guide from questions drawn from and based on work done by FAO Nutrition and Consumer Protection Division,¹⁸ by Ballard and others on dietary diversity to understand food access and food consumption and as a proxy for nutrient adequacy and food security (Herforth and Ballard, 2016, Hoddinott and Yisehac, 2002,

¹⁷ Area of cultivation (Ha) divided into vegetable, banana, others; production (mt) of vegetable, banana, others.

¹⁸ With support from the EC/FAO Food Security Information for Action Programme and the Food and Nutrition Technical Assistance (FANTA)

Kennedy *et al.*, 2011). I also drew from a focus group topic guide used in an impact evaluation of community kitchens developed by VicHealth's Food for All, as well as the 'diet' portion of WHO's STEPwise approach to surveillance (STEPS) instrument and focus group guides used by IFPRI-Helen Keller International to evaluate agriculture nutrition linkages (VicHealth Victorian Health Promotion Foundation, 2011, World Health Organization, 2011).

These guides, which are used mostly in individual or household settings to explore food security conditions (including food sufficiency, quality, or vulnerability), were modified for use at a community level to explore local understanding of food insecurity. The topic guide thus formulated was used to probe the availability and access to F&V such as: which ones are used or available (as a proxy indicator for consumption); where they are available; and how consumers get them (what kind of quantities and at what cost, as well as barriers to accessing F&V). The questions included identification of important fruits/vegetables which were bought, grown and sold and which were indicated as being high priced. It also included the reasons and decisions that influence buying or growing these as well as questions about how and from where these are accessed.

The topics also included how participants used F&V. There were some questions about access particularly seasonality, cost and coping behaviours. The topic guide also explored barriers that constrained access and availability of F&V as well as initiatives and further ideas to expand access and availability

The pilot study

To test the topic guide and to make it culturally and contextually appropriate so that it would yield reliable and accurate data, I carried out a small pilot study in November 2011 with support from Medical Trust Hospital and Diabetes Care Centre (MTH) in Kulanada (near Pandalam) in Kerala. Discussions with dieticians at MTH helped refine the topic guide. A staff member at MTH then translated it into Malayalam. We conducted a pilot focus group discussion with about 15-20 participants at a diabetes detection camp in the local primary health centre in Nooranad panchayat of Alappuzha district.

The insight gained from the pilot study helped to make the FGD topic guide (pages 329) much more context sensitive and specific. Some topics were added such as seeking examples of factors and initiatives that improved or worsened F&V availability and affordability. As several people referred to the differences between buying "kits"

versus loose vegetables, this was incorporated in the topic guide. As were questions about home-grown F&V and the relationship between F&V consumption and NCDs. Questions about consumption were addressed in a much more general way as 'popular' F&V was used as a way to get into the discussion. All the questions were made simpler and much more direct.

3.4.2. Conducting the study

The panchayats in the two districts were geographically far apart. In order to obtain permission to conduct the focus group discussions, I visited each panchayat (including the panchayat office, women's groups, and schools) two or three times, and sought co-operation from principals in schools that had summer classes.

Access and recruitment

The district education authorities in both Alappuzha and Pathanamthitta granted permission to contact the schools in their districts to conduct the focus groups. Further permissions were obtained from their principals and in some cases from school managers. This usually meant two to three visits prior to the focus group. Contact was also built with state and district officers of NRHM, known as Arogya Keralam. Officers in both Alappuzha and Pathanamthitta helped in the identification of schools and also introduced this research. In some cases, these officers came with me on the initial few visits.

Determining the group size and composition

The focus group in each school had about 9-12 participants (Green *et al.*, 2003), comprised mainly of parents whose children attended that school. The focus groups sometimes included teachers and some participants were also members of Kudumbashree groups, a motivated group of women who meet and work together regularly. The focus group participants were recruited by the schools.

The focus groups were conducted between June and September 2012, the monsoon season, when schools reopened after the annual summer holidays. Traditionally July was known as the *panja masam* when food supplies were generally inadequate before the harvests in late August.¹⁹

¹⁹ The optimal time of year to assess dietary diversity of the usual diet of households is when food supplies are adequate (may be up to 4-5 months after the main harvest). Doing this at different points in the agricultural cycle can help investigate seasonality of food security.

Characteristics of participants

Table 11: List of schools in panchayats

Income-level proxy	Alappuzha		Pathanamthitta	
	ARYAD panchayat, (peri-urban)	KANJIKUZH I panchayat, (panchayat-wide and Kudumbashree SHGs)	KOTTANGAL panchayat, (Kudumbashree SHGs)	NARANGANA M panchayat, (VFPCK SHGs, Kudumbashree SHGs)
Government school, (proxy for low-income group)	VVSD LPS	Charamangalam HSS	Kulathur LPS	Naranganam HS
Aided School (proxy for middle-income group)	Lutheran HS	Lutheran LPS, Muhamma	St. Joseph's LPS	Kadammanitta LPS
Unaided School, (proxy for high-income group)	Matha Public School	K.E Carmel	Christu Raja	Mount Zion

Table 12 Focus group participants according to panchayat - Alappuzha

Kanjikuzhi (Alappuzha)				
Sex	Government school (proxy for low-income group)	Aided School (proxy for middle-income group)	Unaided School (proxy for high-income group)	Total
Male	0	0	1	1
Female	14	12	14	40
Total	14	12	15	41
Aryad (Alappuzha)				
	Government school (proxy for low-income group)	Aided School (proxy for middle-income group)	Unaided School (proxy for high-income group)	Total
Male	0	1	1	2
Female	8	9	11	28
Total	8	10	12	30

Table 13 Focus group participants according to panchayat - Pathanamthitta

Naranganam (Pathanamthitta)				
Sex	Government school (proxy for low-income group)	Aided School (proxy for middle-income group)	Unaided School (proxy for high-income group)	Total
Male	1	0	1	2
Female	8	11	8	27
Total	9	11	9	29
Kottangal (Pathanamthitta)				
Sex	Government school (proxy for low-income group)	Aided School (proxy for middle-income group)	Unaided School (proxy for high-income group)	Total
Male	0	1	0	1
Female	12	11	10	33
Total	12	12	10	34

Table 14 Focus group participants according to district

Alappuzha					Pathanamthitta					
	Government school (proxy for low-income group)	Aided School (proxy for middle-income group)	Unaided School (proxy for high-income group)	Subtotal		Government school (proxy for low-income group)	Aided School (proxy for middle-income group)	Unaided School (proxy for high-income group)	Subtotal	Total
Male	0	1	2	3	Male	1	1	1	3	6
Female	22	21	25	68	Female	20	22	18	60	128
Total	22	22	27	71	Total	21	23	19	63	134

Table 15 Focus group participants according to SES and sex

	Male	Female	Total	SES proportion %
Government school (proxy for low-income group)	1	42	43	32.09%
Aided School (proxy for middle-income group)	2	43	45	33.58 %
Unaided School (proxy for high-income group)	3	43	46	34.33%
Total	6	128	134	100%

One hundred and thirty-four parents, teachers and members of Kudumbashree groups took part in the study. The sample included 128 women and six men. There were slightly more focus group participants from private schools compared with aided and government schools (private: 34.33%, aided: 33.58%, government: 32.09%).

Facilitating the groups

The groups usually met in a classroom. However, these classrooms varied in layout from a few benches grouped together around a blackboard in the government schools, to desks and chairs in well-appointed class rooms in private schools. The focus groups generally took place in a circle, but there were a few classrooms where the benches could not be moved. Tea and snacks — *vada*, bananas or biscuits — were usually provided after the focus groups. Before beginning the discussion, participants were reminded that discussions might last one to two hours. Before signing consent forms, participants were reminded that they could choose to leave at any time. Because of timing and logistics-related issues I facilitated most of the focus group discussions apart from two of the early focus groups that were facilitated by health education staff from district Arogya Keralam (NRHM) office. Most focus group discussions were in Malayalam but in a few of the private schools the conversation was in English and Malayalam. Though I am a native Malayalam speaker, because I was unfamiliar with facilitating focus group interviews in Malayalam, staff from Arogya Keralam helped me facilitate a few of the early focus groups. My previous experience with focus groups and interviews, as well as experience of living and negotiating life in Kerala, helped me overcome my initial nervousness and enabled me to facilitate the rest of the focus groups. Discussion followed a semi-structured topic guide (see page 329).

I began each focus group by asking community members their views on access to fruits and vegetables in their food environments. I pursued the question with the presupposition that what was available were regular components of their diet (home-grown, bought or sold) and were what was consumed. The discussion usually began with a general discussion of what a plate of food at lunch or dinner usually looked like — what it contained and in what quantities. To avoid any temptation on their part to say they were eating fruit and vegetables more frequently than was the case, I changed the order of the questions to get at what they were actually eating and avoided beginning by asking if they were eating F&Vs. The discussion usually ended with a question about the relationship between food and non-communicable diseases. In addition, flyers with information on non-communicable diseases were given to participants after the meeting

in the few focus groups where Health Education Officers of NRHM participated. We also answered their queries. After the formal end of the focus group discussions several participants spoke to me in private.

Focus groups that included Kudumbashree members were usually very cohesive since participants knew each other well as they worked together in the MGNREGA²⁰. At a government school in Alappuzha, the participants invited me to stay in their village and offered to teach me to farm. In one focus group all the participants were “daughters-in-law” of the village, who came to the focus group discussion after doing MGNREGA work cleaning the school compound.

There were a few instances when participants were either interrupted, silenced by other group members, or seemed to remain silent almost as a form of self-censorship. This was especially true in a private school in Alappuzha district where a man dominated the discussion. When this happened I tried to encourage others to respond by repeating the question and asking others for their opinion. I tried not to look at this person while smiling and nodding at other participants. Even then I was not always successful and had to follow up with others later. A woman participant in this group later told me in private of the changes she had made in her diet. Through facilitating these focus groups I learned to encourage participation and build relationships while minimising barriers to participation.

3.4.3. Data collection methods, translation and transcription

The discussion was recorded simultaneously with two high quality tape/audio recorders (Zoom H2 Handy Portable Stereo Recorder and Olympus Digital Voice Recorder DM-420) and transcribed in Malayalam. There were no problems with the recording. However, there were several problems with transcription. The major issue was to find appropriate people to transcribe the focus group recording. One person who agreed to transcribe then recruited his wife to do the transcription, but on checking the quality it was found that these were summaries rather than verbatim transcriptions. Therefore I sought recommendations from other researchers about experienced transcribers. Finally all 12 recordings were again transcribed verbatim by a group suggested by a research institution in Bangalore. After checking the audio recording against the transcription for quality, several volunteers and I translated the transcription from Malayalam to English.

²⁰ Kudumbashree groups used funds from the employment guarantee scheme for agriculture.

I then used NVivo to code audio recording, and the translation as well as the field and analytic notes I wrote.

3.4.4. Analysis

To analyse the data from the focus groups, I imported the FGD data as audio, as Malayalam transcript and also as translated English transcript into QSR NVivo 10.0. I prepared the transcript so that on import, NVivo would automatically assign codes generated from the topic guide, the name and type of the school as well as the district. The audio coding was checked against the transcription. Each group was assigned as a case.

For the data from the FGDs, I used a five-stage thematic framework approach (data familiarisation, identification of a thematic framework, coding and refining coding frame, charting by case and theme, and interpretation by typologies and associations) to analyse focus group data. I immersed myself in the data — listening to audio files, reading transcripts, field-notes, and making analytic memos. I read and analysed field notes on the group dynamics of each focus group. I also listened to the audio recordings and annotated the transcripts with my observations and thoughts.

I started by “working down”, with the themes that emerged from the systematic literature review (a priori, first-level codes for actions), and then “working up” refining them with inductive or in vivo codes generated from the gathered data. I used the search tool to retrieve all data pertinent to nodes such as names of F&V. This allowed me to code systematically. At this stage in the analytical process, I had 47 nodes. I used second-level axial coding to formalise text into concepts and used further charting to see emerging relationships. As I familiarized myself with the data I assigned some new codes.

Analysis methods

I used a framework approach to compare across groups. Though NVivo had helped me code the data rigorously, once I had a framework, I exported the data as a thematic framework into MS EXCEL (Microsoft Corporation, 2018) for further analysis. I could have used NVivo much more. However, I attempted to conduct the analysis systematically and rigorously. I used the guidelines on assessing biodiverse foods in dietary surveys recommended by FAO and Bioversity International (FAO and Bioversity International., 2017, pp. 77-79) and those in the Indian Food Composition Tables

(Longvah *et al.*, 2017), to categorize the F&V mentioned in each FGD as vitamin A rich fruits and other fruits; and within vegetables mentioned, for presence of white roots and tubers; vitamin A rich vegetables and tubers; dark GLVs; and other vegetables.

I sought associations and tried to refine theoretical concepts related to the tension in the literature about horticulture programmes for income generation and for local nutritional security. I learned that a well-established network of agents had succeeded in replacing *naadan* vegetables from local home-gardens²¹ which were “treated as inferior” with market-friendly “imported vegetables like tomato, onions and potato” (Venugopal, 2000, pp. 139). Most of this supply went to urban markets (Global Panel on Agriculture and Food Systems for Nutrition, 2017, Government of Kerala (GOK), 2017). Joseph has also highlighted the preponderant availability of commercially cultivated orange, grapes, mangoes, pineapples, bananas and apples in markets alongside a continuing disappearance of traditional local fruits — mangoes, jackfruits, anonna, papaya, guava, sapota, gooseberry and plantains (Joseph, 2014). To explore this tension further I decided to separate the F&V categories mentioned above as *naadan* (locally-grown traditional) or commercially supplied, market-friendly vegetables (‘cool season’, Ooty or English). I counted the totals within each category.

Describing, interpreting and reporting the data

As I began to write about the data more conceptually I found it helpful to go back to my questions as well as the conceptual frameworks that I had developed. I mapped the codes and linked the ideas to the web of theory in the conceptual framework that I had used before. While doing this I asked myself if the themes would fit into the conceptual framework. Once this was done I was able to see the broad themes and make adjustments to the chapter structure. I have used quotes that offered rich examples of the theme under discussion. I have also used quotes to illuminate the interactions in the groups.

3.5. Amendments in methodology

My initial intention was to analyse the focus group discussions and to combine this analysis with a market survey of F&V in each panchayat to extend the understanding about access and availability of F&V in each panchayat. However, I veered from this.

²¹ Such as jackfruit, papaya and green leafy vegetables.

While I conducted the market survey, I decided not to analyse the market survey immediately.

3.6. Limitations

The absence of key policymakers who spearheaded the horticulture programme was a challenge both for the witness seminar and for the oral history interviews. Due to last-minute cancellations we had to find substitutes for several witnesses. In a few cases we had to continue without replacements for key decision makers. The notable absences were Dr. Jacob Thomas, who started Kerala Horticulture Development Programme (KHDP) in 1991 and is known as the ‘father of the horticulture programme’, and Dr. Thomas Isaac, a former finance minister and development economist²² who incorporated funds for collective F&V farming in Kerala’s previous budget (2010-2011). This funding allowed collective farming to spread. Two other decision makers who were not present were T. K. Jose, the first director of Kudumbashree when women’s self-help groups began entering horticulture, and Dr. P.K Kesavan who as director of KHDP moved the organization forward in 1997. Their participation likely would have enhanced the validity of a witness seminar.

Practical limitations of the seminar included low representation of women and experts in gender issues, and the absence of several key policy makers and legislators who had to leave to attend official work or could not arrive at all. Because of this the programme had to be modified several times. As a result, the composition of the final seminar changed even on that day! Though we were able to find substitutes for several witnesses, it must be acknowledged that the absence of some high ranking officials did affect the quality of the seminar.

Inevitably as some witnesses were absent, I followed up with interviewing those who were unable to come to the seminar. However, despite great efforts and several informal conversations it was not possible to interview some key policy makers such as Dr. Jacob Thomas. In their absence I relied on key documents such as financing agreements between KHDP and European Union; proposals for initiating KHDP/VFPCK and Kudumbashree and their annual reports, work plans and evaluation reports; the government of Kerala’s Five Year Plans (documents on agriculture), budgets, and

²² Mararikulam, a panchayat in Dr. Thomas Isaac’s constituency, is one of the pioneers of the local vegetable farming movement in Kerala.

Economic Review; and literature from the department of agriculture and from the State Horticulture Mission.

Another challenge, common to oral history methods is that both participants at the witness seminar and interviewees may have forgotten important details, repeat what they believe to be correct, assume a greater role than was the case, or be tempted to settle scores, and so on (Gorsky, 2013, Tansey, 2006, Thompsom, 1988). The FGDs suffered from limitations posed by the lack of data on agricultural production and because of weaknesses associated with selection of sites. It was difficult to get data about the multiple agency-led panchayat-level agricultural initiatives through VFPCCK, neighbourhood JLG groups associated with Kudumbashree or through the local panchayats. While I was able to use lists of government and aided schools provided by district education offices, it was more difficult to select private unaided schools and to facilitate the participation of community members in private unaided schools. The focus group participants in two private unaided schools were mostly the teachers at that school while the third school had a group of parents who were there for a parent-teacher meeting.

The lack of a second facilitator, due to the occasional unavailability of Arogya Keralam staff members, was detrimental to interaction between the participants. Scheduling and lack of private rooms and gender dynamics also posed challenges for FGD facilitation. The conduct of the focus group was limited by the schools' scheduling conveniences — the school sites generally invited parents, or parents and teachers to the focus group and provided the place and suggested a suitable time. Looking back, I feel that it would have been better to have some ground rules about privacy and time. In the private school, the focus group discussion with the lone male participant was arranged at the front of a large hall and was to be followed by a parent association meeting. While this enabled my access to parents, the lack of private space and continuing influx of parents into the room for the parent association meeting, even as the focus group discussion was in progress, disturbed the process. Though these focus groups were generally homogenous, in hindsight I could have been better prepared to deal with patriarchal behaviour from powerful male participants.

3.7. Reflections on my personal position

My position as an English-speaking middle class Syrian Christian Malayali woman, associated with a well-known university outside India, who was interested in the issues at the intersection of farming and health, gave me inroads that I would not have had otherwise. This was true even though my family was imbued with a sense of justice and idealism that went beyond the bounds of social class. While my school and college days exposed me to people across the social spectrum, I had left Kerala in 1970 as a primary school student, only returning in 1980 for a postgraduate degree and then to work in a rural hospital for a few months, before moving to Delhi. I did not have a chance to work in Kerala again.

When I did the pilot study in 2011, I was a comparative stranger to professional and academic Kerala. The rationale for the research had come from many years of training and communication work with Indian NGOs in Delhi and more recent work with a US based NGO working on issues at the intersection of vulnerability and health. I am grateful for the substantive interactions with organizations and people from different cultural and social milieus. It was this experience that helped me navigate some of the challenges I encountered during the study.

My knowledge of Malayalam, links with the community and the bureaucracy, and familiarity with Kerala's social and cultural context was advantageous. Good working relationships with academics and activists, built through my previous work helped me identify important stakeholders and issues. Having studied in Kerala, I had a strong network of friends who I was able to rely on. They also helped me understand and navigate the complexities of the political landscape. Even with all this support, like other women academics I encountered who saw themselves as engaged in a "precarious enterprise", I had a sense of having narrowly escaped the misogynistic punishment meted out to women who transgress gender and societal boundaries (Chua, 2014, pp. 2). My status as a Malayalam speaker who studied and worked in Kerala and who was interested in the well-being of Malayalis gave me access to decision-makers and bureaucrats and through them to documents and some data. In this situation I was an insider with a priori intimate knowledge (Merton, 1972), of the Kerala society and being an insider also gave me access to documents and people that might have been denied to an outsider.

Chapter 4. Horticulture in Kerala – Context, Policy and Disconnects

4.1. Introduction

In Chapter 2 I discussed the importance of examining the contribution of social determinants of health to population-level changes in diet that contribute to undernutrition, micronutrient deficiencies, obesity and non-communicable diseases (Ramachandran, 2006, Sesikeran, 2009, World Health Organization, 2004)(Anon, 1994, Commission on Social Determinants of Health, 2008, EuroHealthNet and Aufklärung, 2006, Mackenbach *et al.*, 2000, Marmot, 2009, Potvin and Jones, 2011, Whitehead and Dahlgren, 2006). In this chapter I investigate the historical and contemporary context in which Kerala's horticulture programmes evolved. I describe the puzzling disconnect between high fruit and vegetable production and growth in gross domestic product on the one hand, and unhealthy nutrition and food consumption patterns on the other. I also examine how social determinants (socio-economic, cultural and environmental conditions and living and working conditions that include agriculture and food production, education, work and employment etc.) that influence health (Dahlgren and Whitehead, 1991) during period of transitions may have played a role in change of diet (Dahlgren *et al.*, 2006, Nugent, 2011). I argue that various social determinants (Dahlgren and Whitehead, 1991, Marmot and McDowall, 1986) have impacted changes in food consumption patterns (Dahlgren *et al.*, 2006, Nugent, 2011).

I used several sources to understand both the context and social development of Kerala and the organizations involved in horticultural development. These included their websites, the Government of Kerala's Five Year Plans (documents on agriculture), budgets, Economic Review and other documents from the department of agriculture, the Kerala State Horticulture Mission, Kerala State Planning Board and the Directorate of Economics and Statistics. I also accessed key documents such as financing agreements between KHDP and European Union; proposals for initiating KHDP/VFPCK and Kudumbashree and their annual reports, marketing data, work plans and evaluation reports (The Mid-Term Review Mission- European Union Mission in India, 2000, Vegetable and Fruit Promotion Council Keralam (VFPCK), 2017a), and other studies focused on capacity building and marketing (CEBECO India Private Ltd., 2010, Hall *et al.*, 2003, John, 2004, Sulaiman, 2012). My conversations with Dr. Jacob Thomas, who started

Kerala Horticulture Development Programme (KHDP) in 1991 and is known as the ‘father of the horticulture programme’ helped me understand the context.

4.2. Kerala’s historical context and development — a social transformation

Kerala with a population of 33.4 million, of which nearly half is urban, and an area of 38 863 square kilometres (Government of India, 2011b, Sarma *et al.*, 2019) was formed in 1956 from the formerly British-ruled Malabar in the north, and the independent southern kingdoms of Travancore and Cochin. Among Indian states in 2016 Kerala was the eighth-largest economy and its per capita net state domestic product was the seventh-highest in India (Central Statistics Office Ministry of Statistics and Programme Implementation Government of India (GOI), 2017, Central Statistics Office Ministry of Statistics and Programme Implementation Government of India (GOI), 2017). After decades of low growth, there was an economic rebound driven by the real estate, tourism and construction growth fuelled by remittances of almost 2.25 million Malayalees working abroad ²³(Madore *et al.*, 2018, PRS Legislative Research, 2017, Thomas)

Kerala, which had been called a madhouse by Swami Vivekananda for its extreme feudal caste-relations, after decades of reforms came to be known for the ‘Kerala Model’ of development — high human development indicators at relatively low-incomes ((Drèze and Sen, 1989, Kannan, 1995, Tharamangalam, 1998). Perhaps Kerala comes close to Ambedkar’s ideal democracy as “a form and method of government whereby revolutionary changes in the economic and social life of the people are brought about without bloodshed” (Dreze, 2004, pp. 1723). B. R. Ambedkar, who contributed to the inclusion of the right to food as one of the economic and social rights affirmed in the Directive Principles of the Indian Constitution, described the democratic process as both the end and the means of a good society based on ‘liberty, equality and fraternity’. This democratic process has been at the heart of the social transformation of the pluralistic Kerala society comprised of Hindus (54.7%), Muslims (26.5 %), Christians and others (18.4%) (Office of the Registrar General & Census Commissioner - Ministry of Home Affairs, 2018). This unusual story of social transformation which has generally been credited to public action, political will, public policies protecting the poor, and government investments to achieve good health at low cost is an outcome of democratic politics — organized public pressure by demanding people that prodded government

²³ As of 2016

into activity (Chen, 2001, Dreze, 2004, Drèze and Sen, 1989, Franke and Chasin, 1992, Jeffrey, 2003, Sen and Drèze, 1999). People’s demands shaped political will, extracted public policies and public action (Chen, 2001, Dreze, 2004, Jeffrey, 2003, Sen and Drèze, 1999). Jeffrey claims that most of Kerala’s favourable outcomes — have resulted from a complex interaction between the capacity of a politically active population to express their needs, policies extracted by their demands, and their outcomes in society (Jeffrey, 2003).

Figure 6 Map of India

Source: <https://www.mapsofindia.com/maps/india/large-color.html> (accessed May 29, 2018)



Figure 7: Map of Kerala state, India

Source: <https://www.mapsofindia.com/maps/kerala/kerala.htm>, accessed May 29, 2018



4.2.1. Land reform

When Kerala became a state, Kerala's first democratically elected communist-led government sought to make the feudal society more equitable. One of the ways they tried to do this was through land reforms that initiated abolition of tenancy (Desai, 2005, Kurien, 1995, Sreekumar, 2007). After a period of agitations and 'President's Rule' in 1959, Kerala's communist parties passed the pro-poor Kerala Land Reforms Act (1963), which was enacted in 1969 as the Land Reforms (Amendment) Act (following a protracted struggle) and implemented from 1 January 1970. The act abolished the *janmi* (landlord) land tenure system and redistributed over two million acres of land from landlords to peasant tenants (*kudikidappukars*). It assigned ownership rights to formerly landless tenants, and imposed land ceilings of ten hectares (about 24 acres) per family on land owners. As a result more than 96% of land holdings were less than a hectare (Directorate of Agriculture Government of Kerala (GoK), 2016, Jeffrey, 2003, John, 2013).

4.2.2. Cash crops, not food crops and a crisis in agriculture

Even while advocating for land for the poor, the government protected and made concessions for commercial agriculture. Kerala contributed more than half of India's share of commercial crop value — mainly plantation crops (coffee, rubber, pepper, tea, and cardamom — in 2001-2002 (Brigit and Joseph, 2005). The Land Reform Act, while creating a ceiling for family-owned land, exempted plantations, non-agricultural land, and non-food production projects from the land ceiling (Devika and Thampi, 2007, Franke, 1992, Franke and Chasin, 1992, Oommen, 2014). This was a move blessed by the architects of modern India. Even while urging India to concentrate on growing rice and wheat to solve hunger, India's first prime minister, Jawaharlal Nehru, had advised Kerala to concentrate on plantation crops (encouraged during the colonial period), that earned foreign exchange for the country (Nambiar *et al.*, 2008). He had said that the rest of the country would meet the food grains requirement of Kerala. Thus Kerala emphasised production of revenue-oriented and export crops (Ramachandran, 2007)

The state offered subsidies for cash crops. Bolstered by these subsidies and higher prices, farmers, who grew rice earlier, converted their fields to sugarcane and later to rubber. As a result in the 1970s and 1980s farmers began converting entirely to the

cultivation of cash crops. As commercial rubber cultivation increased almost three-fold (1961-2010)²⁴ in Kerala (Kasim, 2012), cultivation in Pathanamthitta's terraced hills changed from roots and tubers, fruits and vegetables to rubber. Larger landholders, even some with low-lying paddy fields have filled in the fields and switched to growing rubber.

Unfortunately this trend towards land conversion and lower food production driven by social changes in employment, labour, migration, education and land reforms from the mid-1970s to the late 1990s, (Gangadharan, 2008, Harilal and Eswaran, 2017, Kunju, 2004, Saju, 2013, Singhal, 2016, Thottathil, 2012) led to Kerala's diet changing from locally-sourced, affordable fruits and vegetables, and other healthy foods, to rice, wheat,²⁵ and commercial English vegetables (Thottathil, 2012).

In 2015-16 Kerala grew crops on 51% of the land (2,040,000 hectares) with only 17% of the cultivated land (350,000 hectares) producing vegetables, fruits such as banana, and other crops, largely in small home-gardens characterised by intensive intercropping (Government of Kerala (GOK), 2017). Most of the land (73%) of the net sown area was cultivated with coconut, tea, coffee, rubber, and cardamom (1,495,000 hectares) Kerala produced 46.69% of the RDA for fruits and just 14% of the RDA for vegetables²⁶ (Government of Kerala (GOK), 2012a, Government of Kerala (GOK), 2017). There was a shift away from traditional nutritious meals with produce from home-gardens (Joseph, 2014). Except for a small share from own production Kerala relied on vegetable imports from other states, while the situation was better for fruits²⁷ (Government of Kerala (GOK), 2012a). Fruits and vegetables are sourced from great distances — even internationally and have long supply chains (Government of Kerala (GOK), 2017).

As commercially cultivated F&V like oranges, grapes, tomato, onions and potatoes appeared in the markets, traditional nutrient-rich local fruits continued disappearing (Joseph, 2014, Venugopal, 2000). This was a changed situation from forty years earlier in 1971 when Panikar counted *naadan* vegetables like amaranth and cowpea but not carrots, cabbage, and coriander as potential commercial food crop commodities because those were “not usually available in most parts of Kerala” (Panikar, 1971, pp. 18-

²⁴ Area under rubber increased from 133133 hectares in 1960, to 525408 in 2010, quoted in Kasim, (Kasim, 2012)

²⁵ According to Thottathil, Green Revolution made inroads to Kerala in the late 1960s with high-yielding varieties of rice.

²⁶ Fruits: 13 lakh tonnes and vegetables: 24.11 lakh tonnes. These excluded exports to the Middle East and Data from the State Horticulture Mission, Kerala, quoted in the report of Working Group on Food Security (Government of Kerala (GOK), 2012a, Government of Kerala (GOK), 2017)

²⁷ Own vegetable production: 347,000 tonnes; imported vegetables: 818,400 tonnes, or 57.6% and own fruit production: 607,494 tonnes or 69.22%; imported fruits: 877,674 tonnes or 30.78% (Government of Kerala (GOK), 2012a).

19). Panikar did not assign a cost to amaranth, a GLV which grew plentifully (Panikar, 1971). As prices rose, the average diet had little fruits and vegetables.

This change of diet was also rooted in policies that prioritised production and distribution of rice and encouraged cash-crops instead of nutrition-rich grains like millets. During the Third, Fourth and Fifth Five-year Plans between 1961 and 1978, subsidized polished rice replaced the double parboiled unpolished rice and tubers, especially among the poor (Department of Economics and Statistics, 1993). NGOs like Thanal pointed out that this change of diet was driven by the growth of modern rice mills that produce polished ‘white’ rice by stripping bran from rice. Policies taken in the Second Five Year Plan to make the less processed red rice accessible to the urban population were never implemented and about 2500 home-based rice mills in Palakkad were shut down.²⁸

Kerala became vulnerable to agricultural insecurity in the 1990s as the traditional export-oriented agriculture in pepper and spices, tea, coffee and cashew became less profitable and India’s policy of economic liberalization, introduced in the 1990s, made Kerala vulnerable to changes in global prices, policy, and tradable commodities. As commercial crops took root agriculture experts supported ‘modern’ chemical agriculture supported with fertilizers and pesticides. The state government owned Plantation Corporation of Kerala, sprayed endosulfan, a persistent organic pollutant (PoP) banned in many countries:

A link was established between the unusually high incidence of deformities and diseases in Padre — a village in Kerala’s Kasaragod district — and endosulfan, an organochlorine pesticide. The Plantation Corporation of Kerala (PCK) had been spraying endosulfan since the mid-1970s on its cashew plantations. The people of Padre had long been waging a lonely battle against the spraying of the pesticide. Laboratory analysis conducted by the Centre for Science and Environment (CSE), New Delhi, revealed that all samples collected from the village contained very high levels of the pesticide...

- Centre for Science and Environment, Down to Earth, (Yadav and Jeevan, 2015)

There was acute fear of pesticide poisoning²⁹ (Rajendran, 2002) and in 2011, the Supreme Court of India banned the production and distribution of endosulfan and in 2017 it directed the Kerala government to pay a compensation to the victims

²⁸ Reported by Sridhar Radhakrishnan, personal communication.

²⁹ Rajendran noted that each resident of Padre whose blood was tested had endosulfan residues several hundred times the limit.

of endosulfan (Embrandiri *et al.*, 2012, Mangad, 2017, National Institute of Occupational Health, 2002, Thottathil, 2012).

Agriculture was in crisis (Government of Kerala (GOK), 2016, Harilal and Eswaran, 2017). With the rising cost of cultivation due to higher input costs (fertilizers, pesticides and wages), farmers began switching from domestic food production to using land for non-agricultural activities such as brick making, or they left land fallow or sold it (Government of Kerala (GOK), 2016). With many Malayalees working abroad, income from employment far surpassed income from farming. Land had ceased to be a means of production. Instead land was treated like an investment or a savings account — an asset to store savings from remittances or other sources (Pushpangadan, 2003). Farming, once a respected profession, lost respectability and was relegated to being unimportant or a hobby (Staff Reporter, 2008). Farming was less feasible for small and marginal farmers and suicides by farmers (with less than one acre of land) increased (Planning Commission Government of India, 2008, Thottathil, 2012). In fact during the turn of the twenty-first century, Kerala had the third highest suicide rate in India (Newsminute.com, 2015, Raman Kutty, 2012, Soman *et al.*, 2009, Staff Reporter, 2010).

4.2.3. Horticulture as a commercial venture (origins and distinctions)

It was in the context of this crisis in agriculture that horticulture programmes were launched in Kerala. Though India formed a National Horticulture Board in 1981 and invested in horticulture development programmes nationwide during the 7th Five Year Plan (1985–1990), the opening up the economy in 1991 was linked to the spread of horticulture (Thottathil, 2012). National five-year plans began to focus on high-value fruits and vegetables and more investments were available to develop horticultural crops. The share of budgetary allocation for horticulture steadily increased as a share of total allocation of agriculture from 3.9% in the Ninth Five Year, to 8.5% in the Tenth Five Year Plan to 11.6% in the Eleventh Plan. This emphasis on fruit and vegetable cultivation was a change from India's focus on food grains — rice and wheat – since independence until the 1980s.

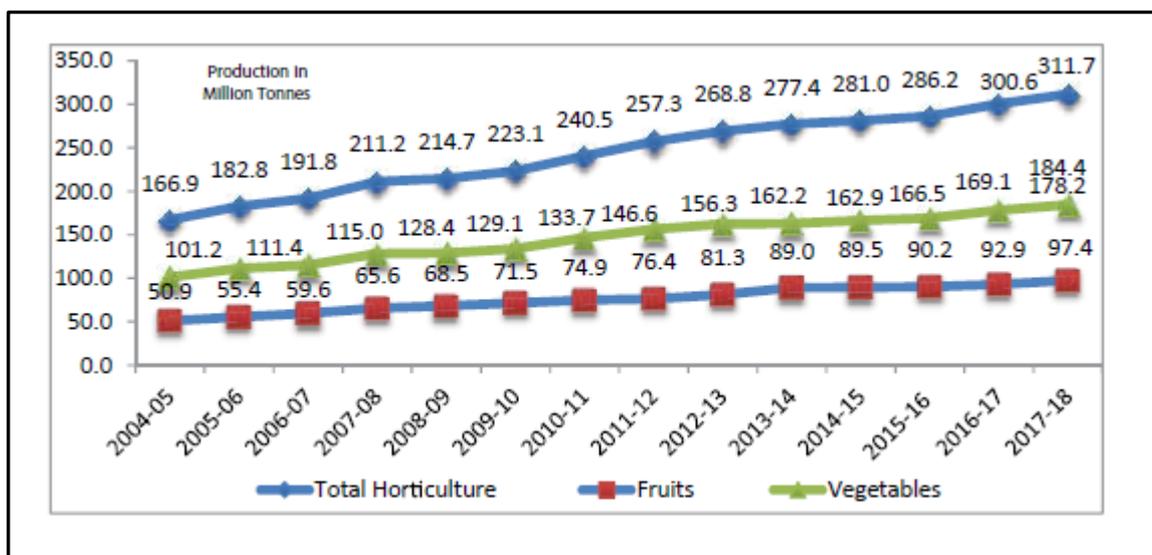


Figure 8: Horticulture production (million tonnes) from 2004-05 to 2017-18

Source: (Government of India, 2018)

Now India is the second largest producer of the world’s vegetables, including okra (highest producer) and aubergine (eggplant, brinjal), cabbage, cauliflower, pea, onion, tomato (second largest producer) and potato (third largest producer). It was the second highest producer of fruits (86.602 million metric tonnes, 13% of world’ share) and vegetables (169.478 million metric tonnes 11% of world share) in 2014-15 (Government of India, Government of India, 2018).

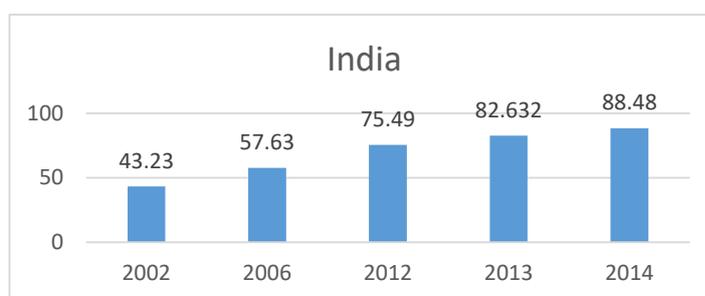


Figure 9: Fruit Production in India, 2002-2014 (million tonnes)

Source: (Government of India)

The total value of India’s horticulture export increased from Rs. 29,723 million (1991-92) to Rs. 64,450 million (2001-02) to Rs. 1,24,175 million (2005-06) and accounted for about 35% of the total value of exports of agricultural commodities including fresh fruits and vegetables, during 2005-06 (Planning Commission, 2007). The value of India’s F&V exports was valued at Rs. 31.21 billion in 2018 (Government of India, 2018).

Figure 10: A timeline for horticulture in Kerala

World	India	Year	Kerala
	Independence	1947	Kerala State formed Democratically elected Communist government
	Fourth Five-year Plan: Green Revolution	1970	Kerala Land Reforms Act High-yielding paddy Migration to the Middle East
Oil Boom in the Middle East Gulf States			Land conversion from paddy to cash crops (sugarcane, rubber etc.)
	National Horticulture Board	1980	Essential commodities retail price control interventions
	7 th Five Year Plan: Investment in horticulture development programmes		Department of Agriculture Decentralization Group approach to extension for rice farming Kerala State Horticulture Products Development Corporation (HORTICORP) Stagnant F&V production
	Eighth Plan Liberalization Economic growth	1990	Introduction of CDS (Community Development Societies), Urban Basic Services & Community Based Nutrition Programme (CBNP) Vulnerable to global price changes
Changes in global prices, policy, and tradable commodities.	Increasing inequalities (food consumption, nutrition & urban-rural divide)		KHDP (European Union-supported)
	Constitutional amendments		Public debate about democratic decentralization People's Plan Campaign Attempt to revive agriculture Campaign for formulation of the Ninth Plan from below
	Increased allocation for horticulture (Ninth Plan: 3.9% to Eleventh Plan: 11.6%)		Recommendation for State Poverty Eradication Mission (SPEM). Intensive vegetable development programme (IVDP) Kudumbashree Mission or the State Poverty Eradication Mission (SPEM)
	Indo-Sri Lanka Free Trade Agreement (ISLFTA)	2000	Vegetable and Fruits Promotion Council, Kerala (VFPCCK), replaced KHDP VFPCCK Cheaper spice imports
	SAFTA (South Asian Free Trade Agreement).		Kerala State Horticulture Mission Fruit and vegetable infrastructure investments Perishable cargo centre at Cochin International Airport (CIAL)
	Free Trade Agreement with ASEAN		
	Supreme Court of India banned Endosulfan	2010	Organic farming policy Increased F&V budget support

4.3. Programmes and projects involved in Kerala's horticultural intervention

For Kerala which had been facing an agricultural crisis, the increased national focus on horticulture was helpful. It enabled Kerala to focus on producing F&V for a domestic market and to avoid the export market for plantation crops.

4.3.1. Implementing organisations

Of several organisations involved in implementing horticulture and food system related programmes in Kerala the following government-related organisations are noteworthy for their large scale influence. They are KHDP/ VFPCCK, Kudumbashree Mission, Department of Agriculture Development and Farmers' Welfare (Government of Kerala (GOK)), Kerala State Civil Supplies Corporation Limited, Kerala State Horticulture Mission and the National Horticulture Mission

Kerala Horticulture Development Programme (KHDP) / Vegetable and Fruit Promotion Council Keralam (VFPCCK)

The Kerala Horticulture Development Programme (KHDP), initiated in 1993 with funding from European Commission, was the first initiative to promote growing fruits and vegetables in Kerala (CEBECO India Private Ltd., 2010). It evolved when there was increasing globalization and migration, failing agriculture, and dependence on imports from neighbouring states. The aim of KHDP-VKPCCK was to improve the *livelihood security*, and thereby enhance and sustain the *income* of fruit and vegetable farmers of Kerala. The programme was designed to establish “a replicable methodology to make the fruit and vegetable crops an important sector in Kerala's agricultural production pattern” (The Mid-Term Review Mission- European Union Mission in India, 2000, pp. 2).

In Kerala KHDP/VFPCCK worked with commercial F&V farmers focusing on production, value addition and marketing as a profitable venture (Vegetable and Fruit Promotion Council Keralam (VFPCCK), 2017b). According to the Financing Agreement signed on the 17th of January 1992, the new initiative aimed to increase the income of small-scale farmers by supplying ‘high-value’ horticultural crops to external agricultural

markets (European Commission, 1991). Further KHDP wanted to strengthen marketing of fresh fruits and vegetables to existing institutions like HORTICORP.

It organized 15 to 20 small and marginal farmers, tribal farmers and farmwomen, and agricultural labourers into participatory farmer self-help groups (SHG)³⁰. These farmers learned to solve their own problems through collective decisions about credit, marketing, technology and value additions (Adhiguru and Vimala Devi, 2004, CEBECO India Private Ltd., 2010, Hall *et al.*, 2003, Sulaiman, 2012, Vegetable and Fruit Promotion Council Keralam (VFPCCK), 2017b). Their innovative agricultural extension used a Master Farmer (MFs) concept with each SHG electing three MFs — one for production, a second for marketing and the third for credit to lead farmers in those areas. Scientists trained three KHDP master farmers in agriculture technology, accessing credit and marketing. The master farmers then trained other groups of farmers.

SHG membership enabled farmers to access credit, training and technical advice leading to increased yields and area expansion, improved marketing and credit and cost reduction. The norms KHDP developed included an "office-less extension" strategy for field staff who visited farmers' fields.

The SHGs took part in group marketing through a Field Centre (FC) that represents 10 to 15 SHGs of around 250-300 farmers. VFPCCK provided each FC with daily F&V market prices and supported centres that become Farmers' Market (*Swasraya Karshaka Samithi*) by reimbursing major expenses for a year, and through investments in land and market building. Some Farmers Markets had an annual turnover of over ten million rupees. VFPCCK arranged easy credit for farmers and expanded to infrastructural development such as cold storage for marketing and exports (Vegetable and Fruit Promotion Council Keralam (VFPCCK), 2017b). By 1996 KHDP facilitated infrastructure development of Nadakkara Agro Processing Company to add value by processing pineapples for juice and jams. For example, investment in Nadakkara Agro Processing Company, a modern pineapple factory, illustrates KHDP's motive to invest in infrastructure development for profit rather than increasing availability or affordability of pineapple. The sole purpose was to add value through processing pineapples.

³⁰ Jacob Thomas, the director of KHDP (since inception, August 1992 till October 1996), developed a model that included farmer self-help groups and clusters (made of several groups) after visits to organisations abroad.

However as the pineapple value addition project was not successful, KHDP developed the 'farmer market' model and two years later KHDP introduced an intensive vegetable development programme (Sethunath, 1997), with people's participation in self-help *haritha* sanghams (green collectives).³¹ The programme included master trainers, collective marketing, and credit packages for leasing land. By the end of 1999, there were increases in yields and cultivated area, improved marketing and credit facilities, and a reduction of production cost. Among the features contributing to success were training, group farming and marketing by self-help groups of farmers, and easy access to credit and participatory approaches (Hall *et al.*, 2003, Kerala Horticulture Development Programme (KHDP), 2003, Sulaiman, 2012).

However KHDP contended with inadequate representation of women and fluctuating prices due to uncertain demand and the flood of cheaper vegetables from neighbouring states (The Mid-Term Review Mission- European Union Mission in India, 2000).

When the European Economic Community (EEC) assistance ended in 2001 KHDP was renamed as the Vegetables and Fruit Promotion Council, Keralam (VFPCCK). The policymakers chose to make fruits and vegetables explicit in the name of the new organization as the term horticulture also covered plantation crops. The total area under fruit cultivation increased from 2.4 lakh hectares in 1992-93 to 3.2 lakh hectares in 2000-01. The number of SHGs had grown from 1,886 in 2001, to 6699 SHGs (women's SHGs: 405) in 2011 (Abraham, 2011) and 9540 SHGs in 2019. In 2019 these groups represented 189,902 commercial fruit and vegetable farmers (2001: 40,958, 2011: 130,000) who had an average farm size of about half an acre (Abraham, 2011). After its inception in seven districts in 2001³², VFPCCK now operates in all fourteen districts.

Farmers in the SHGs held the majority stake in VFPCCK and only 30% stake was with government. VFPCCK saw horticulture as a sunrise area with a "low volume and high value enterprise and having immense commercial potential," which engaged not just farmers but entrepreneurs, sharecroppers, traders, scientists, planners and development agents (Planning Commission, 2007, pp 288). VFPCCK's goals included harnessing

³¹ A *Haritha Sangham* consisted of vegetable farmers cultivating a minimum area of five hectares.

³² Directorate of Economics and Statistics, Government of Kerala

horticulture for employment, income generation and livelihood,³³ while hoping it would also provide nutritional security (see page 295).

Kudumbashree Mission

Kudumbashree Mission, a successful women's self-help poverty alleviation and empowerment programme initiated by the Kerala government³⁴, facilitated participation of motivated neighbourhood women in the planning, implementation and monitoring of poverty reduction programmes (Anand and Maskara, 2014, Devika, 2012). The organization which provided resource support and facilitated micro-entrepreneurship among poor women, spread the KHDP-VFPC model and had 10,000 district-level master farmers.

Between 2004 and 2011, the Kudumbashree associated collectives — the joint liability groups (JLGs) — had farmed on 19850 acres (Anand and Maskara, 2014) and more than 70% of Kudumbashree farmers had landholdings up to a quarter of an acre (Government of Kerala (GOK), 2012a). With Kudumbashree expanding training of master farmers by over 10,000 and land used for farming by 500%, there was hope that the state had turned around the stagnation in production and paddy lands left fallow. As the finance minister of the time stated:

In four years, the Government has been able to stop starvation deaths and farmer suicides which ravaged Kerala in the wake of global trade agreements. In the context of intolerable price rise and the dangers posed by the ASEAN Agreement, it is necessary to be extremely vigilant to prevent the return of those dark days.

- Thomas Isaac, Finance Minister, presenting the Kerala Budget 2010-2011 (Government of Kerala (GOK), 2010a, pp. 3)

They worked with neighbourhood women's groups, local self-government institutions, area development committees and community development societies to cultivate fruits and vegetables and to sell them during the festival season. The direct F&V procurement during the fairs have helped their farmers' returns improve.

The emergence of Kudumbashree that energized farming, has brought to centre stage the scholarship about a gender paradox in Kerala. There were questions about their agency. Were women merely 'given' agency only as long as they did the bidding of the

³³ Initially in Thiruvanthapuram, Kottayam, Ernakulam, Thrissur, Palakkad, Malappuram, Kozhikode

³⁴ Kudumbashree works with poor women, classified on a 9-point scale.

panchayat and political leaders? There were also critiques that women were exploited in less-capital-intensive and low-technology work where they predominated, sometimes under exploitative conditions (Thresia, 2014).

Department of Agriculture Development and Farmers' Welfare

The Department of Agriculture is one of the oldest departments in Kerala, having started functioning in the erstwhile state of Travancore in 1908. The department seeks to increase production of food and cash crops and to facilitate the effective implementation of state and central schemes. It aims to attain self-sufficiency in food production through enhanced productivity of agricultural commodities and thus make agriculture a sustainable and viable vocation providing livelihood support.

With the decentralization of the department in 1987, it opened agriculture offices at regional, district and panchayat levels, with each panchayat having a *Krishi Bhavan*. For vegetable self-sufficiency the state government started intensive vegetable cultivation through a vegetable development programme (IVDP) during 1997-98. (Sulaiman and Holt, 2002). The scheme involved creating a thousand vegetable villages. They declared a '*Haritha Year*' (The year of greening) and organized farmers into *Haritha Sanghams*.

There is cross-fertilization of staff between the Department of Agriculture, VFPC, the State Horticulture Mission and the Kerala Agriculture University (KAU).

Kerala State Civil Supplies Corporation Limited

The Kerala State Civil Supplies Corporation Limited is a government-owned company set up in 1974 under the Department of Food, Civil Supplies and Consumer Affairs to regulate prices of essential commodities through market intervention. The government finances the company to buy essential commodities, which is then sold to consumers at subsidised prices fixed by the government through SUPPLYCO,³⁵ a chain of retail supermarkets and Maveli Stores, a chain of retail outlets.

The Maveli stores began during the Left-led coalition in 1980 under E. Chandrasekharan Nair,³⁶ later known as 'Maveli minister'³⁷, when the Department of Food, Civil Supplies began direct market intervention through Onam fairs as a response

³⁵ The brand name of The Kerala State Civil Supplies Corporation Limited, the execution arm of the Department of Food and Civil Supplies.

³⁶ Chandrasekharan Nair, at 28 years old was elected to the first Kerala assembly in 1959.

³⁷ After King Mahabali whose reign was famed for fairness and equity.

to traders raising prices in tandem with cashew factory workers' Onam bonuses (Correspondent, 2017). These successful Onam fairs were made permanent through a year-round network of fair price shops, and through festival fairs at Onam, Christmas and Ramzan. These stores which started in district headquarters and bigger towns have now spread to smaller towns and there are plans to open them at the panchayat level in each of the 152 blocks of Kerala (CEBECO India Private Ltd., 2010). VFPCK and Kudumbashree Mission also take part in these festival fairs.

HORTICORP - Kerala State Horticulture Products Development Corporation

A Government Company incorporated in 1989, Kerala State Horticulture Products Development Corporation (HORTICORP) offers produce through their network of fair price shops or subsidized vegetable fairs. They also help farmers open marketing centres. The state government gave a grant as a revolving fund to HORTICORP to procure the produce at an assured price (Government of Kerala (GoK), 2009).

Kerala State Horticulture Mission

Following the formation of the Kerala State Horticulture Mission (SHM), an umbrella body for all horticulture activities begun in 2005, horticulture activities gained further ground. The SHM adopted a technology-driven, commercial approach as a pathway to F&V self-sufficiency through subsidized, hi-tech precision farming of vegetables like salad cucumber and capsicum in polyhouses (Singhal, 2016). Singhal's recent evaluation of the Horticulture Mission asserts that even though the Mission prides on "doing the right thing, in the right place, at the right time," the lack of a clear vision of the future of agriculture undermines the stated goal of organic agriculture (Singhal, 2016).

National Horticulture Mission

The National Horticulture Mission (NHM) (for more information, see page 295), a centrally sponsored scheme was launched during the year 2005-06 (Tenth Plan) to provide holistic growth of horticulture³⁸ and to enhance horticulture production, improve nutritional security and income support as well as to establish convergence and synergy (Government of Maharashtra, 2013) It started with the Government of India providing 100% assistance to the state mission and later the assistance was pegged at 85% with 15% contribution by the State Government.

³⁸ It includes produce that has contributed significantly to the agriculture GDP: such as fruits, vegetables, spices, medicinal and aromatic plants, flowers, mushroom and a variety of plantation crops like coconut, areca nut, cashew nut and cocoa.

4.4. People-centered policies (creating enabling environments for nutrition)

4.4.1. PDS and market intervention

Decades of people-oriented development such as Kerala's large PDS³⁹ network and government-supported network of subsidized retail outlets have helped low-income consumers maintain calorie intakes⁴⁰ (especially during periods of price rise) and allowed more of their income to be used for nutritious micronutrient-rich foods (Drèze and Sen, 1989, Government of Kerala (GOK), 2012a, Government of Kerala (GOK), 2012b). Though this can potentially increase access to F&V, Desai and Vanneman argue that a cereal-focused PDS cannot effectively diversify diets as PDS users seem to skew their consumption towards cheap cereals while reducing consumption of fruits (Desai and Vanneman, 2015) and also that nutrition knowledge is important for dietary diversification (Bailey, 2016, Global Panel on Agriculture and Food Systems for Nutrition, 2016a).

Along with a widespread PDS network, Kerala's use of fiscal or price-control measures to influence food prices selectively has also improved nutrition and health outcomes⁴¹ (WHO, 2016). To curb the rate of price rise and to augment the food consumption of poor consumers Kerala embarked on a programme of market intervention that offered subsidised F&V particularly during festival seasons. The government claimed that sometimes these subsidies made vegetables cheaper in Kerala than in the exporting states (Government of Kerala (GOK), 2012a, Government of Kerala (GOK), 2017). I have described this on page 91. At a time of widening rural inequalities, Kerala's market intervention exemplified the nutrition-relevant, multi-sectoral approach and cohesive policy as advocated by De Schutter, a former UN Special Rapporteur on Food (Babu *et al.*, 2016, De Schutter, 2015, International Urban Food Network (IUFN), 2014). This policy impacted nutrition by reducing food consumption inequities and enhancing dietary diversification (Dilip *et al.*, 2013).

³⁹ The state government spent 400 crores (the highest amount ever spent) to provide rice at Rs. 2/per kg through the PDS.

⁴⁰ The Global Panel on Agriculture and Food Systems for Nutrition refers to a Cost of Diet Assessment done by Busquet E and Malam Dodo A in 2011 by Save the Children, UK and Niger.

⁴¹ Some intervened directly in markets to ensure 'fair' food grain prices. WHO reported that 21% countries in the Americas and a fewer than a tenth of other countries reported price subsidies for healthy foods.

4.4.2. Decentralisation

Participatory governance by devolving or transferring power and resources has become integral to Kerala's development discourse (Isaac and Franke, 2002, Riedl and Dickovick, 2014, Törnquist, 2000, Williams *et al.*, 2012). Starting with the Peoples Plan Campaign, a grassroots participatory public action that decentralized decision-making and resources to local self-government institutions (Beaman *et al.*, 2009) Kerala attempted to bring the government closer to the people, reintegrate Kerala's rural society around local development issues, overcome partisan politics, and encourage economic dynamism (Isaac and Franke, 2002, Törnquist, 2000, Williams *et al.*, 2012). The deeply participatory planning process (Isaac and Heller, 2003, Namboodiripad, 1996) increased consensual decision-making and public service delivery (Mansuri and Rao, 2013b). Women and socially marginalised groups gained more public space, a more active role in decision-making, and spending for public goods that benefitted them (Casey *et al.*, 2012, Government of Kerala (GOK), 2006, Heller *et al.*, 2007, Mansuri and Rao, 2013a, Pande, 2003).

The decentralisation programme enabled panchayats to use 30% of the State budget for productive work — particularly in agriculture (Elamon *et al.*, 2004, Gangadharan, 2008, Government of Kerala (GOK), 2006, Riedl and Dickovick, 2014) (Government of Kerala (GoK), 2018b). This fiscal discretion facilitated the push toward vegetable self-sufficiency and facilitated the spread of successful local models and panchayat-initiated innovations (Gangadharan, 2008). Decentralisation also had the unintended consequence of catapulting women into leadership positions in local self-governments (Devika, 2012). While decentralization has energised local governance and agriculture (Boex and Simatupang, 2015, Gangadharan, 2008, UNDP, 2010), it faces the challenge of short-lived state governments and national policies of the central government, as well as lack of transparency and accountability, vertical integration of local plans, under-utilisation of funds and capacity development in the local context (Gangadharan, 2008, Government of Kerala (GOK), 2006, UNDP, 2010).

4.4.3. Organic farming policy, strategy and action plan

The state government formulated and promoted vegetable self-sufficiency through organic farming from 2010 (Anand and Maskara, 2014, Government of Kerala (GOK), 2010b, Government of Kerala (GOK), 2012a, Mencher, 2013, Misra and Joshi, 2017,

Singhal, 2016, Thottathil, 2012). Singhal points out that even though KAU, SHM and Department of Agriculture promote organic farming after the state's announcement of an organic farming policy in 2010, given on page 333 (Government of Kerala (GOK), 2010b), they use safe-to-eat practices that limit the use of chemicals rather than solely organic practices (Singhal, 2016). Singhal is concerned about the lack of unity about objectives and methods — even among the individuals and groups who agree on the environmental and health toll of chemical inputs (Singhal, 2016). A participatory guarantee system (PGS) for organic certification in which farmers certify each other is being tested.

4.4.4. Vegetable self-sufficiency

Recognising the danger of pesticide-laden fruits and vegetables brought from other states, and the acute food and nutrition insecurity, the Planning Board of Kerala recognized the role of home-grown F&V through decentralised, nutritionally-oriented cropping pattern, in ensuring food, nutrition, and livelihood security, while reducing rural-urban and gender divides. (Government of Kerala (GOK), 2012b). Kerala's Thirteenth Five-Year Plan Approach Paper focused on increasing availability. It proposed a *Haritha Keralam* (Green Kerala) Mission to raise vegetable production and double the area cultivated.⁴² To attract a new generation to agriculture, it sought to form a *Karshika Karma Sena* (an army of volunteer farmers). It encouraged group cultivation, and proposed small-scale agriculture mechanisation through a network of agro-service centres. It also proposed strengthening VFPCCK (Government of Kerala (GOK), 2017). By 2016 there were reports that Kerala's vegetable production increased 64% in four years and the area under vegetable cultivation increased to 90,533 hectares (Varma, 2016) as the government encouraged cultivating vegetables on fallow lands, distributed seeds to school students to raise kitchen gardens and the horticulture programme expanded to associations, clubs and even to police department and jails (George, 2015, Varma, 2016).

4.5. The dichotomy of Kerala's development

Even though Kerala witnessed a social transformation and instituted people-centered policies such as decentralisation and participatory governance there are a number of disconnects and paradoxes in areas such as nutrition, health and gender.

⁴² Kanjikuzhi as special agricultural zone (vegetables).

4.5.1. A consumption gap and dietary change

As I pointed out the production of food crops, fruits and vegetables had stagnated from the 1980s and the average diet had little fruits and vegetables (Thottathil, 2012).

However, even as horticulture programmes have taken root in Kerala, a recent study showed people consumed fruits only 3.5 days in a week, with 1.8 servings per day, and the average weekly consumption was just 6.3 servings. Almost 9 in 10 participants (86%) reported consuming less than 2 servings of fruits per day. The average daily intake of vegetables was 2.34 servings per day, but they reported vegetable consumption on 5.9 days. Almost 8 in 10 participants (77.8%) consumed less than 3 servings of vegetables per day. Rural residents consumed more F&V than urban residents. Males consumed fruits more frequently, while females consumed vegetables more frequently (AMCHSS Research Team and Kerala Health Services Department, 2017). This study confirmed an earlier study that pointed to inadequate F&V consumption (Ministry of Health and Family Welfare, 2011).

Table 16: Pattern of consumption of fruits and vegetables by age group, sex, education and residence

	Number of days of vegetable intake in a week Mean (SD)	Number of servings of vegetables on those days Mean (SD)	Number of days of fruits intake in a week Mean (SD)	Number of servings of fruits on those days Mean (SD)
Age (years)				
18 – 44	5.87 (1.57)	2.28 (1.38)	3.45 (2.1)	1.76 (1.07)
45 – 69	5.89 (1.55)	2.39 (1.36)	3.49 (2.12)	1.81 (1.07)
Sex				
Male	5.75 (1.68)	2.29 (1.32)	3.55 (3.00)	1.81 (1.09)
Female	5.97 (1.47)	2.36 (1.40)	3.41 (2.12)	1.77 (1.05)
Education				
Up to high school	5.83 (1.59)	2.34 (1.38)	3.32 (2.06)	1.77 (1.04)
More than high school	6.09 (1.39)	2.32 (1.31)	4.04 (2.20)	1.86 (1.15)
Residence				
Rural	5.92 (1.52)	2.36 (1.34)	3.45 (2.10)	1.82 (1.05)
Urban	5.70 (1.72)	2.23 (1.51)	3.56 (2.18)	1.65 (1.13)
Total	5.88 (1.56)	2.34 (1.37)	3.47 (2.11)	1.79 (1.07)

Source: (AMCHSS Research Team and Kerala Health Services Department, 2017)

Table 17: Intake of vegetables by age group, sex, education and residence

	Less than 3 servings of vegetables per day	Less than 2 servings of vegetables per day
	%	%
Age (years)		
18 – 44	79.9	87.2
45 – 69	75.5	84.6
Sex		
Male	78.8	85.6
Female	77.1	86.2
Education		
Up to high school	78.1	87.5
More than high school	76.2	80
Residence		
Rural	76.9	85.6
Urban	82.1	87.8
Total	77.8	86

Source: (AMCHSS Research Team and Kerala Health Services Department, 2017)

Because vegetable intake explains 94% of total beta-carotene (vitamin A) intake, above a quarter of calcium and riboflavin, and 20% of iron intake (Yu, 2012) it is worrying when more than 90% of the women included in a study in Kerala did not include fruits and green leafy vegetables in their diet (Blossom *et al.*, 2014).

Polished white rice and '*porotta*'⁴³ have become Kerala's staples. Processed food was seen as being modern and hygienic, and a committee on reforms in health services delivery in Kerala recommended replacing *kanji and payar* (rice congee and green gram) diet in hospitals with bread and milk (Government of Kerala (GOK), 2003, Narayana and Kurup, 2000). Instead of fruits, Malayalis shifted to biscuits and health drinks. A doctor told me that fruits, which were once widely available at railway stations, were seen as unhygienic "carriers of cholera" and other diseases. Furthermore, globalization and marketing changed tastes, and also facilitated easy access to packaged 'safe' junk food. Potato chips displaced fruits (Joseph, 2014).

Causes of the consumption gap

While Blossom and colleagues associated low F&V consumption in Kerala with high cost and low purchasing power (Blossom *et al.*, 2014), other studies revealed social gradients in F&V intake, increasing intake with increasing family income (Aravindan, 2008, Kerala Sasthra Sahithya Parishad (KSSP), 2010). A social gradient in average monthly F&V

⁴³ A pan-fried bread made of processed flour (*maida*) and usually served with beef fry.

expenditure was found in Kerala, where access to fruits was more unequal than access to vegetables (Kerala Sasthra Sahithya Parishad (KSSP), 2010).

Table 18: Monthly Consumer Expenditure by Economic Group

Monthly consumer expenditure by Economic Group (in Rupees)						
	I	II	III	IV	ALL	Index of variation
Vegetables	93	135	194	271	169	2.9
Fruits	24	49	100	200	84	8.3

Source: (Kerala Sasthra Sahithya Parishad (KSSP), 2010)

The prices of all fruits and vegetables except for okra, were 30-40% higher in Kerala than in the markets in Chennai, the capital of neighbouring Tamil Nadu (CEBECO India Private Ltd., 2010). A study in Central Kerala found that lack of homestead cultivation of vegetables and fruits, and lack of awareness about the importance of these foods in their daily diet also contributed to the low intake (Blossom *et al.*, 2014). Another study found the number of households consuming home produced categories of vegetables remained stagnant while the average quantities purchased increased: vegetables from 5.7 kg in 2000 to 8.4 kg in 2010; fruits from 4.27 kg in 2000 to 6.51 kg in 2010 (Joseph, 2014). Expenditure on food items showed a substantial increase in 2010, especially in urban areas, where it increased exponentially in 2010 (Joseph, 2014).

These changing patterns of food availability and low micronutrient consumption were seen as contributing to increasing rates of NCD mortality and morbidity, anaemia among pregnant women, malnutrition among children, and obesity among both adults and children (Sivasankaran, 2010).

4.5.2. Nutrition-related non communicable diseases

Kerala – the most advanced among Indian states in the epidemiologic and demographic transition, which reduced mortality, fertility, and anaemia and increased life expectancy and literacy all within one generation and at a time when it had one of the lowest per capita incomes among Indian states (Soman *et al.*, 2011) — is now coping with a high proportion of nutrition related NCDs and consequent catastrophic expenses (Kumar, 1993, Narayana, 2008, Ramachandran, 2007, Ramachandran, Soman, 2007, Thankappan *et al.*, 2010).

A cross-sectional state-wide survey in both rural and urban areas, from October 2016 to March 2017 attributed over 90% of premature mortality in Kerala (mortality in the 15–69 years age group) to NCDs (Indian Council of Medical Research *et al.*, 2017,

Sarma *et al.*, 2019). Nearly a quarter of the total disease burden in DALYs was due to four major NCDs (ischaemic heart disease, stroke, chronic obstructive pulmonary disease and diabetes)(Dandona *et al.*, 2017, Sarma *et al.*, 2019). Most adults (82.4%) in the 18–64 years age group had at least one of the NCD risk factors, and almost half (47.1%) the adults had multiple risk factors (Sarma *et al.*, 2019). Raised blood pressure (BP) or raised fasting blood glucose (FBG) was present in over 40% of the adult population (Sarma *et al.*, 2019). It confirmed the finding of the Prospective Urban Rural Epidemiology study (PURE), one of the largest epidemiological studies involving 663 communities across 22 countries, that NCD risk factors were much higher in Kerala, putting the risk among Malayalis at least 30% higher than the figure at the national level (Miller *et al.*, 2016). Kerala also had other coronary artery disease risk factors such as high total cholesterol 52% and low level of high density lipoprotein cholesterol 39% (Krishnan *et al.*, 2016).

Studies have found a strong gradient between social groups for underweight, anaemia and NCDs (AMCHSS Research Team and Kerala Health Services Department, 2017, Haddad *et al.*, 2012).

Blood sugar levels

Diabetes affected a large proportion of people (India: 11.9% men — urban 13.2: 10.9 rural; 8.6% women — urban 10.5: 7.5 rural and Kerala 19.4 men, urban 18.4: 20.3 rural; 13.5 women urban 13.2: 13.8 rural) (Dandona *et al.*, 2017) and contributed to the highest increase in the rate of disability-adjusted life-years (DALYs) between 1990 and 2016 (Dandona *et al.*, 2017). According to the cross-sectional survey of NCD risk factors using the WHO's STEPs method (World Health Organization, 2011) one in five adults had diabetes (AMCHSS Research Team and Kerala Health Services Department, 2017, Ministry of Health and Family Welfare, 2011). Moreover, dysglycaemia (raised fasting blood glucose) and pre-diabetes together) was found to be present among 54.5% of the adult population (Sarma *et al.*, 2019). Table 19 and Table 20 show the proportion of adults in Kerala with high blood sugar levels.

Table 19: Blood sugar levels (India & Kerala)

	India	Kerala State
	NFHS-4 (2015-16)	NFHS-4 (2015-16)
Blood Sugar Level among Adults (age 15-49 years)		
Women		
Blood sugar level - high (>140 mg/dl) (%)	5.8	8.7
Blood sugar level - very high (>160 mg/dl) (%)	2.8	4.8
Men		
Blood sugar level - high (>140 mg/dl) (%)	8	13.1
Blood sugar level - very high (>160 mg/dl) (%)	3.9	6.3

Source: NFHS-4 Fact sheets

Table 20: Urban and rural adult blood sugar levels (India & Kerala)

	Urban		Rural	
INDICATORS (NFHS-4(2015-16))	India	Kerala State	India	Kerala State
Women				
Blood sugar level - high (>140 mg/dl) (%)	6.9	8.4	5.2	9
Blood sugar level - very high (>160 mg/dl) (%)	3.6	4.8	2.3	4.8
Men				
Blood sugar level - high (>140 mg/dl) (%)	8.8	13.7	7.4	12.6
Blood sugar level - very high (>160 mg/dl) (%)	4.4	4.7	3.5	7.7

Source: NFHS-4 Fact sheets

The proportion of men with very high blood sugar in rural Kerala was more than double the all-India average. Compared to all-India figures, greater proportions of rural women and greater proportions of men in Kerala had high blood sugar levels. The social gradient was reversed, with higher prevalence of diabetes in those with less than high school level education (AMCHSS Research Team and Kerala Health Services Department, 2017).

Hypertension levels

According to Table 21, according to National Family Health Survey, (NFHS)-4, there was a high prevalence of hypertension in Kerala (Harmeet Kaur and Aeri, 2017, International Institute for Population Sciences, 2017, Kaul, 2018). Almost one in three adults in Kerala had raised BP (34.6% in men and 27.9% in women), with no rural-urban difference in systolic or diastolic BP (Sarma *et al.*, 2019). However a slightly higher proportion of men had hypertension.

Table 21: Hypertension levels (India & Kerala)

	India	Kerala State
Hypertension among Adults (age 15-49 years)	NFHS-4 (2015-16)	NFHS-4 (2015-16)
Women		
Slightly above normal (Systolic 140-159 mm of Hg and/or Diastolic 90-99 mm of Hg) (%)	6.7	5.5
Moderately high (Systolic 160-179 mm of Hg and/or Diastolic 100-109 mm of Hg) (%)	1.4	0.8
Very high (Systolic \geq 180 mm of Hg and/or Diastolic \geq 110 mm of Hg) (%)	0.7	0.5
Men		
Slightly above normal (Systolic 140-159 mm of Hg and/or Diastolic 90-99 mm of Hg) (%)	10.4	7.5
Moderately high (Systolic 160-179 mm of Hg and/or Diastolic 100-109 mm of Hg) (%)	2.3	1.3
Very high (Systolic \geq 180 mm of Hg and/or Diastolic \geq 110 mm of Hg) (%)	0.9	0.7

Source: NFHS-4 Fact sheets

Table 22: Urban & rural hypertension levels (India & Kerala)

INDICATORS (NFHS-4(2015-16))	Urban		Rural	
	India	Kerala State	India	Kerala State
Hypertension among Adults (age 15-49 years)				
Women				
Slightly above normal (Systolic 140-159 mm of Hg and/or Diastolic 90-99 mm of Hg) (%)	7.3	4.8	6.5	6.1
Moderately high (Systolic 160-179 mm of Hg and/or Diastolic 100-109 mm of Hg) (%)	1.6	0.6	1.3	1
Very high (Systolic \geq 180 mm of Hg and/or Diastolic \geq 110 mm of Hg) (%)	0.7	0.6	0.7	0.5
Men				
Slightly above normal (Systolic 140-159 mm of Hg and/or Diastolic 90-99 mm of Hg) (%)	11.4	5.6	9.8	9.3
Moderately high (Systolic 160-179 mm of Hg and/or Diastolic 100-109 mm of Hg) (%)	2.7	1.5	2	1.2
Very high (Systolic \geq 180 mm of Hg and/or Diastolic \geq 110 mm of Hg) (%)	1	0.5	0.8	0.8

Source: NFHS-4 Fact sheets

Nutrition status

Kerala had a much lower proportion of men and women whose Body Mass Index (BMI) was below normal (BMI < 18.5 kg/m²), however these rates were higher in rural Kerala

(International Institute for Population Sciences, 2017). Sarma and colleagues found overweight prevalence as high as 30.4%, and 60.2% had abdominal obesity, which was significantly higher in women. (Sarma *et al.*, 2019).

The NFHS-4 (Table 23) had also found the proportion of both men and women who were overweight or obese were higher in Kerala in 2015-16 (women: Kerala 32.4, India 20.7, men: Kerala 28.5%, India: 17.8%). In rural Kerala almost a third of the women were overweight or obese in 2015-16 (31.5%), double that of the rural all India proportion (15%). Among men this was 26.3% in rural Kerala compared to 14.3% all-India. (International Institute for Population Sciences, 2017).

Table 23: Nutrition status (India & Kerala)

Indicators	Nutritional Status of Adults (age 15-49 years)			
	NFHS-3 (2005-06)		NFHS-4 (2015-16)	
	India	Kerala State	India	Kerala State
Women whose Body Mass Index (BMI) is below normal (BMI < 18.5 kg/m ²)	35.5	18	22.9	9.7
Men whose Body Mass Index (BMI) is below normal (BMI < 18.5 kg/m ²) (%)	34.2	21.5	20.2	8.5
Women who are overweight or obese (BMI ≥ 25.0 kg/m ²)14(%)	12.6	28.1	20.7	32.4
Men who are overweight or obese (BMI ≥ 25.0 kg/m ²) (%)	9.3	17.9	18.9	28.5

Source: NFHS-4 Fact sheets

Table 24: Nutritional status of adults (age 15-49 years) status urban & rural (India & Kerala)

Indicators	INDICATORS (NFHS-4(2015-16))			
	Urban		Rural	
	India	Kerala State	India	Kerala State
Women whose Body Mass Index (BMI) is below normal (BMI < 18.5 kg/m ²) (%)	15.5	9.1	26.7	10.2
Men whose Body Mass Index (BMI) is below normal (BMI < 18.5 kg/m ²) (%)	15.4	8.4	23	8.6
Women who are overweight or obese (BMI ≥ 25.0 kg/m ²) (%)	31.3	33.5	15	31.5
Men who are overweight or obese (BMI ≥ 25.0 kg/m ²) (%)	26.6	31.1	14.3	26.3

Source: NFHS-4 Fact sheets

While Krishnan and colleagues found that more than half of adults had abdominal obesity(57%) (Krishnan *et al.*, 2016), a more recent study found that more women had abdominal obesity (72.6%) compared with men (39.1%). It was higher among urban residents (urban: 67.4%, rural: 58.6%) (Sarma *et al.*, 2019).

Anaemia

While anaemia decreased in Kerala among children as it did in the rest of India between 2005-06 and 2015-16, the trends were more complex for women in Kerala. Even while anaemia was lower among Kerala women than all-India averages, between 2005-06 and 2015-16, it increased slightly among all women in Kerala, while declining among pregnant women. For men too, while the levels of anaemia were lower than all-India levels, it increased slightly among Kerala men from 2005-16 and 2015-16.

Table 25: Anaemia among children and adults (India & Kerala)

Indicators	NFHS-3 (2005-06)		NFHS-4 (2015-16)	
	India	Kerala State	India	Kerala State
Children age 6-59 months who are anaemic (<11.0 g/dl) (%)	69.4	44.5	58.5	
Non-pregnant women age 15-49 years who are anaemic (<12.0 g/dl) (%)	55.2	32.8	53.1	34.6
Pregnant women age 15-49 years who are anaemic (<11.0 g/dl) (%)	57.9	33.8	50.3	22.6
All women age 15-49 years who are anaemic (%)	55.3	32.8	53	34.2
Men age 15-49 years who are anaemic (<13.0 g/dl) (%)	24.2	8	22.7	11.7

Source: NFHS-4 Fact sheets

Studies have found a strong gradient between social groups for underweight, anaemia and NCDs (AMCHSS Research Team and Kerala Health Services Department, 2017, Haddad *et al.*, 2012).

Initiatives to prevent and control NCDs

Given the high prevalence of NCD risk factors the state launched Mission *Aardram* (tenderness or “empathy”) in February 2017 to strengthen the quality of primary and secondary care and to address NCD risk factors and to provide antihypertensive and antidiabetic medicines (Sarma *et al.*, 2019). The NCD care protocols were aligned with international standards, and local medical officers partnered with the education department on NCD awareness and prevention tools for schools (Madore *et al.*, 2018). *Aardram* started regular NCD screening for all adults age 30 or older and focused on making Kerala’s health system more people-friendly (Madore *et al.*, 2018). The project that aimed to increase utilization and to lower out-of-pocket spending (Sarma *et al.*, 2019) sought to reach all government health facilities by 2022 (Madore *et al.*, 2018).

While planning urgent policy action, senior officers recognized a need for coordination and accountability between sectors and departments. (AMCHSS Research Team and Kerala Health Services Department, 2017). Kerala’s State Planning Board also

envisioned that dialogue and consultations (including interaction between 'nutrition scientists and scientists belonging to agriculture, medicine, public health, basic sciences and social scientists') as a part of the solution (Government of Kerala (GOK), 2012b).

4.5.3. A gender disconnect

Scholars point out that there is a gender paradox in Kerala which had the highest rates of Human Development Index (HDI) and Gender Development Index (GDI), but also had high rates of female suicide,⁴⁴ as well as reported increases in violence and crimes against women (Anitha *et al.*, 2008, Erwér, 2003, Erwér, 2011, Rose, 2014, Thampi and Devika, 2012). Several studies identify the re-emergence of ideational patriarchy in the state and corroborate that this kind of male power-seeking and positional insecurity are also the most significant risk factors towards crimes against women (Chua, 2014, Mukhopadhyay and Seymour, 1993, Rose, 2014).

Despite increased visibility of Malayali women, public influence and positions of decision-making have remained inaccessible to them (Erwér, 2003, Jeffrey, 2003) and there are consistent gaps in women's agency and public participation. It is important to understand that policies and programmes, including agriculture and horticulture policies and programmes were usually framed in the absence of women in positions of power. While there is a view that gender exclusions represent the "incomplete agenda" of Kerala's social democracy, feminist scholars argue that this was neither coincidental nor a case of 'incomplete development' (Devika, 2006, Devika, 2008, Devika, 2010a, Eapen and Kodoth, 2002, Mukhopadhyay, 2006). They lay the blame on feudal attitudes of paternalistic beneficence which deprived women of agency and gave them no room to decide what they needed or wanted. Devika suggests that the reform movements in Kerala produced a new patriarchy which, fearing that women would gain greater autonomy thanks to modernity, limited female agency to domestic concerns (Devika, 2005).

With governance seen as a male zone informed by a pre-existing masculinism, the bureaucracy and developmental programmes including agriculture were heavily 'manned' and the thrust on social development has almost inevitably been led by men (Anitha *et al.*, 2008, Devika, 2010b). Politics, governance and even community leadership

⁴⁴ Suicide is the chief cause of death among rural women between 15 and 24.

in Kerala have historically been areas of unmitigated male privilege and Devika points out the continuing marginality of women (Devika, 2015 , Devika and Kodoth, 2001).

Jeffrey, Erwér, Devika and Rose contend that despite social developmental achievements, power relations between men and women have changed little and women in Kerala are constrained in their ability to move outside the home, do not have equal access to economic opportunities and resources or equal voice in decision-making (Devika, 2006, Devika, 2010a, Devika, 2012, Devika and Kodoth, 2001, Erwér, 2003, Erwér, 2011, Jeffrey, 2003, Rose, 2014). The power explanation suggests that some people benefit from norms that harm others (Vaitla *et al.*, 2017). In this context it is helpful to look at the work of Mukhopadhyay and Seymour as well as Eapen and Kodoth, who posit that there is a patrifocal⁴⁵ ideational bias that gives precedence to the interests of men and boys, as it systematically places women in an inferior position and regulates their access to material and social resources (Eapen and Kodoth, 2002, Mukhopadhyay and Seymour, 1993).

This misogyny has had ripple effects, for instance that policies for women farmers went so far (ground level work) and no more. Women had almost no leadership roles, access to planning and distribution of resources on a large scale, e.g., for a district or the entire state. Chua points out that power arrangements between males and females in Kerala are such that the male dominates across a number of spheres (Chua, 2014), especially in areas requiring specific expertise and managerial authority while women constitute only one-fourth of the positions of authority (Anitha *et al.*, Arun and Arun, 2002, Devika, 2005, Devika, 2014, Ekatha, Thampi and Devika, 2012). A study in Kerala's burgeoning information technology industry revealed predominantly male senior managers — 18 men in the survey compared to two women project leaders and a stressful appraisal systems for women (Arun and Arun, 2002). Thus women generally conform to feminine norms, remain largely at the lowest levels in several occupations – they receive lower pay, lack tenure, and are subject to masculinist hierarchies (Devika, 2012) and more subject to social regulation compared to their male counterparts (Anitha *et al.*, 2008).

Opposition was often greatest when women challenged entrenched forms of patriarchal power (Anitha *et al.*). In contrast to the ideal of moral, domestic, non-confrontational women, many 'speechifying' women were termed 'divisive' and faced a

⁴⁵ Mukhopadhyay and Seymour consider 'patrifocal' as more flexible and adaptable to pressures for change than 'patriarchy,' which implies that males always predominate in all settings, contexts and through the entire life-cycle.

great deal of slander and ridicule both in public and other spaces. (Devika, 2005). Devika's research has exposed segregationism and knee-jerk hostility to women who transgress gender boundaries (Devika, 2015) Devika, Therese, and Anitha and her colleagues highlighted that breaching gender limits had violent consequences for the woman ranging from defamation and sexual slander, verbal insults to physical and sexual violence (Devika, 2010a, Devika, 2010b, Devika, 2012, Devika and Kodoth, 2001). While Erwèr points out that the perception of agency is crucial, Devika suggests that the female agency in Kerala is akin to Sangari's description of 'agency derived from consent', (Devika, 2006, pp. 54) as a result of a bargain struck with patriarchy which was not freedom, and did not expand women's life-choices (Eapen and Kodoth, 2002, Erwèr, 2003, Erwèr, 2011). Devika and Thampi's research showed that women stayed within social norms by complying with the restrictions, adopting 'modest', dressing styles and speaking in lower, refined tones, and limiting their friends and acquaintances to women (Devika and Thampi, 2007). In return for protective paternalism women were forced to "keep quiet, endure sexist insults, complaining to no one" (Devika and Kodoth, 2001, pp. 3175).

4.6. Conclusion

Social determinants of health have affected diet at the population level in Kerala. Diet has changed, with the average diet having little fruits and vegetables. The limited access to affordable and safe fruits and vegetables had roots in policies that encouraged cash-crops and export-oriented agriculture. Even though the agriculture policies have moved from being purely commercial to more people and health centered, a disconnect with health parameters persists in terms of high rates of NCDs as well as anaemia. There is also the disconnect between higher F&V production, and low consumption.

It is important to examine the role of policies and inter sectoral coordination in places like Kerala, which are facing catastrophic health issues. Kerala's vast urban and rural PDS retail network has the potential to improve access and availability through local purchasing mechanisms (Government of Kerala (GOK), 2012a). If that were to happen, smallholders can increase production and generate income (Global Panel on Agriculture and Food Systems for Nutrition, 2016a) while helping people to be more healthy. In the next chapter, I examine horticulture development programmes that emerged in Kerala for access and availability of fruits and vegetables from the perspectives of stakeholders who took part in a witness seminar.

Chapter 5. Witness Seminar on Effects of Horticultural Programmes on Access to Fruits and Vegetables — a Case Study of the Kerala Experience

5.1. Introduction

As mentioned in Chapter 4, political will, public policies protecting the poor, and public action were the key to Kerala's social transformation. This chapter examines the relationship between policies and programmes for horticulture and the food environment— which connects the individual and household food sources with the wider food system in Kerala (Turner *et al.*, 2017). To do this, I draw upon expert testimony of multiple stakeholders — policy makers, experts, activists and representatives of non-governmental organizations from the fields of agriculture/ horticulture; nutrition and food policy, health, gender, rural development and poverty eradication, who attended a witness seminar organized by the Kerala State Horticulture Mission. Information about the methods I used are in Chapter 3 from pages 52 to 77.

In this chapter and in Chapter 6 I seek to answer the following questions:

- (1) What are the discourses and rationales that shaped the horticulture programmes?
- (2) What are the stakeholders' perceptions of the implementation of the horticulture programmes?
- (3) What are the stakeholders' perceptions about the impacts of the horticulture programmes, including unintended consequences, trade-offs and lessons for the future?

To answer these questions, I begin by laying out the implicit or explicit rationales and motivations that shaped and still drive the development of Kerala's horticulture programmes. Next, I describe the characteristics of the implementation of these programmes and then evaluate the distributional impact and unintended consequences via the lens of the stakeholders' impressions of fruit and vegetable access in the food environment (see page 33). I follow this up by seeking their impressions of the role of the

horticulture programmes to facilitate or create barriers to F&V access, and for whom. I ask what factors might determine these impacts.

In the context of these findings I then discuss if and how horticulture programmes have transformed the food environment in Kerala and assess the extent to which an enabling environment for nutrition did or did not exist. I then consider future policy opportunities, challenges and lessons derived from this research that are helpful in formulating a goal for nutrition-sensitive horticulture programmes and policies in Kerala and other communities undergoing nutrition transition. Finally, I explore the implications of these findings for future research on potential nutritional and health impacts of horticulture programmes and agriculture policies.

5.2. Findings

I organize my findings into four sections. I look at the rationales of the horticulture programmes and its development discourses, the perceptions of implementation, the perceptions of impact and evaluation, and the lessons stakeholders drew for future policy and research on horticulture programmes that address health and nutrition needs.

5.2.1. Rationales for horticulture programmes

In this section I discuss the rationales that shaped the horticulture programme. I do this by interpreting the ‘discourses’ of speakers at the witness seminar. I identify three main discourses that emerged in discussions of the rationale behind the horticulture programme: ‘livelihood and dignity of farmers through economic development,’ ‘prioritising well-being of people and the environment’ and ‘vegetable self-sufficiency.’ The discourses of well-being and vegetable self-sufficiency reflect more contemporary themes. Though the livelihood discourse seemed to be the dominant discourse in the early stages of the horticulture programmes and continues to hold a key place, it was challenged by emerging discourses about ‘prioritising well-being of people and the environment’ and ‘vegetable self-sufficiency.’

Achieving economic and modernized development was a significant priority for the horticulture programme and the livelihood of farmers was often linked to this key rationale. Human development and economic development sometimes dovetailed in harmony when one impulse was ascendant. At other times economic and human development were seen to be in competition. The newer discourses of ‘prioritising well-

being of people and the environment' and 'vegetable self-sufficiency' are linked to human development, and although, superficially, they seem to compete with economic development discourse, interacting together these discourses provide a creative tension vital to pursuing innovation within the horticulture programme.

Rationale 1: Improving the livelihood and dignity of farmers through economic development

The aim of the early horticulture programme, according to Sasidhar who had been with KHDP was focused on improving incomes of marginal farmers who grew vegetables and fruits on land informally leased from land owners. By building the capacity of these mainly landless marginal farmers who had been ignored by commercial banks, the programme sought to empower and enhance their dignity. Dr. V. K Sasidhar who was part of the early KHDP stated that they aimed to increase the income of farmers:

Not to make Kerala state self-sufficient in vegetables and fruits....Farmers are in the forefront. We'll have to support them to stabilize their income.

- V. K. Sasidhar agriculture, programme implementer

Witnesses like K. Prathapan and R. Hali, key strategists and policy makers from horticulture programmes and the agriculture sector, were other proponents of the livelihood and dignity of farmers through economic development discourse. Another witnesses from the agriculture sector also supported this rationale.

Since the discourse of 'increasing income' was the core of the rationale for the horticulture programme, the programme situated itself within a for-profit, income-sensitive, market-driven economic development frame. Even with the move in the late 1990s to change KHDP to a new body, the VFPCK (Vegetable and Fruit Promotion Council of Keralam⁴⁶), to foster both development of horticulture production and marketing, the vision as Sasidhar emphasised was still to provide income to its members, not to increase F&V availability or affordability, or to make Kerala F&V self-sufficient.

Instead of increasing people's access to fruits, KHDP invested in infrastructure development to produce pineapple jams and drinks. The modernization and value addition strategy selected for economic development was not assessed for other impacts.

⁴⁶ The policymakers chose to make fruits and vegetables explicit in the name of the new organization as the term horticulture also covered plantation crops.

Even though the programme did help increase vegetable and fruit production, the focus on raising incomes did little to increase fruits and vegetables in the food environment.

Rationale 2: Prioritising the well-being of people and environment

Mullakara Ratnakaran, a former agriculture minister challenging the income orientation, stated at the witness seminar that one of the lessons learnt was that agriculture needed to nurture dietary diversity, biodiversity, and equality. He emphasised instead that well-being required a development vision of inclusive diversity, an ‘ecosystem interdependence’⁴⁷ in which cranes and water snakes would coexist in paddy fields with frogs feasting on mosquitoes. According to Mullakara Ratnakaran, such a practice of interdependent agriculture (‘agri+culture’) and horticulture (‘horti+culture’) would be welcoming and inclusive and have an “inherent culture” that creates ‘one-ness’, based on the philosophy of ‘goodwill to all’ found in the Vedas:

Each paddy field in every village is its organic capital, where there is freedom for the ecosystem to coexist.

When it comes to agri+culture, it is, Lokah Samastah Sukhino Bhavantu. (May eternal peace and goodwill prevail in the whole universe and all living things — including animals, plants and human beings.)

- Mr. Mullakara Ratnakaran, agriculture, policymaker

Mullakara Ratnakaran contrasted “inclusive one-ness” and culture with the discourse of profit and exclusion by agri+business, “popularized by large corporations in America and Europe”. He explained in the witness seminar that agri+business had “replaced the culture of oneness with profit”. To Mullakara Ratnakaran agriculture generated freedom and contributed to equity and inclusivity, while agribusiness generated profit by exclusion:

If it is agribusiness, you cannot even include your neighbour. Forget the neighbour; it cannot even include members of one’s own household.

- Mr. Mullakara Ratnakaran, agriculture policymaker

⁴⁷ Hindu philosophy of Vasudhaiva Kutumbakam sees the world (animals, birds, plants, trees and other organisms in the ecosystem) as a single family. *Vasudhā*= the earth; *eva*= indeed is; and *kutumbakam*= family).

Two witnesses from nutrition, two from civil society and one from health joined Mullakara Ratnakaran in advocating for the well-being of all living things and the environment. Beela G.K, critiqued the early horticulture programme which aimed to generate income, pointing out that agribusiness generates income to the detriment of nutrition, since its aims are directed:

...at the increase of production and marketing, and (teaching) how to export and how to generate income. So what has happened is, we have lost even our own health and our own nutrition status.

- Dr. Beela G.K, nutrition expert

These witnesses reiterated that economic development could not be an end in itself. At the witness seminar Vinodkumar an Ayurveda physician, linked vegetables farmed for the table instead of the market to biodiversity and to ensuring the health, well-being and income of local communities:

In my childhood... I don't think my family... went to the market to buy vegetables. Every household was self-reliant.

- Dr. T.G Vinodkumar, health expert

Mullakara Ratnakaran stated at the witness seminar that agri+business had first destroyed culture —the soul of agriculture. He reflected that the failure of Kerala's agriculture and biodiversity started with the withering of the farming culture (soul). Just as the body cannot exist without the soul, agriculture in Kerala could not exist without its culture. He pointed out that the loss of paddy fields had done indescribable harm:

Paddy field is a culture. With the loss of the paddy field, first we lost our freedom and then our agriculture. This loss is not only limited to human beings, but extends to the cranes, frogs, and all those organic creatures who depend on the paddy field for their freedom.

- Mr. Mullakara Ratnakaran, agriculture policymaker

The newer rationale of 'prioritising well-being of people and the environment' reflects a view of two witnesses from nutrition, three from agriculture (including two from civil society) and one from health. They agreed that development had come to a difficult crossroad (*oora kudduku*) — between a market-driven, profit-seeking economic

development model, and an inclusive, interdependent, true development approach rooted in culture that generates freedom, emphasizes equity, and supports self-reliance.

Rationale 3: Fruit and vegetable self-sufficiency

Several interrelated factors, including fear of toxic pesticides in vegetables being brought to Kerala and the political or agriculture related supply constraints, had created among policy makers as well as others, a discourse of ‘self-sufficiency of pesticide-free ‘unblemished’ (*malinamavattha*) F&V (particularly GLVs). This discourse articulated by two witnesses from health, two from agriculture civil society, and one from nutrition, supported a rationale for self-reliance in organic, local vegetables. The ‘self-sufficiency’ discourse had backers such as Mullakara Ratnakaran (also quoted above), five other witnesses from agriculture, nutrition and health.

Mullakara Ratnakaran wanted to prioritize self-sufficiency because he was worried that supply-side constraints, including the loss of food crops from drought, and, thousands of acres of land in Andhra Pradesh lost to subsidized oil palm cultivation, would augur ill for vegetable supplies. Both Hali, a highly respected, former director of agriculture who helped draft Kerala’s agriculture policy, and Mullakara Ratnakaran acknowledged the reality of dwindling supplies of safe F&V. Mullakara Ratnakaran was hopeful that “the hard work of some of our good ancestors, due to the poverty and starvation in those days” in Kuttanad⁴⁸ and Malappuram held lessons for the future. Mullakara Ratnakaran thought that “humbled and humiliated Malayalis” would return to agriculture:

Otherwise Kerala will go extinct...nature itself will teach Malayalis; the Malayali will return to agricultural land; they will make new farmlands....

- Mr. Mullakara Ratnakaran, agriculture (policymaker)

This self-sufficiency discourse, with its rationale for self-sufficiency of safe fruits and vegetables, seems to be a harbinger of a new food sovereignty movement in Kerala. However, the move toward self-reliance is not without detractors who argue for maintaining the status-quo — Kerala growing exportable crops (tea, rubber and spices) while being dependent on essential food crops from other states. Hali asks:

⁴⁸ Termed the rice-bowl of Kerala.

What is the problem in sharing seasonal vegetables between states?

- Mr. R. Hali, agriculture expert

These rationales used to justify the horticulture programmes, also frame how witnesses saw the programme impacts. Advocates of livelihood and economic development point out ways in which farmers could earn more income with appropriate marketing and limiting waste; others who see 'prioritising well-being of people and the environment' raise red flags about pesticides and challenges to biodiversity. Proponents of 'self-sufficiency' point to unaffordability of imported F&V, and the paucity of *naadan* F&V (traditional, local fruits and vegetables) especially GLVs).

5.2.2. Perceptions of programme implementation

In this section, I identify the key characteristics of the horticulture programmes. Some of these characteristics, such as capacity building, infrastructural investments, market access, and price intelligence, stemmed from the initial objectives of the programme. Others, such as innovation and partnerships, emerged later.

According to three witnesses from agriculture and one from gender, the design of the horticulture programmes created an efficient alternative to the earlier agriculture model. The design elements that most ensured success were targeted mostly at supply side. The KHDP built farmers' capacity through collectivization, training and ensuring access to financial resources. It also invested in infrastructure, and was innovative and built partnerships. The focus on these supply-side factors probably helped to preserve F&V farming in Kerala.

That KHDP enjoyed a high degree of political commitment, helped encourage innovation. The innovative collective and participatory approach was marked by independence, and efficiency. The design of the model gave voice and agency to small and marginal farmers through capacity building.



Figure 11: Characteristics of the horticulture programme

However, the design of the programme, even though it pioneered marketing and setting prices, focused less on demand-side factors that could potentially have had more nutritional and health impacts than supply-side factors. I will discuss these impacts in the next section.

Capacity building for farmers

The horticulture programmes prioritized capacity building for farmers, through collectivization, training and facilitating access to financial resources. According to Sasidhar⁴⁹, by 2001 KHDP had helped organize over thousand self-help farmer groups. From the “very discouraging” status of F&V farmers at the beginning of the programme, KHDP facilitated over 20,000 farmers form, develop and provide mutual support to each other. KHDP organized independent farmers groups without political interference in Kerala, where each political party had its own farmers’ organization. Organizations like Kudumbashree and the State Horticulture Mission built on the KHDP model. According to P. Bindu, who worked with Kudumbashree in Trichur, Kudumbashree’s self-help collective model, called joint liability groups (JLGs) prioritised interdependence through collective effort, responsibility and accountability. S. Usha, from Thanal,⁵⁰ argued that

⁴⁹ He was the vegetable expert when KHDP was initiated in 1993.

⁵⁰ Thanal, an environmental research NGO promotes poison-free holistic agriculture and had successfully spearheaded a worldwide campaign against endosulfan poisoning.

collective agriculture had revived agriculture itself in Kerala and stemmed conversion of non-remunerative, or fallow paddy lands to non-agricultural uses. Another witness, Mridul Eapen,⁵¹ agreed that self-help groups (SHGs) had “brought back agriculture”. In addition P. Bindu from Kudumbashree maintained that the handsome profits of JLGs who did large scale agriculture were ploughed back into buying more land to farm. Bindu stated at the witness seminar that the ten-member Pradiksha JLG in Nadakkara made a profit of 25 lakhs from farming bitter gourd. She said that each member got nearly two to three lakhs. K. Prathapan, from the Horticulture Mission stated in the witness seminar that the Mission continued the focus on collectivization and supported agriculture societies farm cool season vegetables.⁵²

KHDP-VFPCCK incorporated decentralized participatory training for self-help groups. They supported decisions made by farmers, not by experts, scientists, the officers or by the banks. Sasidhar stated during the witness seminar that KHDP’s training programmes were designed to build the farmers’ capacity and ownership over it. Training in agriculture technology, access to credit and marketing were passed on from the scientists to three KHDP master farmers (each responsible for one area), who then trained other farmers. According to P. Bindu, Kudumbashree’s horticulture programme took the master farmer concept to scale, with 10,000 master farmers in a district instead of three master farmers. Sasidhar explained the popularity of the training. Two witnesses, Sasidhar and Joseph, agreed that once farmers perceived the usefulness of the training, they paid from their own pocket. Sasidhar spoke about how the leaders unafraid of upsetting local politicians, took care to spend time on the actual training and avoiding the political flattery of formal inaugural ceremonies with political bigwigs. Other witnesses agreed that programmes like Kudumbashree were more connected to, and perhaps somewhat subservient to local political leaders.

Sasidhar stressed that small farmers ought to be making more decisions and that nothing should be done without their participation, including determining training needs. He recommended that farmers:

... must come into the main stream, to the policy making level of the agriculture department.

⁵¹ Eapen was a former member of the Kerala State Planning Board with responsibility for gender during the left democratic government in Kerala (2006-2011).

⁵² According to him about 2000 farmer clusters cultivated in peri-urban areas near the major metros, while 140 farmer clusters of about 3500 SHGs farmed on 3000 hectares in Vattavada and Kanthalloor.

- Dr. V. K. Sasidhar, agriculture (programme implementer)

The Horticulture Mission further formalised farmer participation in governance with mandatory farmer representation on key decision-making platforms along with elected representatives of the local self-government (president of the panchayat and local ward members).

Access to credit

Access to credit was a primary characteristic of KHDP's programme. KHDP's intercession in all fiscal interventions, ranging from fixing the scale of finance, refinancing, providing loans and offering loan subsidies to farmers, and securitizing the banks for loans made the difference. Commercial banks were no longer out of reach of marginal farmers who did not possess written lease documents. With KHDP's willingness to make security deposits in banks that would lend to farmers, the banks changed from not making loans to individual small farmers (who were forced to depend on money lenders who charged high interest rates), to releasing document-free subsidized loans without any security (at 2% less than the commercial interest rate) to F&V farmers:

Suppose a branch gives 2 crore of rupees to farmers, we give 2 crore of rupees to a particular branch as a fixed deposit for five years.

- Dr. V. K. Sasidhar, agriculture (programme implementer)

With such interventions KHDP helped farmers access credit easier and faster (five banks agreed to cooperate where none had before) and raised the status of farmers. The system became more efficient as the process from loan application to receiving a loan, took a mere 3 days in 2002 compared with the average of 37 days earlier. As Sasidhar explained, this happened without "the applicant needing to go to the bank at all."

Sasidhar recalled a major breakthrough when banks which had been reluctant to support short season vegetable crops changed their process and agreed to sanction loans based on verifying cultivation. He pointed out that this great victory for marginal farmers who had oral land leases, was won because KHDP leaders travelled to Bombay (now Mumbai), on their behalf to persuade the chairman of the State Bank of India. As

Sasidhar recalled loan recovery rates of these document-free loans were double in comparison with those sanctioned with documents:⁵³

...amazingly the recovery percentage was around 99% to 100%... Seeing that the recovery was very high, the bankers...increased (loan amounts) from Rs. 15000 to Rs. 25000.

- Dr. V. K. Sasidhar, agriculture (programme implementer)

In contrast to the 'service areas approach', of different banks servicing different wards of the panchayat, KHDP wanting farmers to have the option to choose banks, insisted that banks service farmers regardless of where they were based. As Sasidhar elucidated, decision-making by farmers was a key component:

... Every decision was taken by the farmer and not by the programme. Suppose a farmer chose SBT (State bank of Travancore) in a particular panchayat, it is SBT that has to be selected, even if Canara Bank, SBI (State Bank of India) or Federal Bank are there...

- Dr. V. K. Sasidhar, agriculture (programme implementer)

Because KHDP's investments helped bank managers meet deposit targets, Sasidhar recalled that farmers were treated well:

They treat our farmers as kings whenever they go to the branch office immediately....

- Dr. V. K. Sasidhar, agriculture (programme implementer)

Even with the early successes in securing access for farmers, access to credit from commercial banks was hard for poor women farmers in the Kudumbashree JLGs, many of whom were agriculture labourers belonging to lower castes. P. Bindu from Kudumbashree stated in the witness seminar that because banks refused loans to women farmers in Kudumbashree JLGs, they were forced to depend on high interest rate loans from local money lenders. However, women farmers in joint liability groups were able to access credit from neighbourhood thrift networks and from government poverty reduction programmes such as Rashtriya Krishi Vikas Yojana (RKVY) and Mahila Kisan Sashaktikaran Pariyojana (MKSP). Prathapan stressed that RKVY had invested in infrastructure projects and in farmer clusters farming in peri-urban and urban areas.

⁵³ The loan recovery rate for loans sanctioned with full documents was less than 50%.

Bindu said that government subsidised bank loans (with interest rates of 2% to 4%) had proved unpopular and only 15% of the JLGs were able to use those loans in 2011. The scheme was later discontinued. Three women witnesses from agriculture and gender agreed that, even though women farmers had difficulties in accessing credit, thanks to direct and indirect subsidies, and area and production incentives, F&V farming had become more sustainable. While subsidies had the potential to revive agriculture and establish minimum food security, Mridul Eapen asked what crops would be subsidized, and for how long? Professor K. N. Harilal, an economist who led the grassroots 'Peoples' Plan Campaign' and former member of the State Planning Board responsible for agriculture (2006-2011), argued for selective subsidies.

Investment in infrastructure

While building capacity of farmers was one objective of the KHDP, another objective was investment in infrastructure. The KHDP, its successor VFPCCK, and Horticulture Mission developed infrastructure for better planting materials, plant health, agro processing, marketing and exports. In the 1990s KHDP established eight projects — six for fresh fruits and vegetables, including tissue culture for banana plants, a seed multiplication factory for improved planting material and an agro processing factory producing pineapple juice. Prathapan said the Horticulture Mission had developed infrastructure facilities in the Agricultural University, and also set up 30 to 40 plant health clinics, bio-control labs, and tissue culture laboratories throughout the state. The Mission had also set up a perishable cargo centre⁵⁴ in 2009 to export F&V to the Middle East. Sasidhar recounted how KHDP, true to its key mission, had handed over the decision-making and management of the agro processing factory to farmers.

Diffusion of innovation

Diffusion of innovative practices such as collectivized F&V farming, marketing, using fallow lands, and technological innovations — all undergirded by ground-breaking participatory training and decision-making — was a third component of these horticulture programmes.

Hali's perspective was that innovations like collective farming by women's SHGs in the second wave of horticulture programmes, spearheaded state-wide fallow land cultivation. P. Bindu from Kudumbashree revealed that 47,000 Kudumbashree JLGs increased land under F&V farming from 96 hectares to 47,753 hectares (118,000 acres) in

⁵⁴ A joint venture with Agricultural and Processed Food Products Export Development Authority (APEDA), National Horticultural Mission and Cochin International Airport (CIAL) at cost of INR 30.5 crore (\$5.65 million).

seven years (2004-2011), an increase of 500%, by farming their own land, government land, or institutional land (lands belonging to hospitals, panchayats or schools, even farming land once left unused):

...one of our JLG⁵⁵ groups took some fallow land, lying unused after it was acquired for a tile factory... The land had been fallow for a long time. So the JLG did not lose anything even if they didn't make much profit.

- P. Bindu, agriculture (gender & poverty programme implementer)

Almost 90% of the JLGs cultivate on fallow land leased from others on oral land leases. These informal land arrangements to cultivate fruits (mostly plantains and bananas) and vegetables restored land to farming.

Given this massive expansion of farming, there was diffusion of technological innovations including popularizing high tech precision, and terrace farming. Prathapan reported that the Horticulture Mission in 2010 had given 25 grow bags to over 30,000 families in the metros to grow their own vegetables. He also said they had popularized improved planting material of fruit plants and *naadan* vegetables (high yielding seeds produced by farmers' clusters and tissue culture) through seed vending machines (the first in the country).

Culture-changing partnerships

A further objective of the programme was to forge new partnerships among different stakeholders. KHDP-VFPCCK's closest associations seem to have been technical partnerships with agricultural universities for high yielding varieties and credit partnerships with banks. On the other hand, Kudumbashree JLGs made local level links possible through the National Rural Employment Guarantee Scheme (NREGA) and Mahila Kisan Sashaktikaran Pariyojana (MKSP). NREGA provided access to credit, subsidies (from agricultural department) and the panchayat plan fund. Kudumbashree JLGs also worked with Kerala Agriculture University for women-friendly agricultural training and to establish some model plots in some panchayats. P. Bindu from Kudumbashree highlighted an unmet need for women-friendly agricultural tools:

⁵⁵ Joint Liability Group

....women friendly agricultural tools have to be developed and women friendly agricultural training have to be given. We have tied up with KAU, Kerala Agricultural University for this technical support.

- P. Bindu, agriculture (gender & poverty programme implementer)

Bindu was hopeful that even though Kudumbashree's experience of integration and partnership was somewhat patchy and varied, the new MKSP related farmers' facilitation centres (FFC) would provide them technical support, and links with government departments and agencies. She expected village agricultural officers, who have not been fully involved earlier, to be more engaged as a result.

Dr. M Beena from NRHM and others wanted to integrate horticulture and existing government schemes and nutritional programmes such as the robust public distribution system, the mid-day meal scheme, and the anganwadi feeding scheme (for <5 year olds). Other witnesses too wanted to see more integration in marketing fresh produce assisted by government and religious institutions. Harilal said that innovative marketing could include supplying *kathali*,⁵⁶ to the Guruvayoor temple. Even though new partnerships formed as a result of this program, according to a group of four witnesses from agriculture (two), gender and nutrition (one each), more partnerships and integration are needed between VFPCCK and Kudumbashree in training programmes, and memberships in self-help groups.

Access to marketing, setting prices

F&V marketing was crucial to the horticulture programme's goal of improving the livelihood of marginal farmers. As Sasidhar clarified, planners of the horticulture programme were concerned with farmers' incomes above all. Before marketing was initiated, farmers received less than half of what the consumer paid.

To raise their income, farmers had to assume a role in fixing prices for the produce and bypass the traders. As Sasidhar explained:

(The farmers) cultivate under the scorching sun and pelting rain, produce something and bring it to the market. Who decides the price? The traders. All the traditional markets are under the clutches of traders who decide everything.

⁵⁶ A type of banana used for temple rituals.

- Dr. V. K. Sasidhar, agriculture (programme implementer)

Further, Sasidhar emphasized that KHDP had trained farmers to bargain with traders who were perceived as “parasites... doing business on somebody's products” but were necessary, as “every farmer or group cannot take this to the central market”. He described how KHDP prepared farmers to face resistance from traders:

In the beginning the traders definitely tried to torpedo the programme...but they could not withdraw from the scene for long because it was their livelihood.

- Dr. V. K. Sasidhar, agriculture (programme implementer)

Sasidhar recalled the process of beginning a market. Each Swaasraya Karshaka Samithi (SKS), or farmers’ field centres – a farmer-participatory-marketing programme for collective F&V marketing — of about 10 or 15 self-help groups, would withdraw their produce from the traditional market, and let the public and the traders know they were about to start a new market. The group convenors bargained with the traders who as anticipated did in fact boycott the farmer-led marketing initiatives. KHDP stepped in with funds to stem any loss:

... if the traders do not show up for some days we will ask the farmers to take the produce to the central market and sell at whatever price it fetches. ...Suppose they make a loss of two rupees, we... will supplement it from the programme.

- Dr. V. K. Sasidhar, agriculture (programme implementer)

Meanwhile KHDP arranged for farmers to get price information. Sasidhar spoke about KHDP sending agents to all the major markets to collect price information:

And in the beginning when there was no computer...we sent telegrams to field centres. We intimated the previous day's price in the morning about 9.00 o'clock to the centres.

- Dr. V. K. Sasidhar, agriculture (programme implementer)

Sasidhar pointed out that price information helped farmers bargain with traders, who could no longer fool them. For example, traders could no longer claim:

...there was a heavy stock of bitter gourds in a particular market that brought down the price to Rs. 3 per kg. The farmers would confront them by saying, "In your market it was Rs. 8. We got information in the morning itself".

- Dr. V. K. Sasidhar, agriculture (programme implementer)

By the late 1990s, when KHDP-VFPCCK established about 200 Swaasraya Karshaka Samithi (SKS), both farmers and consumers benefited from the group marketing initiatives. Sasidhar spoke about the success they had, with farmers getting up to 70% more for their produce, consumers getting cheaper produce, because 30% of the price did not have to be split between agents, wholesalers and retailers. This investment into smallholder agriculture was an alternative to a purely market-oriented trader-led F&V distribution network.

Farmer-led marketing that circumvents traders has the potential to modify access and availability of fruits and vegetables. Establishing farmer groups has shown some capability if not to dislodge the entrenched trader nexus, at least to provide an alternative supply chain to consumers.

Like the KHDP-VFPCCK groups, Kudumbashree related JLG groups also entered into marketing. Unlike the farmer field centres, which auctioned produce to traders, Kudumbashree groups sold their fruits and vegetables in fairs — monthly, weekly, daily and seasonal festival fairs, especially during the Onam festival. Where JLG groups do large scale F&V farming, local vegetable merchants buy the produce from the fields. Some JLGs also sold vegetables in nearby districts, using vehicles purchased for the purpose.

Prathapan said that the Horticulture Mission was developing panchayat, block and district level markets. The State Mission provided transportation to allow farmer clusters to supply fruits and vegetables for centralized auctions. While KHDP-VFPCCK farmer clusters supply to traders and to auctions, the Kudumbashree groups have been able to sell fruits and vegetables in local fairs, keeping both supply and demand, close to the site of production. Mridul Eapen and Professor Harilal also agreed that horticulture programmes had made some improvements in increased F&V access and availability with better marketing. The programmes grew and farmers were joining the marketing initiatives. There was a perception especially by witnesses from the agriculture sector

that without these interventions there would have been greater exploitation by traders of both farmers and consumers.

5.2.3. Perceptions of impact and evaluation

Witnesses perceived that the impact of horticulture programmes has been mixed; the programmes have been perceived to result in expanding and conserving F&V farming but have been less effective in promoting nutrition-friendly agriculture. Several witnesses from agriculture and one from gender emphasized that the primary benefit of horticulture programmes was to conserve and revive agriculture, which migration and unprofitable paddy cultivation had affected. Dr. K. Prathapan perceived that the programme's technological innovations (high tech and precision farming and distribution of local high quality seeds and seedlings) had contributed to both production and access. However, the programme had different impacts for different constituencies. Farmers accessed training, markets, credit and land, sharpened organizational skills, and increased incomes. While women farmers enhanced their social and economic status, and honed marketing and negotiation skills, inequalities based on gender and class influenced their access to resources.

According to the witnesses, the programme impacted nutrition-friendly agriculture and availability of and access to fruits and vegetables, with little evidence of a rise in nutrition status or vegetable consumption. They reported that F&V access was limited by high cost and that the programme may have negatively impacted GLV availability. The programme benefited traders, bankers, landowners and urban consumers more than other groups.

5.2.4. Impact on food for people

Witnesses acknowledged that a horticulture programme like the KHDP/VFPCK programme which succeeded in generating income for farmers through increased production, marketing and exports, did not promote fruits and vegetables as food for people. Even with investments of “crores of rupees”, Dr. M. Beena pointed out that nutrition was given almost no attention. As Varadachary, a food policy expert and former high-ranked civil servant, stated, infrastructure investment in value addition projects ran counter to nutritional needs:

... The day we started the food processing industry with commercial interests, I think that was the doomsday for our health.

- Mr. Varadachary S. IAS, nutrition expert

As noted, profit rather than the desire to increase pineapple availability was the motive for KHDP to invest in infrastructure development and value addition through processing pineapples for pineapple juice and jams in the Nadakkara Agro Processing Company. Sasidhar emphasized that value addition was for economic benefit rather than for nutritional impact and Beela G.K, Varadachary and Vinodkumar reflected that little had been done to increase the public's access to F&V. Four witnesses from agriculture, three from nutrition and two from the health sector agreed that even with increasing F&V production, barriers related to price, unavailability of healthier food due to poor crop choices, and gender bias prevented people from access to F&V.

Supply and consumption

The witnesses' impressions about the effect of F&V increasing supply on consumption and nutrition provide further insights into the impact of the programme. Beela G.K disagreed that increased F&V production could guarantee better nutrition:

If there is an increase in horticulture production in a particular state, it doesn't mean that the nutrition status of the citizen or the population there is increasing.

- Dr. Beela G.K, nutrition expert

According to Vinodkumar people ate very few vegetables. He asked:

How many leafy vegetables do we in Kerala eat at all? The red spinach, at most the green spinach — which is completely poisoned. Other than that there is hardly any vegetable consumed, particularly (by) the rural and the poor people here.

- Dr. T.G Vinodkumar, health expert

Data from the National Nutrition Monitoring Bureau and studies done by nutritionists from the agriculture university have found low vegetable consumption in Kerala, despite agricultural reforms such as collective farming, subsidies and better prices for farmers. Mary Ukkuru, the head of the department of Home Science and

Nutrition at the College of Agriculture at Vellayani, found no increase in vegetable consumption:

Whether in the coastal region, or in agricultural farmer families, or in middleclass families, whatever it is... we could not see increase in the consumption of vegetables.

- Mary Ukkuru, nutrition expert

Mullakara Ratnakaran, Prathapan, Sasidhar and Usha (agriculture), Beela G.K, Mary Ukkuru and Varadachary (nutrition), Dileepkumar and Vinodkumar (health) and Bindu (Kudumbashree) agreed that meat, fish and egg consumption had increased, while F&V consumption had not. This was despite the horticulture programmes' attempts to increase the availability of selected fruits (pineapple and banana), and tropical varieties of tomatoes, cabbage and cauliflower⁵⁷, that had been either grown in the high ranges, or imported from other states to Kerala's plains.

Most people bought vegetables from traders in the markets who either brought out-of-state produce or produce bought from Kerala's farmers. F&V was available in the metro markets in Thiruvananthapuram, Cochin and Calicut, but not so much in other areas. And if the vegetable was not in the market, it remained inaccessible for most people. Hali linked the popularity of tomatoes to its easy availability:

Tomato is widely available because of the commercial farming.....like salt. It has become an item that gets into every dish.

- Mr. R. Hali, agriculture expert

Witnesses felt there was limited marketing of *naadan* vegetables as few outlets sold them. Four witnesses from agriculture and one from gender mentioned *naadan* vegetables (bitter gourds, snake gourds, etc.) were available during Onam festival season, but not otherwise. G. Dileepkumar, a diabetes educator, and Dr. Vinodkumar, an Ayurveda physician, reported that *naadan* fruits and leafy vegetables were scarce. According to Varadachary, very few of the *naadan* GLVs, such as the leaves of the Moringa plant, widely acknowledged for its nutritious value, were either marketed or consumed. S. Usha and Dr. Vinodkumar reported availability of 80 to 90 different kinds of leafy vegetables in Wayanad, which were neither available in the market nor used by

⁵⁷ Varadachary wondered if the increased production of cauliflower and cabbage, considered an achievement by the horticulture programme, could have led to worsening rates of arthritis.

anyone — whether indigenous people, or villagers, or people in towns. Even though people in cities wanted them, farmers did not bring perishable GLVs to the market. NGOs like Thanal whose organic bazaar sold 10 types of GLVs, supported dietary diversity by marketing nutritious vegetables grown locally in local home-gardens.

Vinodkumar stated that most people relied on traditional agriculture for GLVs, rather than the horticulture programme with its technological and scientific innovations:

... People are dependent on... indigenous agriculture practices for their nutrition ...that is not available within the horticulture programmes.

- Dr. T.G Vinodkumar, health expert

Lack of access, according to S. Usha from Thanal was also because of the for-profit approach of the horticulture programmes. Farmers often sold their produce instead of using it:

Everybody...thinks it is for sale... This is also seen in the consumption studies...They are not eating what they are producing... What they do is to sell all the production and then buy what they need from the market.

Instead, it should be the other way – that we eat and (then) we sell....

In Kerala we are the poorest eaters of leafy vegetables in the whole nation.... That is why (there is) nutrition imbalance. And on top of that, this commercial cultivation of vegetables.

- Dr. S. Usha, agriculture expert

Usha and Vinodkumar blamed mono-cropping and pesticide use for reductions in GLV availability, while they saw organic farming and local marketing as improving GLV availability and improving biodiversity.

Prices and purchase

The horticulture programmes do not seem to have affected F&V prices, which remained high except during festival season when the government supplied subsidized fruits and vegetables. A group of seven witnesses, four from nutrition and health; and three from agriculture agreed that price dictated F&V access and none was affordable. As Vinodkumar explained:

...because the vegetables are too costly...the rural people and the poor people here hardly consume any vegetables ...

- Dr. T.G Vinodkumar, health expert

Since Kerala does not produce significant quantities of fruits or vegetables, high prices had the effect of restricting access to those who could afford its cost. Being a seller's market, fruits and vegetables, whatever the original producer's price, were always marked-up. For poor consumers, fruits and vegetables were a luxury they could not afford. Vinodkumar noted that while the government gave indigenous tribal groups subsidized polished rice, they like everyone else had to depend on "market-oriented vegetables". They consumed F&V less than the cheap polished rice.

Nutrition education

While a witness like Dr. S. Sivasankaran, a professor of cardiology at Thiruvananthapuram Medical College had authored papers on cardio-protective diet, witnesses from agriculture knew little about current nutrition guidelines, especially the recommended daily serving size of F&V. According to Dr. Gopimony's experience, lack of nutrition education also meant that available nutritious foods were not utilized:

I started growing manathakali (fragrant tomato),⁵⁸ which is very good for duodenal ulcer, on my terrace. ...But the unfortunate thing is that, whenever I harvested this and brought it back to the kitchen my wife refused to cook it.

- Dr. Gopimony, agriculture expert

After hearing about the health effects of *manathakali* and amaranth from an Ayurveda physician, Gopimony, like many other families in the metros, grew those vegetables on his terrace. Unfortunately, his wife, who was not party to the nutrition education, refused to cook them. Added to the lack of affordable fruits and vegetables, this lack of nutrition education and traditional gender roles have health impacts. Seven witnesses, four from health and three from nutrition agreed that expanded nutrition education had to be integral to the horticulture programme and could help people take advantage of nutritious vegetables.

⁵⁸ European black nightshade or *Solanum Nigrum*

5.2.5. Impact on farmers

Witness seminar participants agreed that the horticulture programme, by helping farmers gain training, increase organizational skills, and access land, markets and credit and through participation in decision-making, fulfilled its early intent to have “farmers... in the forefront” and to enable them to secure “minimum *jeevitham* (life), minimum *anthassu* (dignity)”. According to Sasidhar, dignity and income for farmers increased as even bankers who had once ignored small farmers treated “farmers as kings”. Farmers, thanks to the bankers, had access to large amounts of capital from the horticulture programme. Horticulture programmes have helped small farmers get temporary (if sometimes expensive) access to land.

Impact on women farmers

Bindu and Mridul Eapen reflected that though Kudumbashree was set up with the aim of poverty alleviation, their involvement in horticulture programmes addressed issues of gender empowerment. Women’s JLGs profited from meeting the demand for seasonal F&V, and accessed farming subsidies for F&V cultivation in over 100,000 acres of land. Bindu pointed out that as women turned to farming, their marketing and negotiation skills increased, and traders started buying produce from the JLGs. The Kudumbashree programme was pivotal in promoting social and economic empowerment and enhancing the status of women. According to Bindu, Kudumbashree transformed women farmers from “mere agricultural labourer to farmers,” and then into entrepreneurs.

Yet with the expansion of the horticulture movement, access to resources — to investment and credit — for marginal farmers was unequal. Many women who took up vegetable farming found it difficult to get access to resources other than government subsidies and credit from neighbourhood thrift schemes. P. Bindu brought attention to the vulnerability faced by women farmers without access to their own land:

...nobody gives anything to the JLG-s group.....when they (JLG-s) lease a land for the first time and farm it well, the owner of the land would demand the land back, and so they don't get it again.

- P. Bindu, agriculture (gender & poverty programme implementer)

Access to land is tied to access to investment and women’s groups fear that the modernized system for receiving subsidies in individual bank accounts will spell doom for the programme, as the subsidies will most likely go to the land owners instead of to

the cultivators. Since 90% of the women's joint liability groups did cultivation on lease lands, the rising cost of land leases, insecurity of land access and inability to get cultivable land impacted women's involvement in F&V farming. Kudumbashree would like some policy intervention on land issues.

Inequality based on gender influenced women's access to resources. Added to this was class and caste discrimination, as access to resources that had worked well for the earlier group of farmers — who were mostly male and perhaps not as poor — seemed not to work as well for the lower middle class women, some of whom were former agriculture labourers, or Dalits at the bottom of the social hierarchy.

5.2.6. The winners and the losers

Who contributed, gained or lost in the effort to establish horticulture in Kerala, apart from farmers, who were the intended beneficiaries of the horticulture programmes?

Those who benefited

Witness seminar participants indicated that the horticulture programme benefited F&V traders, bankers, landowners and urban consumers. Even though the horticulture programme tried to avoid middlemen, Eapen agreed that the government was “still not able to fight that trading lobby”. According to Harilal, six or seven commission agents control and decide everything in Thiruvananthapuram's Palayam market. Hali thought that Kerala's low production and weak marketing led to cheating by an extensive network of traders in “every nook and corner” and “in every village”. According to V. K Sasidhar and R. Hali, while farmer got less than half of the vegetable prices, these traders benefitted from the large mark ups.

V. K Sasidhar noted that banks benefited from the horticulture programme, through large fixed deposits from the horticulture programmes as KHDP compensated bankers for the perceived risk of lending to small holder farmers. Besides, they also got new customers with better repayment rates. According to Hali landowners benefited since Kudumbashree groups who leased their land also used agricultural subsidies to improve soil fertility and pump water into fields.

Contributors

The media had become a powerful actor in Kerala's transitioning society, and according to Prathapan, the fear of ‘media stories’ of overproduction and wastage had spurred

agencies to take steps to procure agricultural produce from farmers. K. Prathapan recognised the contribution of HORTICORP and VFPCCK in procuring produce from farmers and preventing looting by traders from neighbouring states.

Who lost?

Since the horticulture sector neglected nutrition, Harilal who was a former member of the State Planning Board accepted that “both farmers and consumers are exploited”, corroborating Beela G.K’s insight that horticulture planning based on improved incomes and livelihood, rather than improving nutrition, was detrimental to the well-being of both producers and consumers. Hali pointed out that as people did not have access to affordable vegetables, they did not gain as much as other groups. According to him farmers and consumers had an antagonistic relationship:

Consumer is exploited badly, very cruelly...And so the consumer hates the farmer.

- Mr. R. Hali, agriculture expert

According to Hali, agriculture policymakers kept people in the dark about production figures and overproduction-induced cheap prices. It disappointed him that “such a large agriculture system...with so many people and so many agencies,” was unable to provide such information. Instead, the electronic media which functioned as a watchdog, provided this information:

Should we become aware about the excessive production through TV? ...If two young men stand there helplessly trying to sell vegetables, with no one to buy it, only then do we (become aware of excessive production)...

- Mr. R. Hali, agriculture expert

5.2.7. Unintended Consequences, Trade-offs and Lessons for the Future

In this section I offer witness seminar participants’ views of the unintended consequences and trade-offs of the horticulture programmes, along with a summary of the lessons and recommend future policy directions they proposed in response to the current challenges that Kerala’s horticulture programmes face. Witnesses agreed that some of the programme’s unintended consequences were high levels of pesticides and non-traditional F&V replacing *naadan* F&V. They wanted horticulture development

programmes to take people's nutritional needs into consideration, and focus on increasing dietary diversity. Witnesses proposed several policy interventions to further this goal, such as access to land and investments that encourage dietary diversification. Witnesses also agreed that political will is needed to promote nutrition-sensitive horticulture that meets the key challenges of coordination and formulating inclusive and gender-just policies.

Consequences and Trade-offs

Witnesses noted that the horticultural programmes which had resulted in reviving farming, reclaiming fallow land for F&V cultivation, and small farmers increasing their livelihood had also contributed to some unintended consequences and trade-offs. Four witnesses including two from nutrition and health and two from the civil society drew attention to excessive chemical and pesticide use in the agribusiness model that was obliterating indigenous agricultural techniques and negatively affecting GLV farming. According to Dr. S Usha, the banana stem available in the market was poisonous. It was "untouchable" because of Furadan and other systemic pesticides. Pesticides also depleted GLV production:

Farmers are using a lot of weedicides, herbicides, that is taking away all the leafy vegetables.... And people will start applying pesticides even on their terraces.

- Dr. S. Usha, agriculture expert

G. Dileepkumar echoed the widespread fear of pesticides by asking, how it was possible to "trust that it is safe to eat the big tomato... or the very beautiful, very long and fat snakegourd or eggplant". As Hali asked:

How can a producer produce 80 tonnes (of) tomato from a hectare? Definitely they will use fertilisers and pesticides extensively (louder voice, laughter and emphasis).

- Mr. R. Hali, agriculture expert

Several witnesses linked biodiversity with food production and nutrition security. Usha pointed out that it had led to monocultures of selected fruits and vegetables (cabbage, cauliflower, etc.) as farmers tried to maximize profit from temporary land access. Varadachary and Vinodkumar were concerned that toxicity from lead, arsenic and cadmium, would lead to more non-communicable diseases. Usha and Sridhar agreed

with Varadachary, that though endosulfan had been banned, politicians and administrators who obstructed those bans were “complicit with the people who are bent upon... profit” in ruining people’s health.

Some witnesses suggested that the horticulture programme itself may present a challenge to biodiversity conservation. As important as the horticulture programmes were, they were still part of a ‘modern’ world-view that is less tolerant of indigenous organic farming practices. According to Usha and Sridhar from Thanal, there was divergence between what people want and what the horticulture development provided. Sridhar recounted that after all the investment for high yielding hybrid seeds, farmers want local (*naadan*) seeds and fruits:

... Even after all the investment on hybrid and (high) yielding (seeds)... go to a farmer and ask actually what seed he wants? They will say local seed (naadan vithu). We go to a banana store (pazha kada) and ask if they have local banana (naadan pazham). So it is ingrained. But when wants and desires all go one way, development, planning, governance and so on go the other way.

- Mr. Sridhar R., agriculture expert

Varadachary supported increased availability of *naadan* F&V instead of the cabbage, cauliflower, potatoes and capsicum brought from outside or expensive imported fruits from China and the USA:

Why should we go and buy apples at 150 Rupees a kilo when we can get guavas for probably less than 50 Rupees? ...Guava is far superior to apple. The red guava has more lycopen than tomato...

- Mr. Varadachary S. IAS, nutrition expert

A group of mostly women witnesses from nutrition, health, gender and agriculture agreed that it was imperative for horticulture planners to incorporate affordable *naadan* F&V varieties into their programmes.

Lessons and recommendations for future policy from witness seminar participants

Several witnesses across the spectrum stated that horticulture development programmes had neglected nutrition while increasing production, marketing, export and incomes. They perceived that these programmes had done little for dietary diversity or made an effort to prevent, or counteract health problems. They argued for policies that harmonize

and are congruent with putting health at the centre of development, in societies with high rates of nutritional deficiencies and NCDs. A third of the witnesses at the witness seminar representing agriculture, health, nutrition and gender sought to reframe the horticulture and agriculture policy to prioritize nutrition and dietary diversity, to ensure equitable access to chemical-free F&V, and to increase growing GLVs. They spoke of their belief that Kerala would achieve vegetable abundance and better nutrition through easy access to safe *naadan* vegetables grown in home-gardens. They agreed that the goal of a horticulture policy was not only economic development — to improve farmers’ livelihoods and to increase profit through investments in agro-processing, marketing and exports. Beela G.K stressed that progress can be made for everyone, if the Horticulture Mission and the other development programmes promote farming of toxin-free F&V for the sake of people’s health and nutrition and for the well-being of the farming community. Beela G.K and these witnesses sought large-scale farming and easily accessible marketing of toxin-free, nutritious *naadan* F&V, especially GLVs. Three witnesses from agriculture and nutrition called to increase growing F&V in villages, just as urban terrace gardens were popularized in the cities. They sought using all available land for growing vegetables and planting fruit trees. Varadachary called for widespread nutrition-sensitive horticulture:

Every school, every compound you have here can grow a moringa tree.

- Mr. Varadachary S. IAS, nutrition expert

These witnesses recommended, pairing F&V distribution with seedlings and switching from crop-based systems. Saradamoni summed up the central lesson of the witness seminar:

The ultimate message of everything we heard this morning is that... chemical and toxin-free farming is what is required. We have to eat the produce from such farming.

- Dr. K. Saradamoni, gender expert

Another important message was the need as Beela G.K put it, to stimulate people “to love vegetables” through building concerted nutrition awareness. Nutrition and health witnesses joined those from the agriculture sector to reiterate the need for nutrition education within horticulture programmes. They pointed out that hands-on experience in growing food in school gardens would help inculcate good food habits,

with Vinodkumar suggesting it could be done best through “locally available resources, locally available vegetables” and fruits. This was very important for children, as S. Usha recounted that women continued farming because vegetables grown at home tempted even children who before “would not eat” any vegetables. According to G. Dileepkumar, they grew guava trees in about 100 schools in Alappuzha and Pathanamthitta districts during a campaign to popularize nutritious food and help children learn to discriminate between good food and junk food. Further, Varadachary argued that nutrition education would help children help their parents make better food decisions:

After a while they will say: "Mummy, don't buy this. You know it is not good for me".

- Mr. Varadachary S. IAS, nutrition expert

Many witnesses reached an understanding that popularizing *naadan* fruit and vegetable consumption was the most effective way to prioritize dietary diversity as well as resist and reduce tomato-dependent globalization. Vinodkumar suggested planting jackfruit and mango trees in fringe forest areas and Ukkuru stated the importance of monitoring consumption. Several witnesses across the spectrum supported Mullakara’s advocacy of innovative approaches such as organizing community feasts using *naadan* vegetables in traditional dishes:

If you decide to eat nothing but dishes made of jackfruit and (decide) that you would only eat it together, as a community, that can be a samaram⁵⁹... Not eat(ing) some foods, is a way to resist. (Suppose we decide to) only eat kanji⁶⁰ together on the public road, using jackfruit leaves to spoon our kanji.

- Mr. Mullakara Ratnakaran, agriculture (policymaker)

These witnesses agreed on the need to grow *naadan* F&V such as amaranth, moringa, cluster beans, banana stem, broad and sword beans, snake gourd, bitter gourd and sweet potatoes to both enhance nutrition and to manage health problems like anaemia, calcium deficiency, hypertension and cholesterol. According to Varadachary:

⁵⁹ A strike, a way of resistance.

⁶⁰ Rice porridge.

We have to learn what vegetables contribute to our health... And they have to be grown locally. ...We grow whatever we can, as near as possible.

- Mr. Varadachary S. IAS, nutrition expert

Witnesses at the witness seminar stated that stronger marketing strategies and increasing the number of outlets would help everyone and make more *naadan* F&V available. Witnesses from civil society and agriculture suggested that more people would be served if VFPCCK, Kudumbashree and other farmers groups could expand marketing — with more farmers markets, including rotating street markets at panchayat, block and district levels. These might also counter large chain grocery stores. Besides, as both Hali and Sasidhar noted these markets would benefit both local farmers and the community by lowering vegetable prices because they would eliminate the mark-up by middlemen (over 30% currently), and because they would enable farmers to sell smaller quantities, as low as a couple of colocasia. They also suggested the need for better production planning, procurement systems and strategies to prevent post-harvest losses.

Several witnesses from the agriculture, Kudumbashree and nutrition sectors stated that horticulture programmes could facilitate wholesale supply F&V produced by small farmers and SHGs to the public distribution system, mid-day meal and anganwadi feeding schemes, and to institutions like hostels, hospitals, schools and temples, without going via markets. A nutrition witness pointed out that the ability to get safe F&V food would improve nutrition status and solve many health problems.

Ongoing challenges

The horticulture programmes' current challenges are believed to be achieving better coordination of the several agencies doing horticulture, and formulating inclusive and gender-just policies and garnering stronger political will for nutrition-sensitive horticulture.

Hali and Sasidhar recognized that institutions that have similar objectives, coming under one umbrella, will enable better training, marketing and membership coordination. Prathapan, the chief of the Horticulture Mission welcomed such coordination:

I strongly believe that there are so many institutions which are looking after the same activities, so instead we should bring them all under a

single umbrella to gather the needs of the farmers as well as the producers.

- Dr. K. Prathapan, agriculture (policymaker)

P. Bindu and Hali felt that relationships at the panchayat level between agriculture officers and farmers, especially women farmers, have become stronger with the opening of farmer facilitation centres. In the same way Sridhar, Mridul Eapen, and Mullakara Ratnakaran wanted better partnerships, linkages and coordination between institutions with similar activities (department of agriculture, VFPCCK, Kudumbashree and the Horticulture Mission) which now work in their own silos.

Witnesses including Dr. M Beena agreed only an effort to integrate planning and policy making for horticulture and nutrition would facilitate horticulture programmes and agriculture policies to give priority to people's nutrition:

Health and nutrition...how do we see them in an integrated fashion? How do we plan? How do we assist policy making in these two allied topics? ...How can we use the existing systems? ...we have a robust public distribution system... a mid-day meal scheme...anganwadi feeding schemes. How can these government schemes be utilized to ensure that there is an integrated view of horticulture and these governmental nutritional policies?

- Dr. M. Beena IAS, health (programme implementer)

How decisions are made and who is involved in decision-making has repercussions on F&V access. For example, it was the elite and mainly male bureaucrats who formulated policies to spur production of rice and wheat. Varadachary recounted his role:

The emphasis on rice and wheat ...was unfortunately made a sort of permanent ... system by people like me at that time sitting in Delhi, who felt that rice and wheat is the answer to the people's problems. They completely forgot the hundreds of varieties of various other grains grown in India and which were part of our daily lives seventy years ago.

- Mr. Varadachary S. IAS, nutrition expert

A group of five witnesses, including two women from the civil society, agriculture and gender wanted input from experts drawn from a variety of areas, including health

and nutrition, and from a wide body of stakeholders (including farmers, women marginal farmers, agriculture experts and traditionally marginalized communities) to be incorporated in to institutional processes. They felt such an approach to plan agriculture policies from below would serve everyone better. Vinodkumar, an Ayurveda practitioner wanted farmers to be involved in making agriculture policy and asked:

What are the policies to do this? This is very important and urgent. There is no doubt about that.

- Dr. T.G Vinodkumar, health expert

G. Dileepkumar, a diabetes educator, identified the lack of political will as a barrier that prevented both large-scale cultivation of fruits and vegetables and their marketing:

There was no will-power to cultivating it (local fruits like guava) instead of other fruits... Either at the government level or at the level of concerned officials.

- Mr. G. Dileepkumar, health expert

Even though women's involvement has feminized agriculture in Kerala and has been a major reason for the spread of horticulture, their participation in setting policies and their access to resources continues to be difficult. P. Bindu explains:

Nobody is going to give things to the JLGs (joint liability groups); 90% of the Kudumbashree JLGs are doing cultivation on lease lands. So some kind of policy intervention is needed there.

- P. Bindu, agriculture (gender and poverty programme implementer)

Even though farmer facilitation centres have the potential to serve as the grassroots hub for some of these resources a group of four women witnesses from nutrition, Kudumbashree and gender — pointed out that women continued to face problems accessing resources, such as women-friendly agricultural training, appropriate agricultural tools, getting credit, and continuing access to land

In some ways the success of the women's groups in horticulture has made the situation worse. Several witnesses from the civil society noted that land owners prevent women from continuing to farm, by demanding the now-productive land be returned, or

by demanding higher rent when women utilized farm subsidies to improve the leased land, or when they found solutions to problems that had eluded the land owner. These witnesses wanted ongoing monitoring to prevent such exploitation of women's work and consequent action for change.

5.3. Discussion

As I pointed out, the social, cultural and economic factors that operate within the food system impact people's daily living conditions and food consumption patterns (Friel *et al.*, 2015, Tian *et al.*, 1996). From the evidence presented by this witness seminar, it appears that the main motivation of the horticulture programmes was to ensure livelihood and dignity for small farmers through income driven, participatory economic development. Food sovereignty was a secondary motive. The latter, designed to improve the health and wellbeing of people and the environment, promoted vegetable abundance and organic farming. My findings show that the impacts of the programme on economic development and health and wellbeing have been mixed. To discuss these findings I use the food sovereignty framework — articulated at the International Forum for Food Sovereignty in Mali in 2007 (Desmarais *et al.*, 2017, Forum for Food Sovereignty, 2007, Jones *et al.*, 2015, Lee, 2007, Park *et al.*, 2015) and the key elements of LVC's 1996 Nyéléni Declaration (Edelman, 2014).

5.3.1. Enabled agrarian reform

There was abundant evidence that a series of innovative initiatives taken by leaders (mostly elite men drawn from government administrative services) of organizations like the KHDP and Kudumbashree began a process of agrarian reform in Kerala that seemed to fulfill the aspirations of the key elements of LVC's 1996 Nyéléni Declaration (Edelman, 2014). It was clear from the witness seminar that people at the highest echelons of government supported them. The strong political support helped these leaders take independent decisions without any political interference. They were able to take risky innovations — such as deepening participation and strengthening the voices of marginal farmers, establishing their rights, paving the way for policies to improve the access of poor and vulnerable people, especially women, to agricultural resources. The reforms which included unlikely partnerships between different

stakeholders such as agricultural universities, banks and panchayats served, at least to an extent, to reverse of the concentration of wealth and power (Edelman, 2014).

However the evidence also showed that planners and policy makers functioned within an agriculture silo that subscribed to a development paradigm that prioritised economic development for livelihood and dignity of farmers. There was little evidence that these programmes worked to achieve higher F &V consumption. Thus this agricultural reform was based, at least to some level, on neoliberal ideas of economic growth that supported a trade-based food security focused on availability and access, rather than on food sovereignty (Fairbairn, 2010, Schanbacher, 2010).

5.3.2. Built knowledge and skills

There was strong evidence that Kerala's horticulture programmes built knowledge and skills, a key pillar of food sovereignty through helping farmers' groups gain training and organizational skills, and land, market and credit access. The programme enabled this through focus on supply-side factors such as innovative capacity building — collectivizing farmers in self-help co-operatives and joint-liability groups that practised participatory decision-making, farmer-led marketing and decentralized participatory training. The findings reveal the strength of the reforms in enabling access to financial resources, price intelligence and to markets. It was clear that these reforms helped improve the economic status of farmers and contributed to stemming land conversion to non-agricultural use and helped preserve and then expand F&V farming in Kerala.

5.3.3. Little focus on food for people

We saw that Kerala's KHDP/ VFPCCK horticulture model, which sought to improve the 'livelihood and dignity of farmers through economic development', was a commercial, profit-oriented, income-generating programme. Because this commercial model viewed F&V as an economic commodity and emphasized growing and marketing F&V for maximum profits, the marketing was aimed at those who could pay, often in the cities. Thus we saw that markets had become central, with farmers preferring to sell their produce rather than focus on household self-sufficiency. There was growing evidence that the movement from farm to table, was being transformed to a movement from market to table.

There was little evidence that those farmers, whose incomes were increasing, concerned themselves with the nutritional or health status of the community members. While scholars argue that the agriculture sector can improve nutrition outcomes (Friel *et al.*, 2015, Gillespie and van den Bold, 2017, Wilkinson and Marmot, 2003), the KHDP-VFPC model of horticulture was not a nutrition-sensitive programme, and rather than improving nutrition, there was some evidence that nutrition had been given almost no attention. Projects that were to add value ran counter to nutritional needs. This lack of focus created barriers in production and marketing of affordable fruits and vegetables as most people depended on ‘market-oriented vegetables’. Echoing studies that suggest that commercial production programmes do not always improve affordability or consumption of nutrient-rich diets, especially for disadvantaged groups, Beela G.K also pointed out that increased F&V production had not guaranteed better nutrition (Dei, 1992, James *et al.*, 2010, Ramachandran, 2008, Sharma *et al.*, 2006, Wang and Zhang, 2004, Zhai *et al.*, 2014). In fact even as production of high value F&V increased, scholars had noted evidence of lower vegetable availability in Ghana, Thailand, India and China (Dei, 1992, Wang and Zhang, 2004).

Implementing the growth model horticulture programme — through decisions made about crop choices, production processes, and marketing — influenced F&V prices and supply. Witnesses from the nutrition and health sector gave evidence that F&V access was limited by high cost and supply. With high F&V prices, except during festival season when the government supplied subsidized fruits and vegetables, the for-profit, income-sensitive, market-driven approach to F&V marketing meant that these were a luxury the poor people could not afford. Further, the systemic policy drivers of inequality, such as education, gender, rural and urban differences, class and caste, further affected F&V supply and demand, as did the lack of nutrition awareness.

There was little evidence that horticulture programmes that increased farmers’ capability had contributed to increasing F&V in the food environment, especially in rural areas. Indeed, the programme may have negatively impacted GLV availability. The food environment lacked GLV varieties which were perishable and less profitable, but there was year-round presence of the so-called ‘cool season’ vegetables —tomatoes, cabbages and cauliflower etc. People relied on traditional agriculture for GLVs. Thus, horticulture programmes have not been effective in promoting nutrition-friendly agriculture.

Crop selection and distribution was done without paying heed to Kerala’s nutrition status. Thus the impact of Kerala’s early foray into agriculture production

programmes confirms Ackah and Appleton's work that some supply-side initiatives which result in higher production, do not increase affordability or consumption (Ackah and Appleton, 2007). Further, Eldis argues that increased production and supply of F&V as an economic commodity may not curb hunger and malnutrition (Eddis, 2014).

The absence of nutrition education was detrimental to well-being. In the years following the visionary horticulture programme, health and nutrition witnesses noted that malnutrition and anaemia had increased, along with rates of chronic diseases. Witnesses who expressed concern for the well-being of people and the environment and pursued vegetable self-sufficiency, leaned toward food sovereignty in contrast to the neoliberal ideas of competition, liberalisation and economic growth (Fairbairn, 2010, Schanbacher, 2010). Instead of importing produce, nutrition and health witnesses preferred making locally grown toxin-free F&V easily available. In doing so, they affirmed that food sovereignty might be a precondition for nutrition security (La Via Campesina, 2016, Patel, 2009). Further, their yearning for well-being aligns with wanting to build an enabling environment for nutrition (Dei, 1992, Hartini *et al.*, 2003, Njoku and Nweke, 1994, Ramachandran, 2007, Sharma *et al.*, 2006, Thow *et al.*, 2011).

The findings give strong evidence of an evolving focus on the pillars of food sovereignty — food for people, localizing food systems and putting control locally (Desmarais *et al.*, 2017, Forum for Food Sovereignty, 2007, Jones *et al.*, 2015, Lee, 2007, Park *et al.*, 2015). This was seen in advocacy around use and research on *naadan* vegetables to prevent anaemia and NCDs. This was also made clear in seeking nutrition guidelines to be incorporated into local farming and in seeking to document metrics on F&V cultivation, import and export and seeking to revive traditional agricultural knowledge.

5.3.4. Worked both with, and against nature

As I mentioned earlier, Kerala's stated policy since 2010 was to promote vegetable self-sufficiency through organic farming (Government of Kerala (GOK), 2010, Thottathil, 2012), a policy aligned with LVC's 1996 Nyéléni Declaration that sought to reorient agriculture toward agroecology (see page 94, and page 333). However evidence emerged in the witness seminar that in practise, the horticulture programmes had some unintended consequences and trade-offs. One such was the excessive use of agro-chemicals leading to dangerous levels of pesticides. There was indication of wide-spread

mono-cropping of profitable F&V, and replacing *naadan* F&V varieties with commercial 'cool-season' F &V (even though both consumers and farmers seemed to prefer local varieties) and dwindling GLV supply. These consequences challenge biodiversity and nutrition security. Singhal notes that this may be due to organizations like VFPC and SHM being led by staff seconded from KAU or from the Department of Agriculture, who instead of agro-ecology, may subscribe to a more neoliberal paradigm of growth using chemical inputs. Thus Singhal points out that there was a lack of unity about objectives and methods even among the individuals and groups who agreed about the environmental and health toll of chemical inputs (Singhal, 2016). These contradictions that plague Kerala's agricultural policies and programmes could have a deleterious effect on the commendable aspiration, after the endosulfan poisoning, to convert all of Kerala to chemical-free agriculture. If the horticulture programme helped increase the use of agrochemicals, then the programme itself is a threat to biodiversity.

5.3.5. Valuing providers and establishing farmers' rights

There was a troubling indication that traders, land owners and urban consumers benefited more from horticulture programmes that sought to value non-commercial small farmers. However, despite this limitation, there was strong evidence that these programmes succeeded in creating an efficient alternative agricultural model that gave voice and agency to small and marginal farmers. Further, it allowed farmers to give their input into research and policies.

5.3.6. Persisting gender inequalities

Women's rights and the struggle to transform gender relations are seen as central to food sovereignty (Desmarais *et al.*, 2017, Patel, 2012, Wittman *et al.*, 2010). While the 2013 LVC Jakarta conference confirmed gender justice and access to land as pillars of food sovereignty (La Via Campesina, 2014, Park *et al.*, 2015), the evidence from this witness seminar suggest that gender inequalities and class discrimination persisted in Kerala's horticulture programmes, affecting women's access to resources. While women farmers did gain agency as farmers and entrepreneurs, it was generally difficult for women who have been marginalized in a heavily misogynist and patriarchal society to access commercial credit. The reasons for this can be found in the intersectionality of gender, caste and class, which affects access to resources except for specially designed resources.

This lack of inclusion of women and lack of women's access to credit is similar to what has been found elsewhere (Gaiha *et al.*, 2012, June, Joshi *et al.*, 2012, Malapit *et al.*, 2013).

5.3.7. The disconnects

As several scholars point out, there are a number of disconnects — between nutrition, agriculture, health, education, and infrastructure policies (Gillespie *et al.*, 2012, Joshi *et al.*, 2012). Many poor countries with serious nutrition problems have large-scale agricultural programmes that focus on increasing agricultural production, keeping food prices low, and raising farmers' incomes. Theoretically, agricultural programmes should contribute to better nutrition for households and individuals by increasing food supplies and making food more affordable. According to Ruel, Alderman and their colleagues, 'targeted' agricultural programmes and social safety nets can support livelihoods, diet quality, food security, women's empowerment, and meet nutritional needs (Ruel *et al.*, 2013). Ruel explains:

It's not just about having more food. It's about having access to nutritious foods — in sufficient quantities and quality — and to a high-quality diet.

- Ruel, quoted by Lippincott (Lippincott, 2013, pp. 14)

Policy dissonance between the different horticultural policies and programmes accounts for much of the gap between agriculture, health and nutrition policies.

The three discourses around which the horticulture programmes were framed are emblematic of the tension of Kerala's development scenario. Economic development and human development (represented here in the interdependence and self-sufficiency discourses) are its yin and yang. However, the tension between economic and human development highlighted by the discourses may be a force for creative tension pushing horticulture programmes to evolve and innovate. Like yin and yang, the essence of one can perhaps be found in the other. Yet, perhaps horticulture programmes have survived and evolved precisely because of the creative tension between these two forces, such as when proponents of livelihood, such as Hali, recognize that methods to maximize income, such as mono-cropping and use of toxic chemicals, also impact human development. The creative tension has pushed advocates of economic development to begin to support a rationale for food sovereignty — self-reliance in organic, local

vegetables as a strategy for sustainable livelihood. This could begin to shift discourse toward prioritising well-being of people and the environment and self-reliance in organic, local vegetables as a strategy for sustainable livelihood.

5.4. Conclusion

My findings suggest that the impacts of horticulture programmes to ensure livelihood and dignity for small farmers through income driven, participatory economic development have been mixed. Though not designed to make Kerala F&V self-sufficient or enhance potential nutritional and health impacts, these findings imply that horticulture programmes have nevertheless pioneered a process of agrarian reform in Kerala that have nurtured an enabling environment for conserving and promoting F&V farming. The early participatory, farmer-centric model spawned a movement that feminized the face of agriculture, as women's joint liability groups entered horticulture.

Further, these findings also show that these programmes supported trade-based food security and generally viewed F&V as an economic commodity (Fairbairn, 2010, Schanbacher, 2010), thus confirming studies by others (Dei, 1992, James *et al.*, 2010, Ramachandran, 2008, Sharma *et al.*, 2006, Wang and Zhang, 2004, Zhai *et al.*, 2014) that production programmes that increase F&V production, do not always improve affordability or consumption of nutrient-rich diets. The desire to increase farmers' capability had little to do with achieving more F&V in the food environment. As witnesses revealed, prices in Kerala remained high, except during festival season when the government supplied subsidized fruits and vegetables. The findings also suggest little evidence of dietary diversity, while excessive agro-chemical use and mono-cropping may have led to dwindling GLV availability and replacement of *naadan* F&V varieties with commercial 'cool-season' F & V. These unintended consequences pose challenges to biodiversity and nutrition security. The findings also suggest that persistence of gender inequalities affected women's access to resources, while social determinants of diet — such as inequality, education, gender, rural and urban differences, class and caste, operating within the food system continued to impact people's food consumption patterns (Friel *et al.*, 2015, Tian *et al.*, 1996).

These findings also highlight the disenchantment with pesticides which prompted Kerala's stated organic farming policy of 2010 (Government of Kerala (GOK), 2010b), which sought to reorient agriculture toward agroecology, and promote vegetable

self-sufficiency (Anand and Maskara, 2014, Misra and Joshi, 2017, Singhal, 2016). As the findings reveal, there is a tension between the market-driven approach and one that prioritizes food sovereignty and pursues toxin-free vegetable self-sufficiency for the well-being of people and the environment. We saw that those who support the latter, wanted to build an enabling environment for nutrition, and acknowledged food sovereignty as a precondition for nutrition security (La Via Campesina, 2016, Patel, 2009). The findings further reveal that this creative tension has pushed advocates of economic development to support a rationale for food sovereignty — self-reliance in organic, local vegetables as a strategy for sustainable livelihood.

Finally, the findings also brought to light a policy dissonance between the different horticultural policies and programmes and between agriculture and other sectors like health and nutrition. This policy dissonance accounts for much of the gap between agriculture and Kerala's nutrition and health needs. Ruel, Alderman and colleagues show that agricultural programmes can be nutrition-friendly if they explicitly include nutrition goals and activities (Ruel *et al.*, 2013). The TANDI framework conceptualizes that the agriculture sector can impact nutrition outcomes through facilitating enabling environments for nutrition (Gillespie *et al.*, 2012, Gillespie and van den Bold, 2017). This is possible when agricultural priorities focus on growing 'better' food rather than 'more' food (Gillespie and van den Bold, 2017, Willett *et al.*, 2019). The political will that helped the horticulture programme take root can also promote GLV farming and marketing. With food production under pressure, this tension might present an opportunity to move from policy dissonance to policy coherence, by pursuing land use policies and people-centred models of development that put health at the centre of development. Depending on which discourse gains the upper hand, it could either be subsidies to nutrition-sensitive agriculture (human development discourse evident in prioritising the well-being of people and the environment and vegetable self-sufficiency) or subsidies for profitable crops (livelihood and dignity of farmers through economic development), such as those that enabled pineapple cultivation to expand "to the tune of about 300 to 350%" as K. Prathapan of the State Horticulture Mission stated.

Chapter 6. Analysis of Perceptions of Stakeholders on the Effect of Horticultural Programmes on Fruit and Vegetable Access

6.1. Introduction

In Chapter 1 I stated that the main function of this thesis would be to examine the development and impact of Kerala's horticulture programmes, and the contextual and historical factors that shaped it. In the previous chapter we saw from the oral testimony given by panellists and audience members at the witness seminar that the forces and discourses that shaped the horticulture programme and allowed it to take root in Kerala nurtured an enabling environment for conserving and promoting F&V farming. We also saw that this participatory farmer-centric model, which enjoyed a high degree of political will, gave voice and agency to small and marginal farmers, and spawned a whole new movement that feminized the face of agriculture. Further, while horticulture programme leaders leveraged supply-side factors to help small and marginal farmers increase F&V production, the use of agrochemicals and the promotion of certain F&V may have led to decreased GLV availability and biodiversity. This chapter builds on the oral history of the context and processes that shaped Kerala's horticulture programme — made public at the witness seminar — by exploring the opinions of individual key-informants offered in a more private setting.

Despite the fact that the witness seminar provided some answers about the forces that shaped the horticulture programme, and spawned a movement that feminized the face of agriculture, it did not address in sufficient depth the extent to which an enabling environment for nutrition did or did not exist. I wanted, therefore, to understand more deeply issues such as implicit and explicit rationales, and understand how respondents viewed F&V as food for people. More importantly, given the extensive literature on gender, I wanted to understand gender and the impact of the programme on women, and the experience of women professionals and farmers. Therefore, I conducted further semi-structured, in-depth private oral history interviews (in-person or via skype, when face-to-face interviews could not be done) with 25 key stake holders — men and women with expertise in agriculture, food studies, nutrition, gender issues, and/or public health — some of whom had participated in the witness seminar (Table 10). Information about the methods I used are in Chapter 3 (page 52).

6.2. Findings

My findings from the interviews are presented below in four sections which focus on (a) the rationales of the horticulture programmes, (b) the perceptions of implementation, (c) the perceptions of impact and evaluation, and (d) the lessons stakeholders drew for future policy and their perception of problems that challenged horticulture programmes.

6.2.1. Rationales for horticulture programmes

In this section I discuss the rationales that shaped the horticulture programmes. I do this by interpreting the ‘discourses’ of speakers at the witness seminar. I identify four discourses that emerged as drivers of the horticulture programmes: ‘reviving agriculture,’ ‘improving the livelihood and dignity of farmers through economic development,’ ‘prioritising well-being of people and the environment through increasing consumption of affordable and safe fruits and vegetables,’ and ‘vegetable self-sufficiency.’ A comparison of these themes and their frequency suggest that what was initially a plan to revive agriculture later evolved into a desire to achieve self-sufficiency through growing safe and affordable F&V. All these rationales in one way or another helped create an enabling environment for nutrition in Kerala.

Rationale 1: Reviving agriculture

In the late 1990s, a new focus on agriculture, especially vegetables as a ‘productive sector’ for investment was spurred because the Seventy-Third and Seventy-Fourth amendments in the Indian Constitution (1993) had devolved 33% of the central budget to projects formulated at the village, block and district level. A key agriculture policymaker and legislator recalled that with hillsides becoming “virtually rubber monocrops”, public debate about democratic decentralization following constitutional amendments by the Left Democratic Front and The People’s Plan Campaign led to decentralized agriculture planning. The constitutional amendment stimulated the Kerala Panchayat Raj Bill and Kerala Municipality Bill in mid-1996, laying the foundation to revive agriculture. A substantial portion (40%) of the budget was earmarked for productive agriculture sector.

The challenge was to make agriculture remunerative. An agricultural planner told me that the government wanted to promote vegetables in home-gardens similar to the pattern in Indonesia and other Southeast Asian countries. They reached families by distributing seeds to school students. According to a Kudumbashree-related gender

expert and an agriculture policy maker, panchayats and women's self-help groups taking up lease-land agriculture made it become a sunrise sector.

Rationale 2: Improving the livelihood and dignity of farmers

The stated aim of VFPCCK as printed in a leaflet provided in 2011, namely “to improve the *livelihood security*, and thereby enhance and sustain the *income* of F&V farmers of Kerala”, had the potential to build an enabling environment for nutrition. Bureaucrats explained to me that livelihood referred to sustained *income* through commercial, market-driven, ‘purely’ profit-oriented F&V farming. Two other male respondents from the agriculture sector saw this as a way to avoid price crashes linked to international trade by ensuring protected markets. According to four other male agriculture respondents, the goal was for farmers to achieve stable *livelihoods* with *dignity* through economic growth.

... they are not visible... they were not visible to the banking institution... to the agriculture extension machinery...

This was a completely different approach... It said the commercial vegetable and fruit farmers, their income has to be increased... Through whatever particular intervention — better feed, better agronomic practices, better plant protection, and then — better marketing.

- Participant-H (an architect of KHDP/ VFPCCK)

‘Dignity’ to two interviewees associated with KHDP primarily meant improving the economic condition of farmers through sale of desirable F&V marketed to urban and to the Malayali diaspora and protecting landless farmers from exploitative moneylenders and traders. One of the architects of KHDP was clear that their focus was on F&V farming as a commercial venture:

Commercial. We were actually focused on commercial only. We were not looking at the kitchen garden and roof garden, terrace garden... one, two plants of this vegetable, or that vegetable, or bananas. That was not the criteria...there was a requirement of minimum some 200 or 500 banana plants... one-fourth of an acre...

- Participant-H (an architect of KHDP/ VFPCCK)

Farmers who neither owned land nor had written leases relied on traders for capital as banks refused to give them credit.

The agricultural officer doesn't recognize him. The agricultural officer goes to the record... "If you're not the owner then do you have a lease agreement?"

He does not have a lease agreement. So he is cut off from the official extension mechanism.

- Participant-H (an architect of KHDP/ VFPCCK)

In return the farmers pledged their future produce to traders. Two bureaucrats who had led the KHDP/VFPCCK programme pointed out that lack of access to credit and income made debt-ridden farmers lose dignity and social status — through their inability to market their produce or repay money lenders, and because of credit denials and disparaging treatment by bank officials:

The only option seen by the farmer is suicide. He won't file a pauper suit... The debt, whether he owes it to the government or to the bank or to his neighbour, is a debt. And he believes in paying it off... He has something called self-respect. If he loses that, the only option before him is suicide.

- Participant-C (male, leader of organic farmers' association)

A former policymaker stressed the importance of restoring the dignity of farmers by facilitating their access to insurance, grants and pension schemes:

I still remember the farmer, a recipient of the grant, breaking down...He said it was not the money, but the acceptance of people like him, working in mud to feed the country, that brought tears to his eyes. For the first time, they were being given recognition.

- Participant-J (male, former agriculture policymaker)

To benefit marginal farmers an agriculture programme implementer wanted to design shorter supply chains to cut out traders and middlemen. Several respondents (all male) agreed that this focus by the agriculture ministry, Kudumbashree and KHDP to make the marginal lease-land farmer visible, had transformed commercial horticulture. Kudumbashree went a step further, extending dignity to landless women farmers. A prime mover of Kudumbashree told me that by 2012, this kind of agriculture “for the sake of helping the poor people” was instrumental in cultivating 59,000 acres of land and producing marketable surplus.

Rationale 3: Prioritising well-being of people and environment through increasing consumption of affordable and safe fruits, and vegetables

Over 60% of respondents including nutritionists, health workers and gender experts believed that controlling cost and increasing F&V consumption in a food-deficient state with the costliest F&V drove the expansion of horticultural programmes in Kerala. Two respondents (nutritionists) believed horticulture programmes were meant to increase 'very low' consumption, while a former academic from the agriculture college suggested that KHDP was set up to redress the increase in nutrition-related diseases, while a KHDP leader disagreed with the government's policy of supplying customers with cheap vegetables at the expense of the farmer. The State Planning Board and the Finance Ministry took cognisance of the 11th Five Year Plan's (2007-2012) thrust to enhance food security and sought increased funding for vegetables for consumption.

One is this, the income level should increase. Second, they should produce safe food for the consumers.

- Participant-R (male, agriculture policymaker)

The desire to diversify both agriculture and diets with a focus on vegetables as a supplementary food was certainly one of the motivations for the later Kudumbashree programme. Even at the department of agriculture there was an understanding that these programmes were to enhance horticultural production, nutrition, food security and food safety. As people became increasingly concerned about the growing reports of pesticides in vegetables from other states, a legislator wanted access to safe, pesticide-free F&V. Thus organic farming became a cornerstone to the discourse on well-being of the environment:

...keep our land fertile all the time. First, we can free our land from several diseases. Secondly, we will get beautiful land to live in. Finally, we can get back the purity of our water, which is our most precious wealth. We have to free it from pesticides and other pollutants.

- Participant-J (male, former agriculture policymaker)

Rationale 4: Fruit and vegetable self-reliance

A complex web of factors underpinned the discourse on F&V self-sufficiency. Among these was an unarticulated feeling of embarrassment that Kerala was almost completely

dependent on other states, even while eminently suited to vegetable cultivation. As a policymaker recounted:

Because every time you go to a vegetable shop... O my God, it is so much expensive! It has to come from Tamil Nadu!

- Participant-T (male, agriculture policy maker)

He wanted to save expenses and take advantage of the hugely profitable domestic F&V market. A senior agriculture expert, who recalled a conversation with former chief minister E. K. Nayanar, said this was worth almost 300 crores in the early 1990s. Therefore, the European Union-supported KHDP project was rooted in the synergy between the provision of funds and these unspoken feelings. According to three male agriculture policymakers and a programme implementer who found banned chemicals in produce from other states, political will favoured vegetable self-sufficiency to meet 80%-90% of the state's requirement.

An agriculture policymaker recounted how in 2012 the central government increased budget support 12 times from the year before, through garnered additional support from central government schemes, and launched activities aimed at education institutions, urban households, as well as farmer clusters. An agriculture policymaker in the Left-led coalition argued that further rise in productivity was necessary and that agriculture had to spread to 'vaster areas'. He had aimed to cultivate 20,000 hectares with seeds that yield within 90 days and hoped to be self-sufficient in the field of vegetables by 2015. Another agriculture policymaker concurred that this goal was achievable.

6.2.2. Perceptions of programme implementation

In this section I examine the implications of the implementation⁶¹ of the horticulture programme, and to what extent these were influenced by a desire to improve nutrition and health. The primary characteristics that defined horticulture programmes were the feminization of agriculture, capacity building through democratizing and shifting power and professionalism — as well as innovation and partnerships that I had described in Chapter 5. These processes did more than leverage F&V production — they were culture-

⁶¹ Including its objectives.

changing processes that aimed to transform agriculture through the creation of resilient and sustainable institutions. However, they were not designed to improve nutrition.

Several male respondents suggested that from a mostly male-farmer focused KHDP, the entry of Kudumbashree started a process of feminization of Kerala's agriculture. Farmer-friendly processes to accessing financial resources replaced cumbersome bureaucratic processes. According to a fifth of the respondents — mostly programme implementers representing agriculture and gender & poverty — while the programmes nurtured professionalism — in their management, coordination, use of appropriate human resources and entrepreneurship — they also nurtured partnerships with academics, NGO officials and members of the media.

The feminization of agriculture

As more women got into farming, and agriculture became feminized, there were attempts to support women farmers. A gender expert told me that she had been part of a national working group on women in agriculture from 1995 to 2000 that initiated a pilot programme to assist and empower women farmers,⁶² train agriculture officers, conduct demonstrations of farm technologies and organize exposure tours for women farmers. Unfortunately, this women-in-agriculture programme was shut down:

Unfortunately at that time (there was) a decision that gender mainstreaming is enough. There is no need of a separate women exclusive program. ...30% of all programmes would be kept for women....

- Participant-D (woman, gender expert)

According to her, the programme's initial success convinced the department of agriculture of the importance of women in agriculture. A third of the male respondents⁶³ who were mostly policymakers pointed out a synergy between Kudumbashree, employment guarantee schemes such as Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), and the involvement of women in agriculture. A policymaker involved in both Kudumbashree and agriculture emphasized the importance of formal and informal training. Academics from the agriculture university trained women to use agricultural machines, something only male farmers had done before. Later, when peri-urban vegetable clusters began as a feeder programme for cities,

⁶²This focus was perhaps an offshoot of the Eighth Plan (1990–1995) which paid more attention to women in agriculture.

⁶³ From agriculture, Kudumbashree and a health expert.

the Kerala State Horticulture Mission aided women in panchayats near Thiruvananthapuram in growing vegetables, even though they had little land. The Mission gave them containers, grow-bags and information.

If a housewife says that I have only five cents of land... we... tell them. "Look, you can make payaru (long beans), you can make vendakka (ladies finger), you can make vazhuthalanga (brinjal)." There is nobody to dig. So we give it (seedlings) in container.

- Participant-T (man, agriculture policymaker)

When women started Kudumbashree's collective work, their manual labour was regarded as 'social work'. The labour which made them stronger physically helped them overcome inhibitions about working 'with the spade' in public and also inculcated a sense of one-ness:

There was no caste, no religion or economic classes...

- Participant-F (man, Kudumbashree implementer)

Women farmers took part enthusiastically in discussions at *naattukootams*. An agriculture policymaker and legislator recalled the presence of 2000 women, among the 4500 people in one in Palakkad. To KHDP/VFPCK's SHG model, Kudumbashree added lessons on entrepreneurship. A female gender expert informed me how poor women farmers who registered and managed a profitably run company drew in huge investments.

Capacity building and democratization were crucial to effectiveness

The main component of the KHDP model was capacity building through sharing power, training and support. Their respect for farmers' knowledge, needs and decisions helped to diffuse and democratise power. Agriculture policymakers and a civil servant who had been involved in Kudumbashree said they wanted farmers to make decisions. They did not want experts or other officials to decide what should, or should not be done. People used forums like *naattukootam*, to share their ideas, opinions and complaints. Response to these ideas prompted the government to further reform and transfer financial power from agriculture extension officers to farmers:

We said in horticulture mission, amidst tremendous resistance, tremendous resistance... I don't want to go in details. We said that,

“Look if a farmer has cultivated (a certain amount of) land, with such and such a crop... He, the agriculture officer, only has to inspect, satisfy himself that he has cultivated so much of land. And according to the norms, he is eligible for such an amount of subsidy. Issue a cheque to him...”

- Participant-T (man, agriculture policymaker)

This agriculture policymaker said that this direct financing plugged a leaky process that allowed “all kind of hanky-panky” enabling farmers to decide inputs. It also changed the idea that government handouts (*sarkarikam*) must intrinsically be low-quality. He pointed out that the “change of ethos” that accompanied the transfer of financial power to farmers was the biggest success or “the revolutionary point in the implementation of the vegetable programme”. These policymakers widened certification authority rules, from dependence on sole signatories to a larger group of people such as the panchayat officers, including the president and secretary, and even panchayat members.

The Kudumbashree-associated implementer spoke about democratizing power through developing systems. Community decision-making forums such as area development committees, and community development society (CDS) checked the malpractices of local bureaucrats who refused to certify subsidies to Kudumbashree groups. They took power away from bureaucrats and gave it to the peoples’ representatives. Sign-off for cultivable land was changed from bureaucrat to panchayats, and then if bureaucrats refused to certify, Kudumbashree arranged inter-subsidy scheme and loans up to 1 lakh at the rate of 7% interest from banks.

When the agriculture department wanted farmers to follow a “package of practices approved by the Kerala Agriculture University”, an agriculture policymaker persuaded them that farmers knew best, and would function according to their “native wisdom”. He suggested that a farmer who did not use manure was in fact conducting an experiment:

The farmer knows best what to do with his land and crop... Why are you ... assuming that he doesn't know anything?

- Participant-T (man, agriculture policymaker)

An agriculture programme implementer recalled farmers taking KHDP’s marketing managers with them to explore marketing tie-up with SUPPLYCO. He met

with SUPPLYCO's managing director at their request. The director agreed to waive the marketing conditions, pending performance. According to him, the stellar performance the next year ensured that the marketing continued. The majority of interviewees from agriculture and one from Kudumbashree agreed that these collective F&V programmes were successful not only because they built capacity and enabled access to cheaper inputs, but because a system of shared power enabled farmers to have agency and control, and increased their bargaining power, and so, created an environment for nutrition that enabled them to farm, sell and consume F&V.

Professionals in mission-mode

Interviewees from both agriculture and gender indicated that being part of the government, staffing was a particularly challenging issue. This prompted Kudumbashree to take remedial measures to nurture teams:

The first thing is, I wanted to have my Kudumbashree team as a team from government, private sector and NGO.

- Participant-G (man, Kudumbashree implementer)

A gender expert echoed this, saying that KHDP went full steam only after gaining permission to recruit their own agriculture extension officers. KHDP hired specialists to develop programme strategies. Among the institutional development specialists it employed were foreign nationals associated with the European Commission which had contributed 78% of KHDP's budget. For example, one of those hired was a British national whose responsibility was to transform KHDP into a sustainable council jointly owned by farmers and the Government of Kerala through capacity building for staff. This programme implementation specialist was made a co-director. Having a representative from the funder was advantageous:

It is very unusual, that was sometimes a blessing in disguise also. We had powers which I think, were not common to the executives at this level. We could take decisions involving huge financial commitment and technical involvement.

- Participant-H (an architect of KHDP/ VFPCCK)

An agriculture implementer and expert associated with KHDP/VFPCCK asserted how in order to build committed teams, they chose not to 'hire by recommendation', from political bigwigs and instead fostered transparent hiring practices. The result, an

expert suggested, was seen in KHDP staffs' detailed visit plans and accountability, unlike other government staff who often arrived at 10 am, and then took long lunch and coffee breaks. The need to develop and retain a good team was echoed by a Kudumbashree implementer. He explained that unlike the "crowds" and "groups" in government departments, they facilitated mission-driven teams with *koottayma* (one-ness, fellowship):

The team means everybody should understand each other, supplement and compliment, help and go for a common goal.

- Participant-G (man, Kudumbashree implementer)

A wide spectrum of interviewees suggested that training at all levels — from a three-month entrepreneurial and management training for the resource team, to training for agricultural officers, co-ordinators, master-farmers,⁶⁴ SHGs and farmer clusters⁶⁵ — was integral to this radical reformation. A gender expert associated with Kudumbashree added that some groups trained in environment impact assessment had even compiled an instructive manual. All these interviewees suggested that such activities were unusual in Kerala.

Two respondents, one an implementer with Kudumbashree and the other who was involved with both agriculture and poverty eradication, suggested that independence, transparent and formula-based fund allocation, combined with behavioural change among senior political leaders to favour a nonpartisan approach, helped these organizations veer from narrow politics, to issue-based discussions. To respect local government autonomy and ensure accountability in processing complaints, they set up an independent ombudsman's office. The 13th Finance Commission (2010-2015) later recommended this for country-wide adoption.

Respondents from agriculture, including legislators and policymakers were unanimous that these programmes were innovative. These interviewees indicated that these programmes not only tried to meet discerned needs, but also met those needs through systems undergirded by openness, agility, flexibility and freedom for farmers. An agriculture programme implementer observed that KHDP/VFPCCK functioned in a mission-mode "with lot of liberties and lot of freedom, lot of flexibilities" to implement

⁶⁴ Three master-farmers: for production, marketing and credit trained others.

⁶⁵ Farmer clusters were trained in 'precision' and high-tech farming, and were given seeds and fertilizers.

this “totally new” programme. When innovations that were fostered in a culture of freedom, flexibility and openness took root, those were leveraged for impact and scaled up.

While each institution built up its own systems, there was also a need for coordination. An agriculture policymaker enabled different agencies⁶⁶ to undertake surveys together. According to him, the agriculture department deepened their relationships with farmers, after realizing that “the whole society stood with them”. A legislator and an agriculture implementer suggested that bureaucrats and managers at horticulture programmes were change agents. A health expert echoed this sentiment, and added that Kudumbashree had brought back a sense of mission-driven togetherness to a society that was rapidly becoming focused on “self-centred self-growth, self-perpetuity”.

Culture-changing partnerships

A recurrent theme in interviews with three respondents from gender, agriculture and media, was their sense of horticultural programmes’ openness to new ideas and unconventional ways of thinking. These respondents pointed out that horticulture programmes partnered with academics, NGOs, and the media. A group of agriculture interviewees described how, in partnership with the Malayala Manorama group of newspapers, they attempted to “insert a packet of seed” from VFPCCK, as a promotion through the *Manorama Weekly* magazine:

...if you add a sachet of seed, the circulation would go up... So we gave the seeds, amaranth... We give (gave) out only after making sure that it germinates. Everyone appreciated it.... You don't have to go to the shops to get your seed. It comes in Malayala Manorama weekly. You open to read a story, there is a seed with a booklet!

- Participant-T (man, agriculture policymaker)

Later, other popular magazines like *Mathrubhoomi* and *Grihalakshmi* also started attaching seed sachets. According to the agriculture implementer, with very little effort, the horticulture programmes reached over 100,000 people on a single day. He was pleased that they had bypassed the bureaucratic paperwork (application, tax receipt, receipt book, stock register) required by Krishi Bhavans. Attitudes of informality, equality, humility and mutual trust and treating farmers with dignity fostered these

⁶⁶ VFPCCK, HortiCorp, Horticulture Mission, along with panchayats.

diverse partnerships. In the path to modernizing agriculture there was a willingness to ignore formality. A policymaker and legislator, who valued equality and dignity in agricultural work, sought to find a place for a *nattukootam* — a place to hold a meeting that would illustrate this lack of hierarchy. This policymaker felt there had to be “some sort of equality” if they wished to involve the public or the farmers. Dismantling hierarchies and the feudal mind-set was a value he wanted to inculcate. He did not want some people on chairs and others on the floor. He chose a riverbank for the first *nattukootam*:

Yes, everyone from women and children, officials from peon to engineers, mothers from the grand lineages and ancestral houses, to the farm labourer on daily wages — everyone assembled there on the river bank... All representatives of the people were there, but without a chair for anyone...

- Participant-J (man, former agriculture policymaker)

The policymaker recollected that the “gap between the common man and the officers disappeared” and they developed a strong bond. Similar norms KHDP developed included an “office-less extension” strategy for field staff who visited villages daily. The staff treated farmers with dignity. There was a tenor of competent humility. This was particularly true of Kudumbashree’s leaders. According to an implementer at Kudumbashree, they would talk about their ‘experiences’ rather than ‘achievements’. VFPCCK promoted mutual trust — so farmers had “trust in the manager” as did the traders. As a VFPCCK implementer commented, district managers bought and sold hundreds of truckloads of vegetables on trust. VFPCCK released the money to the farmers when traders paid for the vegetables “after three days, four days”. According to him, mutual trust kept “the health of VFPCCK”. However, though VFPCCK managers worked with traders, their loyalty was always with farmers:

*And every time our managers stand with the farmers and negotiate...
he never stands with the trader.*

- Participant-P (man, agriculture programme implementer)

These attitudes of respect and equality were culture-changing processes that transformed agriculture through creating resilient and sustainable institutions that shaped horticultural programmes.

6.2.3. Perceptions of impact and evaluation

While most interviewees perceived that horticultural programmes were positive for farmers ensuring more financial support and ushering in farmer-centric reforms throughout the state, a more complex view was shared by those associated with Kudumbashree's women farmers and by gender experts. Women farmers, who once had been isolated in their homes and were subject to their public presence being strictly controlled were now aware of their rights and entitlements and had gained visibility. However, according to a Kudumbashree implementer and an agriculture policymaker, leadership positions still eluded women farmers. Moreover women faced technical, financial and other problems. Therefore while the reforms helped women farmers use and profit from home grown F&V, they were still vulnerable to limitations imposed by Kerala society's feudal attitudes.

Over half the interviewees confirmed that farming had expanded. Almost half the interviewees (44%, agriculture policymakers and gender and health experts) believed that horticulture programmes arrested the decline in F&V availability and began meeting basic needs. According to them, without the horticulture programmes the situation would have been "further bleak". Though the expansion had not met F&V demand, a fifth of the interviewees, (mostly from nutrition) pointed out that small holders had helped increase F&V trade. However about a third of interviewees (gender and nutrition) expressed divergent views. They felt there was little F&V supply in rural areas. A fifth of the interviewees (mostly women⁶⁷) agreed that urban areas had seen a tremendous increase in English F&V while local F&V⁶⁸ was wasted. Moreover, they felt that the government-supported marketing systems were no match for the strong trader nexus⁶⁹.

There were divergent and often conflicting views about the role of F&V as food for people. About half the respondents (48%), a majority of them women — including all nutritionists, gender and health experts and two persons associated with Kudumbashree -- said price was a barrier. A quarter of those I interviewed, particularly all the nutritionists, were concerned about low F&V (especially GLV) consumption, particularly in rural areas. In contrast a third of the respondents — half of those from agriculture

⁶⁷ Three women (gender, nutrition experts and a Kudumbashree implementer) and agriculture expert and an implementer)

⁶⁸ With few people to harvest them, jackfruits usually rotted.

⁶⁹ Small and marginal farmers found it hard to break into marketing networks from Tamil Nadu.

perceived income as a fundamental determinant of F&V access. To these respondents current prices were affordable.

Impact on food for people

After the drastic reduction in F&V supply from other states from the late 2000s, twelve of the 25 respondents⁷⁰ cited logistical and supply chain improvements undertaken by the left-led LDF government for increasing the number of home-gardens and improving trade and marketing,⁷¹ with HORTICORP mobile vans and a network of *Haritha* F&V stores in almost 'every junction' and outlets (some owned by farmer-clusters) selling pesticide-free GLVs.

Cultivated area and 'ethnic' F&V production had increased because of initiatives such as the campaign for a thousand vegetable villages, distributing nutritious and potentially profitable, pesticide-free F&V seedlings⁷² and popular magazines distributing seeds and, encouraging vegetable farming in peri-urban areas (to feed cities), lease-land cultivation, and farming on vacant land around schools, government offices and jails as well as distributing 'grow-bags' for terrace-farming among urban residents' associations.

A senior agriculture expert observed that commercial plantations also grew vegetables for their workers and for the market. A nutritionist told me of Horticulture Mission giving her 20 grow-bags (with seeds of amaranth and long beans), natural pesticides, instructional booklet, and technical support at home. Four interviewees⁷³ acknowledged that besides own consumption, there was more *naadan* produce (jackfruit, mango, bread fruit, amaranth and moringa leaves) in panchayat markets and that urban neighbours were sharing more F&V.

Five interviewees, comprising of two agriculture policymakers and three women nutrition and gender experts, contended that even though increased F&V production met "perhaps 20%" of requirements, it had neither assured nutrition security nor adequate supply. A nutritionist and the organic farmer perceived that nothing had been done to improve marketing, which might have increased household consumption. The nutritionist drew attention to the lack of GLVs in the market:

⁷⁰ Including all agriculture policymakers, agriculture and Kudumbashree implementers, a gender expert, and a nutritionist.

⁷¹ Sometimes with F&V from outside the state.

⁷² Curry leaf, moringa and papaya. Tests of market-bought curry leaves had shown high pesticide levels.

⁷³ Including two nutritionists and a legislator.

If you go into the interiors, you know, they had something called velicheera⁷⁴ and it is highly nutritious, it is rich in iron. But those leaves are not available in the market and it's not available in the metros of Kerala.

- Participant-K (woman, nutrition and food policy expert)

Besides, she pointed out that nobody was “checking to see whether people are consuming what was produced”. While an agriculture implementer credited “propaganda that people should have a lot of vegetables, a lot of greens” for motivating people to buy more F&V, four interviewees⁷⁵ cited a lack of government-supported retailers, coupled with inadequate logistics and supply chain management, and export as barriers. However an agriculture expert claimed that F&V exports were from Tamil Nadu, not Kerala, which had no exportable surplus. To a legislator, lack of farm loans, social system weaknesses and climate change posed barriers to F&V production.

About 40% of respondents,⁷⁶ representing over two-thirds of the women respondents were concerned that horticultural programmes had neglected *naadan* F&V, except for propagating pineapple and bananas as marketable crops. Pineapple plants which had earlier been used as hedges had disappeared outside the cash economy, and seasonal fruits like jackfruit, papaya, guava and *sapota* were neglected. These fruits, grown mostly outside the metros, were wasted without people to climb the trees to collect them. Those who could afford them had replaced *naadan* with marketed F&V such as tomatoes, carrots, cauliflower, cabbage and radish, and Neelam mangoes from Maharashtra, Tamil Nadu and Karnataka.

There were divergent opinions about increase in F&V output on nutrition between people from the agriculture sector and those from nutrition and health. Nutritionists supported the view that increasing production without paying adequate attention to barriers to consumption would not achieve nutrition security. A nutritionist pointed out that children in her recent study had not met dietary recommendations for F&V. She noted that according to a study conducted in Kuttanad,⁷⁷ the per capita F&V consumption was very low, and GLV consumption was below 10 grams, a fifth of the required RDA. Even an agriculture programme implementer agreed:

⁷⁴ *Sauropus androgynus*

⁷⁵ Including two nutritionists and a Kudumbashree implementer.

⁷⁶ Most from nutrition.

⁷⁷ The low-lying paddy lands in Pathanamthitta and Alappuzha districts.

Consumption of green leafy vegetables is virtually nil in Kerala. The cheera (amaranth) that you see in shops, it may be only in 10 or 20 houses. The consumption is low. That concept to eat green leafy vegetables is not there much. Honestly saying there is scope for that.

- Participant-A (man, agriculture programme implementer)

An agriculture policymaker was happy because “high value fruits or the fruits of rich” like “Shimla apples”, “imported apples from US and California” or *kinnow* from the Punjab were available at the panchayat-level. This view was shared by a number of agriculture respondents (30%), who believed that there was a wider diversity of vegetables in shops in Kerala, as compared to shops in neighbouring states. A health expert was concerned that people from rural areas, which had local production two or three decades ago, were buying from city markets:

Now it is a reverse flow. People come to city, purchase vegetables imported from Tamil Nadu and take them to the interior.

- Participant-X (man, health expert)

A nutritionist believed that many of these, excepting amaranth, ladies fingers and brinjal, were from neighbouring states. An agriculture expert, formerly associated with VFPCCK, termed these *naadan* F&V as “common vegetables” that only met the needs of “certain segments”. He believed that the problem was Kerala’s inability to produce “desirable vegetables” such as cabbages and cauliflower.

Impact on farmers

Almost a third of the respondents (mostly agriculture policymakers) drew attention to the role played by leaders who prioritized F&V farming, and listened to, and understood problems facing farmers. They perceived that the key role played by leaders caused farmer-centric agricultural reforms and innovations⁷⁸ to spread all over Kerala, enabling farmers to access training and financial resources, cheaper inputs and group marketing. Three agriculture policymakers agreed that a massive increase in funding for agriculture had helped the government expand financial support.⁷⁹ A legislator attributed his

⁷⁸ Such as collectivization SHGs and farmer clusters.

⁷⁹ Including grants, loans, credit and even debt relief.

understanding of the problems faced by farmers to all-day meetings in each of the 14 districts.

When they say something to me I tell them that I am not sure about the outcome, but I would be with them, as one among them...

- Participant-J (man, former agriculture policymaker)

The agricultural production commissioner and the director of agriculture who accompanied the legislator to these meetings listened to problems farmers faced — their inability to get seeds on time, even from their own fields; destruction of crops during monsoons, lack of storage, and just prices for their produce.

Two agriculture policymakers credited central government grants through the Horticulture Mission and RKVY of Rupees 300 to 500 crores (2007-2012) for a steep rise in vegetable cultivation. According to an agriculture implementer, in one year alone, the funds increased from between 4 to 10 crores, to almost 100 crores. According to the senior policymaker, the flexibility of RKVY grants provided autonomy:

They give you freedom. Do what you want. It is your need. It is your state... You come with projects, we'll pass them in the meeting itself. So here we sit in my conference hall... We drive it. We say...let us have more projects to facilitate vegetable growth. So such projects were encouraged on a very selective fashion.

- Participant-T (man, agriculture policymaker)

It has been announced as a state policy, which I think is not a small achievement... I made the chief minister announce it, although it has not been implemented.

- Participant-T, (man, agriculture policymaker)

Several initiatives to mitigate the financial burdens that farmers faced were recounted by a gender expert and an agriculture policymaker, with the latter recounting low-interest (2%) loans for vegetable-cultivating Kudumbashree groups. A legislator spoke of pension and insurance schemes, along with grants for family emergencies and special needs. He talked about setting up a debt-relief commission, and instituting crop insurance at more than 10 times the rate of the central government:

I prepared a note and presented it before the cabinet. I told them that Kerala should lead the way, even though 10,000 had not been given anywhere.

- Participant-J (man, former agriculture policymaker)

He visited farmers to distribute the money. His visits had a tremendous impact, because farmers saw him as “a close relative” and not as a minister.

- Participant-J (man, former agriculture policymaker)

These policymakers who valued freedom and flexibility made farming farmer-friendly by dismantling bureaucratic barriers. As this legislator recounted, one of the first reforms was cash transfers to farmers’ bank accounts. He was concerned about farmers who were forced to give their produce to moneylenders, in lieu of high interest loans. Therefore, the Horticultural Mission sought to strengthen farmers and make them:

.... stand erect... make them bargain with the middlemen.

- Participant-N (man, agriculture policymaker)

A legislator explained how, during a glut in banana production in 2009, they arranged for VFPC and HORTICORP to buy bananas from farmers at Rs. 13 per kg⁸⁰. They sold everything within two days. Two agriculture policymakers said that farming income stabilized and became profitable because of innovative marketing initiatives to collect and sell F&V and to distribute unsold produce through agencies like HORTICORP.

The government also helped panchayats and other agencies construct and start Kudumbashree markets and festival outlets. A legislator described local initiatives such as farmer-cluster-owned, mobile vending outlets in Mararikulam that sold organic, *naadan* vegetables or with those with low pesticide residue. Agriculture programme implementers recounted using unconventional ways such as ‘armies’ of farm workers recruited through Green Cadet Corps (2011), to introduce farming to school students, and a Green Army Labour Bank to meet the acute shortage of farmers. These innovations, according to an agriculture programme implementer attracted young people from non-

⁸⁰ Including a subsidy of five rupees.

agricultural backgrounds into the 'respectable job' of year-round commercial vegetable farming.

Impact on women farmers

Kudumbashree assisted large numbers of women become highly productive F&V farmers according to three interviewees including two gender experts. Efforts to increase land productivity between Kudumbashree, panchayats and the government led to women farmers in JLGs seizing opportunities to lease farmlands and produce large quantities of vegetables. They marketed these through government agencies, panchayat markets and Kudumbashree vegetable festivals.

A gender expert associated with Kudumbashree acknowledged how Government grants and subsidised loans and marketing (collecting and selling produce) helped women farmers get additional income, and better food for home consumption. A third of the respondents⁸¹ asserted with pleasure that agriculture became an enterprise that empowered women farmers and helped them become accepted, and more visible. A policymaker described how the agricultural department, through the local Krishi Bhavan, sought out Kudumbashree units. To him, the increase in women's social capital and confidence was the biggest long-term benefit. A gender expert concurred that Kudumbashree's microenterprise efforts bore fruit when women became entrepreneurs running companies and starting large-scale collective farming on fallow land. Another gender expert supported this with an example of women farmers in Naduthara panchayat who connected marketing with their large-scale vegetable farming.⁸² As a Kudumbashree implementer described:

In Wayanad, they bought farmland from the profit of agriculture. At Perambra in Kozhikode around 150 acres of waste land had been made cultivable by these women... I have stories of women power to narrate, from Kasargod to Trivandrum... In Ollur panchayat they told me that their profit was 38 lakhs.

- Participant-F (man, Kudumbashree implementer)

A legislator associated with Kudumbashree and an agriculture expert observed that the labour of women' groups gained visibility:

⁸¹ Including agriculture and gender and poverty policymakers.

⁸² 15-20 hectares

It is the women who cultivate. But it is never recognized. But when women's groups began to cultivate, their efforts became very visible.

- Participant-W (man, agriculture policymaker and legislator)

According to a Kudumbashree gender expert, farming provided opportunity to women whose public presence was strictly controlled, and allowed them to “go to office, ten-to-five”, or go to temple, or to the market or to festivals, to “come into the public”. There was a feeling that it was “safe to send your wife” to a government programme. They “learnt to live independently” and had more agency. A policymaker echoed that being part of a collective gave women who had been isolated in their homes more opportunities and greater awareness of basic rights and entitlements. However, not everything was rosy. A Kudumbashree implementer was disheartened that, even with women’s increasing agricultural contribution, they faced technical, financial and other difficulties. He observed that there was a tendency to see women’s work as ‘cheap labour’ and they were “called for all cleaning work,” and for panchayat meetings or for when more bodies were needed to make events appear well attended. A gender expert perceived this devaluing of women’s labour and some of the problems they faced were due to the general feudal attitude.

Look at the benefits given to the male farmers... — everything is offered to them, but when it comes to the female, it is different.

- Participant-F (man, Kudumbashree implementer)

An agriculture expert agreed with a gender expert’s perception that most male agriculture officers (women had formed almost 60% of KHDP’s extension officers), “probably did not see women as farmers” and did not visit fields that women cultivated. Another senior agriculture expert, recognizing that banks were reluctant to give loans to small scale farmers, wanted more attention paid to the technological and financial empowerment of women.

A senior bureaucrat and a Kudumbashree implementer were aware that women were not “listened to” and were excluded from leadership. The Kudumbashree implementer thought that this reflected the “the total insensitivity” in Kerala towards women’s position.

The winners and losers

In this section I shall examine who contributed, gained or lost in the effort to engender horticulture as an enabling environment for nutrition in Kerala.

Contributors

The majority of respondents (almost three-fourths) recognized farmers — especially women, leased-land and landless farmers — as the main contributors to the farming initiative. Respondents across sectors⁸³ acknowledged KDHP/VFPCCK with energizing F&V production and cited the role of Kerala State Horticulture Mission in initiating urban agriculture. They recognized HORTICORP and VFPCCK for marketing and highlighted the role of panchayats in farming coordination and starting farmers' and Kudumbashree markets. They also mentioned the training and awareness provided by district Krishi Vigyana Kendras (KVK), Organic Farmers Association and Prakrithi Jeevana Samithi and other NGOs. They remarked on the contributions made to the movement by policy makers (from the LDF), faculty and alumni⁸⁴ and faculty from agricultural universities, and staff of NGOs. Several agriculture and nutrition sector interviewees also described how a few young, educated, higher-income male farmers⁸⁵ were beginning to farm.

The people-centered nature of Kerala's policies and the genuineness of the reforms were at least partly due to a deeper ongoing engagement and the personal commitment of leaders. Contributions to successful changes in the farming sector came from visionaries who were strategically positioned in organizations that were vital to fostering changes. For example, within the government, a chief minister,⁸⁶ pressed the idea of increasing F&V production within Kerala to replace the 500 crore worth of imported vegetables. While a finance minister⁸⁷ helped evolve decentralized planning, several civil servants⁸⁸ facilitated women's involvement in agriculture through Kudumbashree, framed issues effectively and used their institutional links to be in "so many places at the same time," and bring "everything together". In the government

⁸³ Interviewees from agriculture, nutrition and from Kudumbashree.

⁸⁴ Who became village agricultural officers

⁸⁵ A few software engineers returned from abroad and took up high-tech farming to produce high-value crops such as salad-cucumber, capsicum, and herbs like basil and, thyme.

⁸⁶ E.K Nayanar (1919-2004), a member of Communist Party of India (Marxist) was a three-time chief minister (1980-81, 1987-91 and 1996-2001).

⁸⁷ T. M Thomas Isaac is a two-time finance minister elected from Alappuzha and a former member of the State Planning Board.

⁸⁸ Including S.M Vijayanand IAS and K. Jayakumar IAS.

agriculture sector, a former director of agriculture⁸⁹ and an agricultural scientist⁹⁰ developed ideas that led to developing VFPCCK. In the panchayat sector, a president and an agricultural officer in Kanjikuzhi panchayat transformed F&V farming in Kerala. In civil society, visionaries in the areas of naturopathy⁹¹ and nutrition⁹² linked diet to health.

Those who benefited

Over half the respondents, comprising all sectors, thought that farmers — especially those in SHGs, and women farmers had benefitted the most. Examples of benefits ranged from protection from exploitation, participatory governance, and access to education, training and exposure, financial benefits (loans, lower input costs) and direct access to consumers through marketing systems that bypassed middlemen. They perceived that empowered women farmers got “way more than income,” as they became strong entrepreneurs with social acceptance. Farmers, especially those who grew *naadan* vegetables like bitter melon, cow peas, and bananas, made higher income. Most farmers increased their income because they saved F&V costs while also having access to fresh, nutritious and pesticide-free or organic home grown F&V, thereby increasing their nutrition status. Experts in agriculture gender and nutrition suggested that women farmers often shared with their neighbours and the local community, benefitting “the rural mass” by increasing access to F&V.

Even though there was a move to bypass intermediaries, about 40% of respondents (mostly nutritionists, some from agriculture and others from gender and health) felt that middlemen, wholesalers, retail supermarkets (such as Birla More and Reliance who had cold storage) who sourced directly from the farmers, and traders had benefitted the most. Others including an agriculture policymaker emphasized that traders had benefited most from commercially-grown F&V from VFPCCK auctions and organic vegetables.

A large proportion (44%) of respondents — almost two-thirds of them from agriculture — perceived that horticulture programmes enabled the public to get (inconsistent) lower prices. (However, one respondent alleged that HORTICORP may

⁸⁹ R. Hali

⁹⁰ Dr. M. S Swaminathan

⁹¹ C.R.R Varma, a naturopath known as 'Varmaji' was the founder of the co-operative nature cure sanatorium, Sanjeevani, near Thrissur

⁹² Mumtaz, a nutrition consultant made nutrition relevant in a hospital setting by helping to establish a dietary kitchen in the general hospital in Ernakulam.

have sourced F&V from outside Kerala.) A gender expert felt that the public may have had access to safer F&V. There was a strong perception that urban areas benefited from “tremendously” increased access to cheaper, commercially-grown English F&V (imported from Tamil Nadu), through the wide network of HORTICOP outlets. Several interviewees including those from nutrition, agriculture, gender and health perceived it to benefit the middle class in urban areas, while others, particularly those associated with Kudumbashree, argued that rural areas only benefitted when local production came into markets. Meanwhile, an implementer with KHDP/VFPCK felt that it helped bankers meet their lending goals.

Who lost?

A fairly large proportion of respondents (40%) dominated by nutritionists, felt that high prices and fear of pesticides limited F&V purchase and consumption, contesting the view offered by two agriculture policymakers who insisted that nobody lost out in the distribution of gains from horticultural programmes as no segment of society had been neglected. The nutritionists pointed out that people in rural areas, and the poor and lower middle-class people in urban areas had lost out. Many interviewees perceived that farmers suffered losses through waste and low prices. A nutritionist talked of farmers selling bananas for Rs. 5/- to Rs. 6/- while consumers bought it for between Rs. 35 and Rs 40 per kg. According to an agriculture policymaker, while “tomato farmers in Vadakarapathy, got less than two rupees per kilo” consumers in the nearest town paid ten times more for a kilo of tomatoes.

6.2.4. Unintended Consequences, trade-offs and lessons

In this section, I analyse perceptions of the interviewees of the unintended consequences and trade-offs of the horticulture programmes, a summary of the lessons they learned and their suggestions for future policy direction for nutrition-sensitive horticulture. I also analyse their views on challenges that Kerala’s horticulture programmes face now. The people I interviewed agreed that high levels of pesticides and monocultures of selected F&V replacing local, traditional varieties have been among the programme’s unintended consequences.

A large proportion of respondents (48%), comprising agriculture, nutrition and health, and gender, were unanimous in the view that it was critical to incorporate nutrition security in horticulture programmes. Surprisingly, more than half of them,

including three policymakers, represented agriculture. They wanted policy to focus on people's well-being and give priority to making safe, affordable, nutrition-rich F&V accessible to those who needed it most. A large group of respondents that included all the nutritionists and a few from the agriculture sector proposed an inclusive and gender-just Nutrition in All Policy approach that met the key challenges of coordination. To further this goal, about a third of the respondents, many of them from the agriculture sector, recommended adequate resources — including land, financial support, and assured marketing systems that favoured *naadan* F&V through a farm-to-table movement. They also recommended the employment of an adequate number of nutrition professionals at every level.

Consequences and Trade-offs

A small number of interviewees, including half from agriculture, admitted that nutrition security had not been a priority in the for-profit, market-driven production strategy. They were concerned that the focus on profitable F&V (especially on bananas, pineapples and English vegetables) may have increased pesticide use and unplanned expansion of monocultures and neglect of *naadan* F&V (including fruits like jackfruit and berries⁹³). Three interviewees from agriculture observed that only a minority grew vegetables, while three-fourths of farmers in the *vipanis* grew bananas. One of them expressed the concern that, with the rapid growth of banana farming from 20-25,000 hectares to 75, 000 hectares, Kerala was fast becoming a banana republic. Agriculture policymakers pointed also to the cultivation of market-friendly pineapple, which had grown six times from 2008 to 2012. A nutritionist and an agriculture policymaker (the latter with some pride), pointed out that government subsidies were given for high tech farming for English vegetables like salad cucumbers and herbs. The nutritionist was disappointed that *naadan* vegetables grown by ordinary farmers were neglected, while those like cucumber, grown for the urban market by rich people with land, gained favour. Commercial horticulture, according to gender and health experts, an agriculture policymaker, and a Kudumbashree implementer, had promoted monocultures and heavy use of chemical fertilizers and pesticides. An agriculture implementer pointed out that VFPC had educated farmers in the proper use of pesticides. But others attributed some of the overuse of chemical fertilisers and pesticides to the lack of scientific and technical guidance from agricultural officers. They also suspected the presence of pesticides in vegetables procured by HORTICORP. A few respondents from agriculture and gender

⁹³ Mulberry, gooseberry etc.

perceived that the popularity of leased-land vegetable cultivation, besides increasing cost of land rental, also converted large tracts of land from paddy, to vegetables and bananas cultivation. An agriculture policymaker added that unplanned expansion also created marketing issues.

A senior implementer associated with Kudumbashree observed that one of the consequences was a pronounced increase in the role of women in development. As empowered women found their political voice, political parties fielded many for elections. From among the 4000 Kudumbashree women who contested in the local body elections in 2005, 2346 women were elected to district, block and village councils. Some became panchayat presidents. Three became municipal chairpersons and one became a District Panchayat president.

Lessons learned

Several implementers reflected that they learned to turn crisis into opportunities. Early leaders of KHDP/VFPCK, Kudumbashree and a senior agriculture policymaker viewed crisis as opportunity. A Kudumbashree implementer recalled developing and testing a “small idea” there. He realized there were bound to be problems when new ideas are introduced. In 2001 this implementer had helped Kudumbashree farmers arrest low coconut prices through value addition and enterprise development. He was grateful for crises that led to moments of transformation.

The Kudumbashree implementer and the senior civil servant learned to value tenacity and openness. They believed that change was inevitable when capable and willing change-makers and inclusive teams of committed professionals along with stakeholders put good ideas into action. An agriculture policymaker and a Kudumbashree implementer perceived that nothing was impossible. The Kudumbashree implementer believed that a synergy between resources, land, human resources and leadership (which he defined as technical, organizational and financial leadership), would help Kerala produce “even surplus vegetables”:

If a state like Kerala genuinely, sincerely, seriously takes up a programme on vegetables... Do you think it is unachievable? ...Over a period of three crop cycles you can achieve more than what you need.

- Participant-G (man, Kudumbashree implementer)

Legislators learned to foster community pride in agriculture. They learned that an environment of community pride would instil the capacity to work hard even in the face of challenges such as lack of soil fertility. Others, for example an agriculture policymaker and a legislator, were open to hearing differing opinions. This legislator, who had learned from environmentalists and scientists about the effect of genetically modified (GM) seeds, asked the central government to declare Kerala, a 'GM Free State' by 2009. Thus Kerala, "the torch bearer" of non-GMO (genetically modified organism) agriculture invited chief ministers and agricultural leaders from other states:

...we listened to all opinions, both for and against it. Some people are against any kind of experiments. I accepted everyone's opinion.

- Participant-J (man, former agriculture policymaker)

Another implementer learned that it was not necessary to accept inflexible conditions. He observed that such conditions were not "the best way" to secure externally-aided projects. A gender expert pointed out that clarity of vision and policy may have forearmed them and prevented unintended consequences such as land conversion and pesticide contamination. Another agriculture policymaker understood that earlier policy monitoring could reorient policy to face future challenges, such as weather and price related instability, unstable income and other uncertainties. A key policymaker learned that early monitoring of exclusion and other policy effects were needed to prevent the poorest from being left out, or gaining at a slower rate. Through this kind of "genuine, sincere and serious" leadership and synergy, these leaders strove to covert the impossible into the possible.

Views on nutrition-sensitive horticulture policy

All the nutritionists as well as the then chief secretary accepted nutrition as a problem. According to almost half the respondents (40%), most from the agriculture sector, told me that Kerala's horticulture policy should be centered on people's well-being, focusing on safe and nutrition-rich F&V, that is affordable to those who needed it most.

More than stomach-filling, food should be cost-effective, locally produced and nutritious.

- Participant-F (man, gender and poverty programme implementer)

They suggested a policy for nutrition security that encouraged intensive, organic and diverse F&V farming. An agriculture expert emphasised this by quoting Dr. M S Swaminathan:

For every nutrition malady, there is a horticultural remedy.

- Participant-M (man, agriculture expert), quoting M.S Swaminathan (Swaminathan, 2010).⁹⁴

Nutrition, gender and health experts sought revival of local endangered GLVs and fruit trees. They wanted to spread awareness of the nutritional value of *naadan* GLVs, the orange and yellow fruits and other vegetables.⁹⁵ The majority of interviewees, (including all the health experts), suggested marketing *naadan* GLVs,⁹⁶ (there were over 40 varieties), in convenient packs. A Kudumbashree implementer suggested establishing shops that sold only *naadan* vegetables as in Mararikulam. A large group, across all sectors, suggested popularizing traditional cooking, and encouraging people to take pride in making and serving community meals, with *naadan* F&V.

To bridge nutrition gaps, almost half the interviewees (half from agriculture) suggested nutrition-focused cropping strategies in tune with local nutritional needs. A legislator sought policy cohesion:

We have a policy for health, and policies for agriculture... All these work separately. What we need is a unification of our health policy and that of agriculture... Suppose we spend Rs.600 crores for medicines, we must decide how and where this should be spent in the absence of illness... It will be given to the farmer who feeds us with organic food. In short, our policies of health must go hand in hand with our policies of agriculture...That means better health for people and less expenses on medicines.

- Participant-J (man, former agriculture policymaker)

A policymaker reminded me that Kudumbashree was effective at responding to local needs and for vegetable cultivation. However as price was a major issue, a gender

⁹⁴ Swaminathan said, "Horticultural remedies can be applied for nutritional maladies, with particular reference to micro nutrients like iodine, zinc, iron and vitamin A. Such community nutrition security systems can help nations to leapfrog in achieving the UN Millennium Development Goal in relation to hunger".

⁹⁵ They suggested the following fruits: papaya, mangoes, jackfruit, passion fruit, guava, gooseberry (for vitamin C), watermelon (for anaemia) and pineapple. The suggestions for vegetables were: banana (banana flower has iron and banana stem has fibre), *amaraka* (a variety of beans-Indian butter beans), long beans, ladies finger, ivy gourd, roots and tubers like sweet potato.

⁹⁶ *Naadan* GLVs included amaranth, *chembu* (taro) leaves, cow pea leaves, spinach, moringa, *velicheera* (*sauropus androgynus*) and *agathi* (*sesbania grandiflora*) leaves and flowers (which have vitamin A, calcium and organic iodine).

expert and a Kudumbashree implementer insisted that for consumption to increase, there had to be strategies to make F&V affordable, especially for the most vulnerable people. A nutritionist stipulated:

It should be cheap... no one eats... (even) 250, 300 grams of vegetables. Because cost is very high.

- Participant-B (woman, nutrition and food policy expert)

There were conflicting views about subsidies for F&V. Citing a need for self-sufficiency, agriculture policymakers sought increased subsidies for F&V farmers to grow organic, nutritionally-rich *naadan* vegetables, on par with rubber planters, and instead of subsidies (up to 75%) used by rich farmers for high-tech farming and greenhouses growing cabbage and cauliflower. A health expert, even while acknowledging that price played a role in the low fruit consumption, discouraged subsidies for all but the “10 or 20 % consumers who might need it”.

Concerned about the preponderance of non-vegetarian food (in north Kerala), a fish-and-rice diet (lower socio-economic groups), as well as intra-household availability, they wanted to promote nutrition-sensitive agriculture and awareness of healthy eating. A large group of interviewees underscored the urgency for ongoing nutrition campaigns and community nutrition programmes among farmers, children and reproductive-aged women to promote the importance of having 400 grams of F&V in diets. They advocated for doctors prescribing food (F&V) as medicine. About a third of respondents (mostly from nutrition, gender and Kudumbashree) agreed that education about healthy food and healthy cooking methods was required everywhere, and among all socio-economic classes. A nutritionist suggested learning from the example of Gujarat, which based state policy on central nutrition policy but focused on different target groups each year.

Supporting farmers for nutrition-sensitive agriculture

Experts across all sectors agreed on a need for flexible, farmer-friendly support programmes that supplied quality inputs,⁹⁷ assistance for tillage, harvesting and technical expertise combined with initial weekly ‘handholding’ visits. They suggested effective logistics and post-harvest management to prevent loss. Other suggestions

⁹⁷ These inputs included seeds, seed-kits, seedlings and fertilizers.

included infrastructure investments from the National Horticulture Mission and an agency to provide interest-free loans. Respondents sought strict adherence to pesticide safety and criminalization of dangerous use of agrochemicals and pesticides, while seeking laboratories to test pesticide residues. They also suggested an exclusive agency, tasked with increasing area under vegetable cultivation.

Towards a Nutrition-in-all Policy

Nutrition and gender experts recommended a 'Nutrition-in-all Policy' approach and suggested a nutrition audit to identify gaps and problems. They advocated for budgetary support to hire nutrition professionals at all decision-making levels, including school-based nutritionists and a nutrition unit within the agriculture department. Nutritionists reminded me that public health nutritionists needed to be able to make recommendations on food-related policies. A Kudumbashree implementer proposed nutrition as an evaluation criterion for governance:

When we select the best panchayat, the nutrition status of the children and pregnant women ...should be equal to or above the state level.

- Participant-F (man, Kudumbashree implementer)

Ongoing challenges

Ongoing challenges were related to gender and nutrition, disconnect, and lack of coordination, land issues and marketing.

The unmaking of nutrition

There was a perception that nutrition was neglected. Nutrition experts pointed out that there had been no nutritionists either within horticultural programmes or in the agricultural department. Some of this neglect was due to a perception of nutrition 'fit', with those in the agriculture department suggesting that nutrition fitted in health, not in agriculture. In fact, according to nutritionists, in 1995 the agriculture department had abolished the position of a deputy director for nutrition— the department's *only* nutrition-related position.

When nutrition became the most important agenda, there was no senior level officer to take it forward.

- Participant-B (woman, nutrition and food policy expert)

Nutritionists⁹⁸ perceived gender discrimination to be the cause of this neglect. Most women — both nutrition and gender experts (majority had PhDs) — and three of the few men interviewees, perceived gender discrimination to be a major problem. They pointed out that women were mostly absent at higher decision-making echelons. Even though C.S Soman, a public health doctor and nutritionist, had collaborated with women nutritionists and some civil servants, like T.K Jose (Kudumbashree) and T. Madhava Menon⁹⁹ had supported gender equity, there were few women at the helm of organisations, in the executive committees of political parties, or in other institutions that controlled political decisions and policies. According to a Kudumbashree implementer leadership positions had eluded women:

In our state, there are enough women with knowledge and experience. But they are not allowed to come into leadership... These women are very sensitive to public issues, but they are not listened to.

- Participant-F (man, Kudumbashree implementer)

The Kudumbashree implementer noted that feudal attitudes and misogyny prevented women's work from being considered equal to a man's work. Women respondents perceived a lack of acceptance of women's spaces. Nutritionists suggested it was worth looking at the circumstances surrounding withdrawal of college status for the College of Rural Health Science, and the closing down after three years of its 4-year Bachelor of Science Rural Home Science programme that had incorporated nutrition.¹⁰⁰ They observed that some people who wanted to prevent home science professors from becoming deans, or a vice chancellor, had orchestrated a campaign of mudslinging, through "vulgar posters on campus walls and "filthy" articles in the newspaper". The incident traumatized a professor from "keeping any official contacts". These actions also traumatized the then-young women academics. Thus, while other Agricultural Universities had *Faculties* of home science, in Kerala, home science functioned as a department under the Faculty of Agriculture.

Women in disciplines that had a majority of women (as in home science within agriculture universities, or in nutrition), chose to keep quiet rather than be called out or humiliated:

⁹⁸ All nutritionists were women.

⁹⁹ Former agricultural production commissioner and vice chancellor of the agricultural university

¹⁰⁰ In 1988 when Madhava Menon was vice chancellor.

As just one person there is no point in creating a problem (kidannu bahalam undakkiyal) If we create a disturbance we become the odd one out.

- Participant-B (woman, nutrition and food policy expert)

Once you raise your hands you will be stepped on.

- Participant-I (woman, nutrition and food policy expert)

A gender expert described a failed attempt to integrate a gender curriculum at the Kerala Agricultural University. Researchers, scientists and academics who associated gender with feminism, saw “no need of gender in agriculture” as agriculture was:

Just science and technology. Technology is gender neutral. It can be used by men and women.”

- Participant-D (woman, gender expert)

Nutritionists were absent even in the Integrated Child Development Scheme (ICDS) that focused on children’s nutritional status. According to nutritionists it was the Social Welfare Department, in consultation with a doctor from the community medicine department,¹⁰¹ who had drafted Kerala’s nutrition policy. Both nutrition and health experts observed that this reliance on medical professionals was the usual practice. They pointed out the example of Dr. K. N Pai, who through the ‘Pai reforms’¹⁰² in 1979, had almost single-handedly changed Kerala’s hospital diets from *kanji* and *payar* (rice porridge with mung beans), standardising it to biscuits and bread. This was done partially to avoid pilferage, prevent discrimination and for hygiene. (According to a health expert, patients preferred *kanji* and *payar*, and bought it from roadside stalls, and took the hospital-supplied bread and biscuits home, for their children. ‘Special diet’ such as the ordinary *kanji* and *payar* was allowed only in the TB hospital and in the mental hospital.) Following the ‘Pai reforms’, when the health department dismantled hospital kitchens, nutritionists had no role beyond diet counselling, handing out the prepacked standard diet food and boiling milk. However I was reminded that a nutritionist had successfully challenged the status-quo and won the right to start a dietary kitchen in an Ernakulam hospital (see footnote on page 168).

¹⁰¹ This person was not a nutritionist.

¹⁰² The government of Kerala as per GO. Rt. 3750/77 /HD. dated 8-11-1977 constituted a High Power Committee on Health, led by Dr. K. N Pai to review the working of hospital system.

A senior agriculture expert concurred that gender discrimination had indeed curtailed women's opportunities and denied them access to technological and financial resources. For example, many landless women farmers could not use the government-issued Kisan Guardian Card or get membership in cooperative banking institutions. A Kudumbashree implementer felt that the agriculture department did not support women farmers much and some agriculture officers did not visit areas where women did the farming. While panchayats offered male farmers "everything",¹⁰³ there was a tendency to see women's work as cheap labour and, according to him, most politicians did not respect women farmers:

*They have no respect for farmers and the least for women farmers.
They do not even accept that this is a problem.*

- Participant-F (man, Kudumbashree implementer)

Gender discrimination was a feature in the community as well. A key Kudumbashree implementer described how affluent groups laughed derisively, and humiliated the women's groups¹⁰⁴ campaigning for water and toilets, calling them *kakkoos* (toilet) groups.¹⁰⁵ A Kudumbashree implementer remarked that the male leadership was dismayed to see submissive Kudumbashree women become vocal. According to the male leader these women showed insolence by "sitting in front of me and demanding".¹⁰⁶ However, a senior bureaucrat believed that since half the seats in panchayat bodies was reserved for women, panchayats had become nurseries of political leadership, and he was hopeful that there would be more women in leadership positions.

Disconnect and lack of co-ordination

The lack of co-ordination — of policy initiatives, execution and monitoring — between the many departments and institutions, was of great concern to a key group of policymakers, experts, and an implementer from agriculture, Kudumbashree, nutrition and gender. Surprisingly policymakers, implementers and experts from agriculture and a few interviewees associated with Kudumbashree, unanimously viewed the agriculture department as huge, lethargic, insensitive to both gender and nutrition and lacking in

¹⁰³ Technology was usually developed for male farmers.

¹⁰⁴The Total Sanitation Programme, and subsequent programmes like *Jalanidhi*, Kerala Rural Water Supply and Sanitation spread all over Kerala from a single Kudumbashree group in a Malappuram panchayat.

¹⁰⁵ ഓ ഇതെല്ലാം കക്കൂസ് കുട്ടർ ആണ്.

¹⁰⁶ Sitting was associated with equal status. In his eyes these women had crossed caste, class and gender boundaries by sitting.

initiative. A key agriculture policymaker and a Kudumbashree implementer identified lack of credible agriculture data as a significant problem.

Interviewees considered panchayat-level agriculture officers as likely to be office-centred, focused on their ever increasing subsidy-pushing paperwork, rather than focusing on the needs of farmers. A legislator discerned a lack of connection between the agriculture department and the agricultural university. According to him, neither institution had any connection with central government institutions although they were supposed to implement research done by, them. Meanwhile, there was a vast gap between the agriculture department and the farmers. The legislator attributed the professional status of agricultural graduates as a barrier for funding and interacting with women farmers. A policymaker closely involved with decentralization found the problem worse in places where leaders had been unsupportive of decentralization.

Lack of co-ordination and collaboration was widespread. Nutritionists perceived a gap between NRHM-related nutritionists working on non-communicable diseases, and dietitians and nutritionists in the government health service. According to them, there was little or no collaboration between the nutrition department of the state government and other departments. Nutrition and gender experts sensed that there was a disconnect between policymakers who believed that Kerala had to change, and staff who preferred the status quo. They pointed out that some staff used political influence or connections to bureaucrats to avoid transfers that might disrupt their families. A legislator said some people resisted and opposed other ways, preferring the safety of “familiar trodden paths”.

Land

Many interviewees raised the issue about lack of land for F&V farming. To overcome this a majority of respondents favoured nutrition-focused community and home-gardens, especially in rural areas. Several interviewees from the agriculture sector argued for large scale F&V farming to take precedence over plantations and cash crops. Over a third of the respondents proposed policy interventions to identify and cultivate all fallow land.¹⁰⁷ Experts from all sectors suggested starting vegetable gardens in schools and colleges.

A Kudumbashree implementer attributed increasing cost of leasing scarce paddy land to the “terrifyingly powerful” real estate mafia. According to a gender expert, even when landowners leased land to women farmers’ groups, they did not share land-tax

¹⁰⁷ An agriculture and media expert recounted seeing Kudumbashree cultivating bananas in the formerly fallow sandy land they leased from palace grounds in Haripad.

receipts, a requirement for credit, with them. A Kudumbashree implementer confirmed that sometimes landlords wanted land returned when the production was at its peak, or after the first crop had increased the land's fertility. Both these interviewees perceived that agrochemicals had degraded the land.

Marketing

Policymakers from agriculture and Kudumbashree and a nutritionist regarded marketing an ongoing problem, hampered by several layers of powerful intermediaries, agencies and middlemen. These intermediaries were known to procure the produce and thus prevent farmers from getting fair prices. Others from nutrition and Kudumbashree reasoned that exploitative intermediaries thrived in the context of low produce prices and non-existent procurement systems, as in most districts, except Idukki. An organic farmer laid the blame on the change of leadership at KHDP/VFPCK for discontinuity in marketing strategy. According to him, the abrupt transfer of Jacob Thomas from KHDP, just as he began to collaborate with organic farmers in an innovative marketing strategy, had failed Kerala's F&V sector.

Most interviewees insisted on improving marketing. Several interviewees wanted to see production-linked local marketing at panchayat, block, district and state-levels. They wanted a farm-to-table movement of community-supported-agriculture, co-operative farmers' markets, local school and *anganwadi* mid-day meal programmes, market linkages to nearby hospitals, shopping centres and malls. They felt that marketing through HortiCorp or other institutions that included text messages, assured buy-back at a minimum support price, and direct payments to bank accounts would make F&V more accessible. A former Kudumbashree implementer suggested smart procurement:

Once they SMS, "I have this much quantity of... (for example ladies finger), between 50 or 100 kilos, ready to harvest next week, somebody or some agency, with a vehicle can come... and harvest from the farmer's field, and put money into his account... If Israel can do that why can't Kerala? It is not giving more subsidy alone. It is more...it is co-ordinating, complementing and supplementing all the efforts.

- Participant-G (man, Kudumbashree implementer)

They suggested direct sales of subsidised F&V through small retail and PDS outlets instead of large terminal farmers' markets as in Tamil Nadu. However, according to an interviewee, the Tamil Nadu government gave farmers free bus passes to take their

produce to the market. Farmers also contributed for the market's maintenance. He said it was unfortunate that such a model had not worked in Kerala, where horticulture markets were "just storage for wholesalers".

6.3. Discussion

As in the last chapter, in this chapter too, I use the food sovereignty framework (Desmarais *et al.*, 2017, Forum for Food Sovereignty, 2007, Jones *et al.*, 2015, Lee, 2007, Park *et al.*, 2015) and key elements of LVC's 1996 Nyéléni Declaration (Edelman, 2014) to discuss these findings and assess the extent to which an enabling environment for nutrition did or did not exist. In this chapter I combine the food sovereignty framework with Gillespie and colleagues' elements that contribute to an "enabling environment" for nutrition (Gillespie *et al.*, 2013, pp. 553). Further I link these elements with Webb and colleagues' three key domains for nutrition governance: commitment, capability and collaboration to understand stakeholder perceptions of Kerala's horticulture programmes (Webb *et al.*, 2016).

Commitment was seen in the stakeholders' willingness to act — to implement, build capability and collaborate. Capability was exemplified in the building of culture-changing, farmer-friendly processes and resilient, professional and sustainable institutions. These actions encouraged entrepreneurship, feminized agriculture, democratized power and nurtured innovation. Collaboration among sectors, among colleagues and between levels of administration was critical for governance. This discussion draws attention to how the horticulture programmes enabled agrarian reform, while focusing mainly on F&V as cash crops (though this has been changing). The discussion also highlights the persisting gender inequalities in Kerala's agriculture and nutrition sectors.

6.3.1. Enabled agrarian reform

Horticulture programmes for economic growth initiated at a time of agricultural crisis when it was hard for small farmers to survive (Planning Commission Government of India, 2008, Thottathil, 2012) paved the way for "genuine agricultural reform, mutual dependence and local, small-scale community prosperity" (Schanbacher, 2010, pp. xiv). To begin, the KHDP programme, the forerunner to the later programmes, sought to

‘revive agriculture,’ and train small farmers, build their skills, establish their rights and help them build wealth using neoliberal ideas of economic growth.

The next stage in the evolution of horticulture programmes was an ambitious plan for vegetable self-sufficiency. The state’s periodic reassessment of policy direction sharpened policy clarity and vision and deepened a commitment to the well-being of people and environment — with focus on food for people and working with nature. Furthermore, stakeholders wanted to refocus horticulture programmes toward nutrition security and people’s well-being, with focus on safe and affordable nutrition-rich F&V, girded by adequate resources, nutrition professionals and marketing systems for local vegetables and assured markets for farmers. Thus, Kerala’s horticulture programmes that initially started as commercial programmes to improve the livelihood and dignity of farmers through economic development, stimulated a nutrition-sensitive food sovereignty model in local and regional food systems that strengthened family farmers (Edelman, 2014).

6.3.2. Focus on food for people

To begin with, the focus in Kerala was on fruits and vegetables as high value crops to bolster farmers’ income. As scholars in Ghana, Thailand, India and China had observed, in Kerala too, higher F&V production helped farmers’ income increase (particularly the income of male farmers in KHDP/ VFPCCK) and led to further expansion of these crops. However production alone was not enough to decrease prices or to increase consumption (Dei, 1992, Itharattana, 1996, Kumar *et al.*, 2009, Wang and Zhang, 2004). It might also be that improved marketing of high value F&V to urban areas fuelled F&V price increases, and farmer profits, while also putting them out of the reach of poor consumers and reducing F&V access in rural areas (Fuglie, 1991, Itharattana, 1996, Khaliq Uz, 2011, Rahman *et al.*, 2011, Simler, 2011, Wang and Li, 2008). Thus though Kerala’s horticulture programmes successfully arrested declining F&V availability, as Green and colleagues’ study on the distinct effect of price on consumption in low-income countries shows, there was a strong perception by non-agriculture-related stakeholders that the pathways of price and income were significant barriers to consumption (Green *et al.*, 2013).

Higher F&V prices may also have stimulated dietary changes as people ate affordable but less nutritious foods (Babu *et al.*, 1993, Honfoga and van den Boom, 2003, Njoku and Nweke, 1994, Simler, 2011). Further, an exploitative trader network may have

also played a role in transporting F&V to where the greatest profits lay. Stakeholders perceptions, similar to observations in other LMIC contexts, (Adamu, 1989, Itharattana, 1996, Rahman *et al.*, 2011, Wang and Zhang, 2004) hold that Kerala's profit-oriented agriculture reforms focusing on high value crops was perhaps detrimental to household nutrition (Gavan and Chandrasekera, 1979)¹⁰⁸ and may have led to promoting monocultures of certain F&V that replaced local, traditional varieties, neglecting GLVs and indigenous F&V such as jackfruit.

In Kerala there was a perception of extremely low F&V consumption, among people in rural areas, and among the lower middle class in urban areas. This was similar to what other scholars found elsewhere that existing inequalities, prices, income (Levy-Costa *et al.*, 2005, Mishra and Ray, 2011, Popkin, 2003, Ramachandran, 2008, Sharma *et al.*, 2006) and urban focused-marketing (Florentino *et al.*, 1992) promoted an urban-biased food supply and exacerbated inequalities in F&V consumption. Further, the programme's unintended consequences may have been to increase agrochemical use that may have affected both GLV cultivation and biodiversity.

6.3.3. Persisting gender inequalities

The entry of Kudumbashree has brought women's rights and the struggle to transform gender relations (Desmarais *et al.*, 2017, Patel, 2012, Wittman *et al.*, 2010) to the fore in Kerala. Kerala's experiment with food sovereignty leveraged F&V production, and women gained both economic opportunities as well as opportunities to use F&V to feed their families and communities. These processes enabled need-based and flexible culture-changing processes for systemic change and helped spread farmer-centric reforms throughout Kerala. Moreover, by increasing women's capability Kudumbashree helped democratize power and create resilient and sustainable institutions.

However, we saw that everything was not positive, especially in relation to gender justice and access to land (La Via Campesina, 2014, Park *et al.*, 2015). Women, were devalued. Leadership positions eluded most women and women had difficulties in accessing resources. This exclusion was not limited to marginal women farmers. Kerala's academic and political arenas were not free from this hostility to women. It is vital not

¹⁰⁸ Gavan credits the public distribution system for rice with stimulating demand.

merely to empower women in their roles as food producers but also as decision-makers (Pingali *et al.*, 2013).

I argue that exclusion of women from leadership positions in Kerala and from access to resources owes much to a misogyny that punishes women who transgress gender boundaries. Kerala society provides a gender paradox, with its simultaneous high rates of female suicide,¹⁰⁹ reported increases in violence and crimes against women juxtaposed with high HDI and GDI (Erwér, 2011, Rose, 2014, Thampi and Devika, 2012). While scholars like Chua and Thresia have documented Kerala's culture of hostility to women (Chua, Thresia, 2014), Das suggests that violence limits capacities to engage with everyday life (Das, 2007).

Inequitable power relations between men and women mean that women in Kerala are constrained in their ability to move outside the home, do not have equal access to economic opportunities and resources or equal voice in decision-making (Devika, 2012, Devika and Kodoth, 2001, Erwér, 2011, Rose, 2014). I observed several examples of these limits on women's sense of agency. Among the interviewees, the gender identities of stakeholders seemed directly related to their agency. Nowhere was this more evident than the positions of male agriculture-stakeholders versus the female nutrition-stakeholders. The heavily 'manned' bureaucracy was not used to sharing power with women (Anitha *et al.*, 2008). With governance as a male zone informed by a pre-existing masculinism (Anitha *et al.*, 2008), there was nothing to constrain the agency of male agriculture stakeholders. They were free to concentrate solely on ideas to foster change.

On the other hand, despite increased visibility of Malayali women, women academics, particularly nutritionists with knowledge and experience, did not have public influence or access to positions of decision-making (Erwér, 2003, Jeffrey, 2003). Their agency was 'derived from consent' (Devika, 2006, pp. 54) as a result of a bargain struck with patriarchy (Devika, 2006, Eapen and Kodoth, 2002, Erwér, 2011). By keeping their voices low these women academics stayed within social norms conforming to feminine norms (Anitha *et al.*, 2008). These academics, who too had dreams about the well-being of the local community, were neither allowed to contribute to appropriate policymaking nor "allowed to come into leadership". As a stakeholder who preferred anonymity put it:

¹⁰⁹ Suicide is the chief cause of death among rural women between 15 and 24.

Do you think this will happen here? My whole life is spoilt, is it not?

- Participant-I (woman, nutrition and food policy expert)

Thus, in return for protective paternalism, women were forced to “keep quiet, endure sexist insults, complaining to no one” (Devika and Kodoth, 2001, pp. 3175). This is why I see women academics as a “precarious enterprise” (Chua, 2014, pp. 2) because of their frustrated and demoralized survival. The experiences of exclusion and hostility faced by nutritionists and women academics in nutrition expose forms of patriarchy and inequality to lay bare the claim of women’s high status claimed by Kerala’s exceptionalism (low IMR, high education etc.) (Chua, 2014, Devika, 2008, Devika, 2009, Devika, 2010a, Drèze and Sen, 1997, Jeffrey, 2003). This exclusion has undermined not just horticulture programmes but Kerala’s nutrition status (Scaria, 2014).

6.4. Conclusion

Chapter 5 outlined the oral testimony given in a public setting by panellists and audience members at a witness seminar that the forces and rationales that allowed horticulture programmes to take root in Kerala and shaped their evolution, nurtured an enabling environment, conserving and promoting F&V farming. In this chapter, further exploration of this enabling environment through in-depth interviews revealed contradictions, such as the lower levels of consumption in spite of the programme, along with other unintended consequences. This chapter also revealed the impact of the programme on women, an issue that could not be explored adequately in a public setting. The horticulture programmes arrested the decline of F&V availability through home-gardens and improved trade and marketing. However, the neglect of local F&V varieties and the weakness in government-supported marketing systems that could not overcome strong trade networks diminished their impact. Low availability of GLVs, high use of pesticides, and monocultures of selected certain F&V are some of the unintended consequences.

This chapter revealed the high commitment of leaders and their focus on improved capability, which defined Kerala’s horticulture programmes. Resilient and sustainable institutions associated with Kerala’s farmer-centric horticulture programmes nurtured enabling environments that expanded F&V farming. In so doing, the programmes were culture-changing processes that helped increase women’s participation in the agricultural sector and enhanced the socioeconomic stature and

dignity of farmers. Even so, F&V consumption, particularly of GLVs, is very low, especially in rural areas, and price was a significant barrier. However, without these interventions, the situation may have been worse.

Women professionals faced resistance from a deeply entrenched patriarchal society, while women farmers gained opportunities for visibility, profit and improved food security but faced technical, financial and other problems. Both groups faced exclusion from leadership positions. Weak horizontal collaboration within and among horticulture programmes, government departments and other institutions exacerbated the tendency to work in disconnected silos.

Therefore, policy dissonance cannot be overcome simply by reorienting the goal of the horticulture programme. Instead, I argue that it needs a collaborative gender-just approach that puts women and girls at the heart of development (Cornwall, 2012, Development Dissident, 2014). Kerala also needs a nutrition-in-all policies approach supporting “new social relations free from oppression and inequality between men and women” (Forum for Food Sovereignty, 2007, pp. 9, 13, Wittman, 2011) that encourages intensive farming of safe and nutrition-rich F&V and revival of local endangered GLVs and fruit trees. Food for people must take precedence over non-food cash crops. Policies designed to utilise unproductive lands for agriculture will also be necessary. Kerala also needs to harness a research strategy to understand nutritional gaps and formulate local and state-level goals. Bridging nutrition gaps requires cropping and production strategies and marketing linkages consistent with nutrition goals. Such an enabling environment for nutrition will harness processes that effectively implement actions that reduce undernutrition (Gillespie *et al.*, 2013, pp. 553).

After examining the perceptions of stakeholders and experts, in this chapter, in the next chapter I explore the views of community members about access to fruits and vegetables in the local food environment.

Chapter 7. Community Perceptions of Access to Fruit and Vegetables in the Food Environment

7.1. Introduction

In Chapter 1 I stated that the main function of this thesis would be to examine the development and impact of Kerala's horticulture programmes that focus on increasing incomes for farmers through increasing F&V production and— on the availability, affordability and access to diverse, nutrient-dense F&V (Dahlgren *et al.*, 2006, Nugent, 2011, World Health Organization, 2004). In Chapters 5 and 6 we saw from the witness seminar and from the in-depth oral history interviews that resilient and sustainable institutions associated with Kerala's farmer-centric horticulture programmes nurtured enabling environments that expanded F&V farming. We also saw that culture-changing processes that helped increase home-gardens and women's participation in agriculture also successfully arrested declining F&V availability. Even so, we saw that there was a perception of very low F&V consumption, particularly GLVs, neglect of local F&V varieties and high pesticide use as well as weak government-supported marketing systems. We also saw there was a perception that the pathways of price and income were significant barriers to consumption.

The previous two chapters focussed on the perceptions of stakeholders — panellists and audience members at the witness seminar and individual key-informants — about their perceptions of the context and processes that shaped Kerala's horticulture programme and its impact on the local food environment. This chapter explores the local food environment from the insights and experiences of community members (parents, teachers and others) from local government schools, aided schools and unaided, private schools as a proxy for socio-economic groups.

In this chapter I try to understand community perceptions of access to fruits and vegetables in their food environment. To understand the local perceptions of the food environment I had used a focus group guide from questions drawn from and based on work done by FAO Nutrition and Consumer Protection Division and others on dietary diversity (Deitchler *et al.*, 2011, FAO and WHO, 2014, Hoddinott and Yisehac, 2002, Kennedy *et al.*, 2011, World Health Organization, 2011) and agriculture-nutrition linkages at the community level (Bonnard, 2001, Herforth and Ballard, 2016, VicHealth Victorian

Health Promotion Foundation, 2011). I described the methods I used here (pages 55, 64-75). The main question I seek to answer is:

1. What are the perceptions of community members about supplies, production and prices of fruits and vegetables in their food environment? I further subdivide the main question into:
 - (a) How do these views differ among Kanjikuzhi, Aryad, Naranganam and Kottangal panchayats?
 - (b) How do these views differ among community members from different income-groups? In government (proxy for low-income), aided (proxy for middle-income) and private schools (proxy for high-income).

While addressing these questions, I will also examine the pathways of impact on availability, affordability and access and further examine the factors that determine these impacts.

To answer these questions and to explore the impact of horticulture programmes on the local food environment and on different socio-economic groups, I conducted 12 FGDs in government, aided and private schools in the state of Kerala in India. Three FGDs each were conducted in Kanjikuzhi and Aryad panchayats of Alappuzha district and three each in Naranganam and Kottangal panchayats of Pathanamthitta district. I will describe (a) their perception about F&V as food for people in their local food environments, through their description of fruits and vegetables they valued, grew, sold and bought, as well as their perceptions of F&V supply, production, prices and consumption. I also describe the differences in these perceptions between socio-economic groups and key differences between panchayats. Further I will explore (b) if and how agrarian reforms that supported small farmers helped strengthen local and regional food systems. I will describe community members' perceptions of what they perceive to be barriers to F&V access and what they suggest to facilitate increased F&V access.

I then consider future policy opportunities, challenges and lessons derived from this research that are helpful in formulating a goal for considering F&V as food for people in Kerala and in other communities undergoing nutrition transition.

7.2. Findings

In this section I report the findings from my analysis of focus group discussions on the perceptions and experiences of community members in four panchayats — Kanjikuzhi, Aryad, Naranganam and Kottangal about the fruits and vegetables in their local food environments. My purpose is to examine the impacts of horticulture programmes on the food environment, and to understand heterogeneity of impact across groups.

7.2.1. On food for people

Given below are the perceptions of community members from Kanjikuzhi, Aryad, Naranganam and Kottangal about F&V in their local food environments. These findings are based on their description of fruits and vegetables they valued, grew, sold and bought, as well as their perceptions of F&V supply, production, prices and consumption. I also describe the differences in these perceptions between socio-economic groups and key differences between panchayats.

There were commonalities among the different panchayats in what they valued, grew and bought. All panchayats valued homegrown fruits such as local banana varieties¹¹⁰, papayas, guavas and seasonal mangoes and jackfruits. Though community members in all panchayats bought both *naadan* and commercial cool-season fruits, they did not buy or sell jackfruit, papayas or guavas. While community members in Kanjikuzhi relied more on homegrown *naadan* vegetables those in Aryad and Kottangal were market-dependant for most vegetables.

What they grew and sold

In Table 27 we see that Kanjikuzhi, Aryad¹¹¹ and Naranganam panchayats mentioned that they grew 18 types of F&V. The fruits¹¹² they named were among those they valued. Community members in Naranganam, Aryad and Kottangal mentioned many more fruits than Kanjikuzhi, with half being vitamin A-rich *naadan* fruits. Community members in Kanjikuzhi mentioned only one fruit they grew (papaya¹¹³), but mentioned the most types

¹¹⁰ Poovan and jnalipoovan

¹¹¹ A community member in Aryad mentioned that they grew several English vegetables in another district purely for the market. These have been omitted.

¹¹² Mangoes, papayas, guavas, jackfruit and bananas.

¹¹³ Papaya, which could be used as both vegetable and fruit, was not a 'high status' fruit and it is possible that others dismissed its use.

of vegetables (17), including two varieties of GLVs. Many community members kept produce, particularly fruits for their own use.

We cultivate items such as amaranth and take them for domestic use.

- Kadammanitta LPS (Naranganam-MIG/Pathanamthitta)

The community in Aryad mentioned 12 vegetables, including two GLVs and pumpkin. Naranganam said they grew 11 vegetables (1 GLV). Community members in Kottangal said they grew 10 vegetables, of which nine were *naadan* vegetables.

Table 28 lists the fruits and vegetables that community members said they sold. However in comparison to other panchayats, community members in Kanjikuzhi said they sold nine types of vegetables, including a GLV. This was double what other panchayats reported selling. Kottangal panchayat reported selling just one vegetable (excluding white tubers), while Aryad and Naranganam panchayats reported selling bananas.

What they valued

I show in Table 26 that community members in all panchayats valued *naadan* fruits and vegetables. Among the panchayats, Kanjikuzhi named the most number of valued F&V (29), with 21 vegetables including six GLVs (none were commercial). Of the 24 F&V Naranganam named, 13 *naadan* vegetables including five GLVs. They also mentioned the most commercial vegetables (four). While of the 11 F&V Aryad named, five were vegetables, including two GLVs (one commercial). Kottangal named the least types of F&V they valued (10) of which just three were vegetables, including one GLV (one commercial).

While the private school group in Kanjikuzhi mentioned seven *naadan* vegetables, three GLVs and carrots, private school groups in other panchayats mentioned just one or two other *naadan* vegetables, carrot and one GLV. It was a similar pattern among the aided school groups, with the school group in Kanjikuzhi mentioning the most *naadan* vegetables (six), followed by Naranganam (four) and Aryad and Kottangal (one).

Table 26: Fruits and vegetables community members mentioned they valued

F&V VALUED								
	Kanjikuzhi		Aryad		Naranganam		Kottangal	
Categories	Naadan	Commercial	Naadan	Commercial	Naadan	Commercial	Naadan	Commercial
Vitamin A rich fruits	Papaya, Mango, Guava	-	Mango, Guava	-	Mango, Papaya, Guava	-	Mango, Papaya, Guava	-
Other fruits	Banana, Rose (wax) apple, Pineapple, Jackfruit	-	Jackfruit, Banana, custard apple, Rose (wax) apple	-	Banana, Passion fruit, Jackfruit, Plantain	-	Jackfruit, Pineapple, Banana, Plantain	-
White roots and tubers	-	-	-	-	-	-	-	-
Vitamin A rich vegetables and tubers	Pumpkin flower, Pumpkin	-	-	Carrot	-	Carrot	-	Carrot
Dark green leafy vegetables	Amaranth, Cowpea, Pumpkin, Ivygourd, colocasia and moringa leaves	-	Amaranth, colocasia leaves	-	Moringa, Amaranth, Cowpea, Pumpkin, Colocasia leaves	-	Amaranth	-
Other vegetables	Bittergourd, Brinjal, Cowpea, Cucumber (<i>vellarikka</i>), Ivygourd, Jackfruit, Ladiesfinger, Moringa, Papaya, Plantain, Banana flower, Ridgegourd, Snakegourd	Tomato	Cowpea, Ladiesfinger	-	Banana flower, Bittergourd, Brinjal, Cowpea, Ivygourd, Jackfruit, Ladiesfinger, Papaya	Beetroot, Cabbage, Tomato	Cowpea	-
TOTAL	28	1	10	1	20	4	9	1

Table 27: Fruits and vegetables community members mentioned growing

Fruits and Vegetables (Produced)								
Categories	Kanjikuzhi		Aryad		Naranganam		Kottangal	
	Naadan	Commercial	Naadan	Commercial	Naadan	Commercial	Naadan	Commercial
Vitamin A rich fruits	Papaya	-	Guava, Mango, Papaya	-	Guava, Passionfruit, Papaya, Mango	-	Guava, Papaya, Mango	-
Other fruits	-	-	Banana, Pineapple, Jackfruit	-	Banana, Pineapple, Jackfruit	-	Banana, Pineapple, Jackfruit	-
White roots and tubers	Colocasia, Tapioca, Yam (<i>kachil</i>), Elephant foot yam	-	Elephant foot yam, Colocasia	-	Yam (<i>kachil</i>) Tapioca	-	Yam	-
Vitamin A rich vegetables and tubers	-	-	Pumpkin	-	-	-	-	-
Dark green leafy vegetables	Moringa leaves, Amaranth	-	Moringa, Amaranth	-	Amaranth	-	Amaranth	-
Other vegetables	Bittergourd, Brinjal, Cowpea (green), Cowpea (red), Ivygourd, Ladiesfinger, Moringa, Mung beans, Papaya, Ridgegourd, Snakegourd	-	Ash gourd, Bittergourd, Brinjal, Cowpea, Ivygourd, Ladiesfinger, Moringa	-	Bittergourd, Brinjal, Cowpea, Ivygourd, Ladiesfinger, Moringa, Papaya, Snakegourd	-	Bittergourd, Cowpea, Ivygourd, Jackfruit, Ladiesfinger, Snakegourd	Tomato
TOTAL	18	0	18	0	18	0	15	1

Table 28: Fruits and vegetables community members mentioned selling

F&V SOLD								
	Kanjikuzhi		Aryad		Naranganam		Kottangal	
Categories	Naadan	Commercial	Naadan	Commercial	Naadan	Commercial	Naadan	Commercial
Vitamin A rich fruits	-	-	Mango	-	-	-	-	-
Other fruits	-	-	Banana	-	Banana	-	-	-
White roots and tubers	-	-	Yam	-	Colocasia, Tapioca, Yam	-	Colocasia	-
Vitamin A rich vegetables and tubers	-	-	-	-	-	-	-	-
Dark green leafy vegetables	Amaranth	-	-	-	-	-	-	-
Other vegetables	Bittergourd, Brinjal, Cowpea (green), Cowpea (red), Ivygourd, Ladiesfinger, Mung (green gram), Ridgegourd, Snakegourd	-	Ivygourd	-	-	-	Snakegourd	-
TOTAL	9	0	4	0	4	0	2	0

Do supplies and production affect F&V consumption?

Most groups in all panchayats agreed that intensified agriculture, with more people taking up farming, mostly through collective farming in neighbourhood groups had served to increase domestic production. This F&V production made it possible for them to use their own home-grown F&V¹¹⁴ and to make it more available locally. As I pointed out earlier most panchayats relied on seasonal fruits and vegetables from their own home-gardens and they knew the value of fruits like papayas and green leafy vegetables:

...as the water rose, the papaya tree full of fruits, fell down... We will plant it again next Onam... during the rainy season it will fall down. We know that. Still we plant it.

¹¹⁴ Seasonal tree fruits like mangoes, jackfruit, as well as bananas, papayas, guavas, pineapples, plantains, guavas, passion fruits and rose apples. The most mentioned vegetable were cowpeas and ivygourds.

All of us use cheera¹¹⁵. Yes, you will find cheera in most of the houses. That is the peculiarity of this place.

- Aided school, Kanjikuzhi

The community groups in Kanjikuzhi credited their increased F&V availability to intensified panchayat-wide agriculture initiatives, especially collective farming in neighbourhood groups:

The panchayat sends people to work... those who are interested in cultivating their land can do it inexpensively... land that has been left fallow gets cultivated.

- Aided school, Kanjikuzhi

However the aided school in Naranganam did not support collective farming. According to them “the smart ones” who did not work, would “take everything” while those who worked, would get nothing. Another admitted that it required regular monitoring to prevent vegetables from being stolen:

There was lot of vegetable cultivation in this school compound. But some used to steal the vegetables before they were ready.

- Aided School, Aryad

However, the groups in Aryad and Kottangal panchayats pointed out how popularizing innovations such as roof-top farming in urban areas had helped intensify F&V farming. These two panchayats also highlighted the importance of easy access to good quality inputs for intensive agriculture.

Groups in all panchayats had several suggestions to increase F&V production. Foremost among these was to continue popularizing intensified agriculture through collective farming in neighbourhood groups, with higher sale prices for their produce. While selling locally increases local availability, the lack of procurement policies has made it difficult for cultivators. They sold tubers¹¹⁶ and *naadan*¹¹⁷ bananas to shopkeepers who paid them very little. During the season there was “no use in stocking” tubers, and

¹¹⁵ *Cheera* usually referring to amaranth.

¹¹⁶ *Kachil* (Greater yam), *chena* (elephant foot yam) and *chembu* (colocasia)

¹¹⁷ Jnalippoovan

they had to accept being paid only for the banana fruit, while shopkeepers charged consumers for the weight of the stem:

One bucketful of ivy gourd in exchange for a handful of carrots! That sort of situation is a mental torture for the farmers who may lose their interest in farming.

- Aided school, Aryad

All FGDs said that significant barriers to F&V consumption were the scarcity caused by low domestic production and supply chain interruptions which led to increased prices of *naadan* vegetables, especially during festival seasons. They attributed low domestic production to unavailability of farm land and the high input costs, which, rising in tandem with policy changes, increased production costs,¹¹⁸ and made farming a losing venture. A common reason given for low domestic production was that agriculture workers and land owners had shifted from agriculture to other professions. Those who shifted to other sources of income gradually lost interest in agriculture and few took the “trouble to cultivate” (Aided school, Naranganam).

If people have money, they don't bother to cultivate.

- Aided School, Kanjikuzhi

FGDs in all panchayats brought up the lack of farm land as a reason for low domestic production. Many farmers had little land and panchayat schemes did not provide land or water:

As far as our family is concerned, we live in four cents of land... so we can plant only some green leaves or beans, just for daily use.

- Government School, Aryad

There was a feeling that popularity of rubber cultivation changed land use patterns leading to a decline in the land available for F&V farming.

Landowners had no interest in agriculture, when they could profit from planting rubber. People with money, plant rubber plants instead of vegetables.

¹¹⁸ fertilizers, petrol

- Kadammanitta LPS (Naranganam-MIG/Pathanamthitta)

Community members in the private and aided schools in Aryad and those from the aided school in Kottangal argued that rubber, which blocked sunlight, had reduced land for F&V farming. In Kottangal panchayat which was forested with rubber plantations, a group admitted that land that could be used to grow one's own F&V was planted with rubber:

Yes, rubber is the problem! (All laugh)

It is rubber everywhere now. Rubber trees have to be cleared from the land and then only we can hope for a return to vegetable cultivation.

- Aided school, Kottangal, Pathanamthitta

With more cheap, out-of-state F&V imports, Kanjikuzhi and Naranganam groups perceived that these had decreased prices of local produce, making farming less profitable and unattractive.

What did people suggest to help improve F&V supply?

Community members in Kanjikuzhi believed that encouraging people to enter farming would be the first step to improve F&V supplies. They pointed out that while in other states it was the rich who cultivate, in Kanjikuzhi panchayat low-income people were encouraged to take up farming. They also wanted the government to initiate programmes in schools and colleges to encourage students' interest in collective farming.

All groups wanted easy access to more land made available for farming by clearing rubber and other plantations. The groups in all four panchayats suggested leasing fallow land for agriculture.

Still there is fallow land. If farming is started there also, there would not be scarcity of vegetables in this panchayat.

- Government School, Kanjikuzhi

A participant in Aryad panchayat described how a church had allowed her to do vegetable farming on fallow church land.

We have no land at home. Then there was fallow land of church and we started farming there.

- Aided School, Aryad

As important as land was, the groups involved in panchayat or Kudumbashree's co-operative neighbourhood collective farming (*karshaka koottayma*) in Kanjikuzhi, Aryad and Kottangal emphasized the vital role of co-operation in transforming the agriculture sector. They stressed that little could be achieved without co-operation. According to them co-operation had played a vital role in transforming the agriculture sector:

Land should be there, co-operation should be there.

- Aided School, Aryad

Peoples' perceptions of what influences purchase and consumption

Community members in all panchayats agreed that prices affected their purchases. The most popular fruit, bought in all panchayats was undoubtedly bananas (used for breakfast to accompany *poottu*¹¹⁹) and local varieties such as *poovan*, and *Jnalippoovan* were highly valued. While groups in three panchayats bought apples, the most bought commercial fruit was orange. All panchayats bought cowpea — the only *naadan* vegetable purchased in all panchayats and commercial, cool-season vegetables such as carrots, beetroot, cabbage and tomato. Kottangal reported purchase of the least types of *Naadan* vegetables and Naranganam the most.

The types of F&V that community members in panchayats mentioned buying varied from 15 types of F&V (including five fruits) in Naranganam, to 11 types (five fruits) in Aryad. Kanjikuzhi spoke of buying 13 F&V (including four fruits). Unlike in other panchayats, community members were also able to buy GLVs there. Kottangal groups mentioned 13 types of F&V of which most were fruits (seven) and four commercial, cool-season vegetables.

What was expensive? Fruits were reputed to be expensive in all panchayats. FGDs in several panchayats revealed people worried about the prices of *naadan* bananas¹²⁰. Community members in Aryad suspected mangoes were uneatable because of high pesticide content. Instead they said they preferred to eat homegrown fruits or got them from their neighbours.

¹¹⁹ A steamed rice and coconut breakfast dish.

¹²⁰ One Aryad group said bananas were expensive (Rupees 45).

Table 29: Fruits and vegetables community members purchased

F&V PURCHASED								
	Kanjikuzhi		Aryad		Naranganam		Kottangal	
Categories	Naadan	Commercial	Naadan	Commercial	Naadan	Commercial	Naadan	Commercial
Vitamin A-rich fruits	-	-	Mango	-	Mango	-	Mango	-
Other fruits	Banana	Oranges, Apple, Grapes	Banana, Plantain	Apple, Oranges	Banana, Pineapple	Grapes, Oranges	Banana, Pineapple, Plantain	Apple, Grapes, Oranges
White roots and tubers	-	-	-	-	-	-	-	-
Vitamin A-rich vegetables and tubers	-	Carrot	-	Carrot	-	Carrot	-	Carrot
Dark green leafy vegetables	Amaranth	-	-	-	-	-	-	-
Other vegetables	Bitter gourd, Cowpea (red), Cowpea (green), Ladiesfinger	Beetroot, Cabbage, Tomato	Cowpea, Cucumber (<i>vellarikka</i>)	Beetroot, Cabbage, Tomato	Bitter gourd, Cowpea, Ivy gourd, Ladyfinger, Snakegourd	Beetroot, Cabbage, Cauliflower, Tomato	Cowpea, Cucumber (<i>vellarikka</i>)	Beetroot, Cabbage, Tomato
TOTAL	6	7	5	6	8	7	6	7

In Naranganam where there was a perception that fruits were a luxury, a few community members, admitted that they could not afford to buy any fruit. However, both in the aided school in Kanjikuzhi and in the government school in Kottangal people also bought small quantities of the more expensive fruits (apples) and cool-season vegetables for children.

*Naadan*¹²¹ F&V was reputed to be expensive during Vishu, Onam festivals, and during the Sabarimala season.¹²² In all panchayats cowpeas, as well as cool-season, commercial vegetables (carrots, beetroot, cabbage and tomato), were said to be expensive and the prices were said to fluctuate. Moringa pods were also vulnerable to price spikes. Most groups reported buying small quantities¹²³ of vegetables. There was a perception especially in Naranganam that vegetables prices were “exorbitant” and never decreased. While they bought onions in large quantities, they bought small quantities of vegetables infrequently:

When guests come we buy quarter kg beans, quarter kg bitter gourd etc. Otherwise we do not buy.

- Government School, Naranganam

A majority of the FGD groups in Aryad and Kottangal, and one in Naranganam panchayat reported buying vegetable kits. These kits were sometimes filled with bulky local cucumber (*vellarikka*) or *thadiyan kai*¹²⁴ rather than other vegetables they preferred. They explained that vegetables in these kits:

If not cooked on the same day itself, it will get rotten.

- Government School, Naranganam

Once we realize that we are duped, we don't buy again (loud laughter)

- Aided School, Kottangal

¹²¹ Bananas, cowpeas and moringa, were unavailable or extremely expensive, with prices spiking from Rs. 23 to Rs. 80 moringa (festival-related increases up to Rs 100);

¹²² Vegetarian food is consumed during several festivals and the 41 day Hindu pilgrimage and fast (Mandala vratham) during December–January).

¹²³ Half the groups bought between a quarter and half a kilo.

¹²⁴ A less desirable type plantain used for curry.

Community members in Aryad said that the availability of vegetable kits was inversely related to their prices — higher the prices, fewer the kits. Others in Naranganam reported the price of kits brought from nearby towns had doubled:

Sambar kit used to cost 50 Rupees now it is 100 Rupees. You get about 10-14 assorted vegetables. You can use it for a week.

- Kadammanitta LPS (Naranganam-MIG/Pathanamthitta)

Not everyone bought kits. Community members in the Kanjikuzhi¹²⁵ and the private and aided school groups in Naranganam and a few others from Aryad and Kottangal preferred to buy small quantities of loose vegetables. There were gender differences about who bought kits. At the private school in Kanjikuzhi, the perception was that women who were careful about price and freshness, would rather buy loose vegetables while men, who were more likely to work in the towns, would buy even “five, six kits”.

How did community members cope with these prices and interruptions? To cope with expensive or unavailable F&V community members in all panchayats used a combination of strategies. Community members from the government school in Kottangal said when prices were high, they settled for a one-vegetable fry or a *thoran* instead of mixed-vegetable preparations *sambar* or *aviyal*. Most people substituted with home-grown produce or switched to cheaper F&V or bought cheaper, prepacked, vegetable kits¹²⁶ or even halved their purchases. Community groups from the aided school in Naranganam and Kanjikuzhi as well as from a private school in Kanjikuzhi also reported reducing purchases.

We buy less quantity. Children have to be provided.

Where we bought half a kilo, we buy quarter a kilo.

- Aided School, Kanjikuzhi

Some bought as little of the necessities as possible. When asked if they had vegetables daily, a participant replied:

¹²⁵ Even though Charamangalam HSS claimed to buy ‘kits’ it was likely to refer to an inexpensive selection of different whole vegetables for sambar and avial rather than a bag of prepacked cut vegetables.

¹²⁶ Plastic bags filled with a mix of chopped vegetables such as carrots, tomato, potato, cucumber and *thadiyanga* needed for *avial* and *sambar* cost between Rs. 40 and Rs.70 and were usually available in towns.

I have them only occasionally as they have become so expensive.

- Aided School, Aryad

Where we bought half a kilo, we buy quarter a kilo.

- Aided School, Kanjikuzhi

In Naranganam, a woman, a widow, among the group of women (and a solitary man), who took a break from MGNREGA work of cleaning the school compound told me about her joy in the easy camaraderie in her work group. She told me that she was happy where once she was sad. Her health had improved since she was active. There was no shame in holding the *thoomba* (hoe) in public or stretching out to rest after hours of labour. However, the group confessed that they generally bought very little F&V — it was all too costly — and depended on vegetable-kits. Like groups in Aryad and Kottangal this group too was market-dependent. However, they loved being able to get the subsidised F&V at Onam time when their mates from Kudumbashree would open a seasonal outlet. Even more, they loved walking past “Ammini’s store” with very expensive F&V, which they were forced to buy from at other times. While Naranganam groups bargained with local retailers and bought F&V from nearby towns, one Kottangal group faced another reality:

We buy without bargaining. They tell us, “Buy if you want.”

- Government School, Kottangal

Thus affordability was a crucial barrier for community members from the government school in Kottangal who contended “scarcity of money” was a barrier to F&V consumption.

During the times when vegetables were either expensive or not available, others like the aided school in Kottangal switched to eating cassava and fish or depended on meat or dried fish.

Peoples’ perceptions of what helped

High production in places like Kanjikuzhi, government policies such as the subsidized public distribution scheme and agricultural inputs, government-supported wholesale and retail shops, farmers’ markets and Kudumbashree kiosks especially during festival season made F&V affordable. Many community members said they bought the more affordable subsidised F&V

from horticulture programmes distributed during Onam from government outlets like *Neethi* stores:

Once a year for Onam, the government controls the price of food essentials. Those times it is tough to get through the thronging crowd and buy anything.

- Aided School, Kottangal

Almost all go to Neethi shop during Onam (All)

There will be long queue. All will be jostling.

- Government School, Kottangal

People in Naranganam who had felt vegetable shops had overcharged them also bought their F&V during Onam from a temporary vegetable shop run by the *Ayalkkoottam* (neighbourhood women's self-help group) that they said to be "the best among all the vegetable shops".

It is a relief that vegetables are brought here during Onam. Or else we have to go to them (the local retailer) again!

- Government School, Naranganam

Community members in the private school in Naranganam said they found only cool-season, commercial F&V "beans, carrot and cabbage" rather than *naadan* F&V even in government's own retail outlets in Pathanamthitta:

Horticulture corporation shop in Pathanamthitta claims that they have all vegetables in their shop, but when we go there, we find beans, carrot and cabbage only.

- Private School, Naranganam

However, there was some frustration, especially in Pathanamthitta, that vegetables, collected from farmers and 'abundantly available to the government' were expensive even in the Government's own subsidized retail outlets. For the government school in Aryad and in Naranganam distress sales to prevent waste during harvest offered some relief. Several community members in Aryad and in Naranganam said they bought tomatoes as shops that

had no refrigeration would sell large quantities even of out-of-state produce during harvest season cheap, to avoid waste:

During summer tomatoes will go bad soon and so it is sold cheap. Otherwise it will go bad.

- Government School, Aryad

Besides the subsidized F&V, community members in the private schools in Naranganam and Kanjikuzhi credited local vegetable production with stabilizing prices.

There will not be increase or decrease in the price of pumpkin. Its price remains the same almost all the time. (All)

- Private School, Kanjikuzhi

People cultivate a lot of vegetables so the prices are not very high.

- Mount Zion (Naranganam-HIG/Pathanamthitta)

Affordability created its own problems as people confined themselves to cooking only affordable vegetables:

After eating ivy gourd in different forms such as thoran, mezhukku purattiyath, theyal etc. children become fed up with it...

- Aided School, Aryad

What did community members perceive as reasons for high F&V prices?

Community members attributed high F&V prices to demand and supply factors. All panchayats pointed to lack of government-supported retailers such as *Maveli* and *Neethi* stores, ineffective or skewed government policies, and decreased availability during festivals and monsoons.

Two groups, a government school from Kottangal and a private school group from Aryad blamed unhelpful rural and export policies, which gave handouts to producers of exportable rubber, coconut and other plantation crops, while denying F&V farmers necessary land and water, as responsible for increased domestic scarcity and dependence on out-of-state F&V supply. They felt while other consumer items may become cheaper, irrespective of the political party in power, vegetable prices always increased. This perception was the sharpest in

Naranganam. Further, they also attributed high prices to increased transportation and production costs, exploitation by traders and decrease in number of items and quantity sold in government-controlled stores and PDS shops. Groups at the government and aided schools in Kanjikuzhi, the government school in Naranganam and a private school in Kottangal said when government-controlled stores and PDS shops sold fewer items and quantities, other retailers and local markets increased price gouging.

Low domestic production made Kerala a seller's market, where profiteering exploitation by traders and retailers was rife. Community members at private schools in Aryad and Kottangal, others at government school in Naranganam perceived retailers to be buying cheap and selling high, and setting any price, especially when there were shortages. According to a Naranganam group, low production attracted cheap, out-of-state F&V imports which hurt local production through decreasing prices of local produce and making farming unprofitable and unattractive. Shops paid farmers very little for their produce, while charging consumers a lot:

We sold a bunch of plantains for Rs. 9 per kg. The same bunch I bought back for Rs. 20 per kg.

- Government School, Naranganam

Community members at the government school in Kottangal pointed out that shops failed to display the mandated price list. There was also a perception that suppliers would destroy vegetables to keep prices high:

If production increases there To not lower the price, they destroy. Thus to say the price has decreased is very rare.

- Private School, Aryad

Community members at the government and private schools in Kanjikuzhi, those from the government school in Kottangal, and others from the aided school in Aryad, felt that the dependence on out-of-state supply¹²⁷ multiplied the impact of transportation and fuel price hikes. Price spurts were common if F&V supplies were interrupted and during the monsoon season and in the summer. This was particularly felt by all Aryad and Kottangal groups.

¹²⁷ Especially of onions, beans and cool season vegetables like carrots and cabbage.

According to many community members their inability to get small quantities of vegetables and good quality kits led to low demand which then led to limited supplies. Low demand was further amplified by fear of pesticides, lack of transportation, and avoiding 'cold'¹²⁸ fruits during monsoon season, especially if children had cold and cough (Naranganam-MIG/Pathanamthitta).

People's suggestions for better F&V access

Focus group participants in all areas made two suggestions that would increase F&V affordability. They linked F&V consumption with constant, plentiful supply, sales and distribution from home-gardens and from local cultivation and with affordable prices. The first was flooding the local food environment with sales and distribution of local produce, i.e. the many different types of F&V from home-gardens. The second was to increase the presence, particularly the year-round presence of government-supported outlets selling F&V.

All FGD participants in Naranganam, the aided school group in Aryad and private and government school groups in Kottangal suggested increasing convenient access to government-subsidized F&V outlets such as *Maveli* and *Neethi* stores and kiosks managed by Kudumbashree, year-round rather than just during festival. They also credited the government's subsidized public distribution scheme for creating demand for F&V, as it enabled people to spend the savings on higher value foods. All community members who participated in FDGs from Kottangal and those from aided and government schools in Kanjikuzhi, said that people below poverty line who were given 10 kilos of highly subsidized rice every week were able to use savings from lower grain expenses on F&V:

One advantage now is that 1 kg rice is available for Rs.1/ we are really grateful for that.

- Aided School, Kanjikuzhi

Disparities and social gradients

Since people who have more diverse diets are less likely to have vitamin or mineral deficiencies, in this section I aim to understand the food system disparities among the different community groups from private, aided and government schools. Table 26, Table 27 and Table 29 show the vegetables and vitamin A rich tubers in the food environment, that the groups reported valuing, growing and purchasing. This section also includes their perceptions

¹²⁸ Examples included jackfruit, papaya and others.

about supplies, production and prices. Information about the methods I used are on pages 64 to 75.

Where growing vegetables was concerned, the government schools grew many more types of vegetables (18) than private schools (10) and Aided schools (10). The government school group mentioned the most types of *naadan* vegetables they valued (18), followed by private schools (14) and aided schools. While in all other panchayats the community groups from private and aided schools valued, grew or bought more Vitamin-A rich F&V than those from government schools, in Kanjikuzhi, the community group at the government school valued, grew and bought a wider variety of *naadan* vegetables than private and aided schools.

Table 30: Valued vegetables mentioned by community — whether *naadan* or commercial

VALUED VEGETABLES	Private school group		Aided school group		Government school group	
	<i>Naadan</i>	Commercial	<i>Naadan</i>	Commercial	<i>Naadan</i>	Commercial
Vitamin A rich vegetables and tubers	-	Carrots	-	Carrot	Pumpkin flower, Pumpkin	Carrot
Dark green leafy vegetables	Amaranth, Moringa and other <i>naadan</i> GLVs	-	Amaranth, cowpeas and pumpkin leaves	-	Amaranth, Leaves of colocasia, Cowpea, ivygourd, moringa and pumpkin	-
Other vegetables	Banana flower, brinjal, cowpeas, cucumber (<i>vellarikka</i>), ivygourd, jackfruit, ladiesfinger, papaya, snakegourd	Tomato	Bittergourd, Brinjal, Cowpeas, Ivygourd, Jackfruit, Ladies finger	Beetroot, Cabbage, Tomato	Banana flower, bittergourd, brinjal, cowpeas, Ivygourd, jackfruit, ladiesfinger, moringa, papaya, ridgegourd	-
TOTAL TYPES OF VEGETABLES	14	2	10	4	18	1

Table 30 shows the vegetables valued by community groups in private, aided and government schools. The government school group mentioned the most types of *naadan* vegetables they valued (18), followed by private schools (14) and aided schools (10). The aided schools reported the most types of commercial vegetables (4) and the government schools reported the least (1).

The government school group in Kanjikuzhi panchayat, the only group who valued pumpkin flower also mentioned six types of GLVs and nine *naadan* vegetables. The next was Naranganam group with three GLVs and six *naadan* vegetables. Neither of these groups

mentioned carrots. Kottangal and Aryad both of whom reported just one GLV and one *naadan* vegetable, also valued carrots.

When it came to GLVs and carrots, all aided schools valued GLVs —three types in Naranganam and one in others. All aided school community groups except Kanjikuzhi valued carrot. Naranganam, the only aided school that mentioned commercial vegetables, mentioned more commercial vegetables than all other groups in all four panchayats.

Table 31: Reported vegetable production according to groups

VEGETABLES PRODUCED	Private school group	Aided school group	Government school group
Vitamin A rich vegetables and tubers			Pumpkin
Dark green leafy vegetables	Amaranth, Moringa	Amaranth	Amaranth, cowpea, pumpkin, ivy gourd, colocasia & moringa leaves
Other vegetables	Bittergourd, Brinjal, Cowpeas, Ivy gourd, Ladiesfinger, Moringa, Papaya, Snakegourd ¹²⁹	Bittergourd, Brinjal, Broad Beans, Cowpeas, Ivygourd, Jackfruit, Ladiesfinger, Mangoes, Papaya, Snakegourd	Ashgourd, bittergourd, brinjal, cowpeas (green), cowpeas (red), ivygourd, ladiesfinger, moringa, mungbeans, ridgegourd, snakegourd
TOTAL TYPES OF VEGETABLES	10	11	18

Where growing vegetables was concerned, the government schools grew many more types of vegetables (18) than private schools (10) and aided school (11). There was more disparity seen in Naranganam between what the community group at the government school grew (3) and the number of types of vegetables grown by groups at the private (7) and aided schools (7).

In Kanjikuzhi the community group in the government school reported growing the most types of vegetables (government: 14, aided: 5, private: 8). It was similar in Aryad (government: 5, aided: 4, private: 3) while aided school group in Kottangal reported growing more types (aided: 7, private and government 5). The community group in the government school at Kanjikuzhi also reported growing six types of GLVs, compared to others (1), except for the aided school in Kottangal and government school in Naranganam, who grew no GLVs.

¹²⁹ Kanjikuzhi mentioned eight vegetables while Aryad reported three.

Table 32: Reported vegetables purchased according to groups

PURCHASED VEGETABLES						
VEGETABLES PURCHASED	Private school group		Aided school group		Government school group	
	<i>Naadan</i>	Commercial	<i>Naadan</i>	Commercial	<i>Naadan</i>	Commercial
Vitamin A rich vegetables and tubers	-	Carrot	-	Carrot	-	Carrot
Dark green leafy vegetables	-	-	-	-	Amaranth	-
Other vegetables	Snake gourd	Beetroot, Cabbage, Cauliflower	Bitter gourd, Cowpeas, Ivygourd, Ladiesfinger	Beetroot, Cabbage, Tomato	Bittergourd, Cowpeas (green), Cowpeas (red), Cucumber (vellarikka), Ladiesfinger	Beetroot, Cabbage, Tomato
TOTAL TYPES OF VEGETABLES	1	4	4	4	6	4

While all groups reported buying four types of commercial vegetables, government school groups reported buying more *naadan* vegetables than other groups (Government: 6, private 1; aided 4).

With regard to private and aided schools buying commercial vegetables, those in Kanjikuzhi reported buying just one commercial vegetable, while those in Naranganam bought three. The price of carrots worried the aided school groups in Aryad and Kottangal. Among aided schools, Naranganam and Kanjikuzhi reported buying more *naadan* vegetables (4, 3) than Aryad and Kottangal (1). The aided school in Naranganam reported buying larger quantities than other groups. Others preferred buying small quantities of loose vegetables but also bought vegetable kits (especially in Aryad). Only Kanjikuzhi government school group reported buying GLVs. The aided and government school groups in Kanjikuzhi reported selling GLVs as well as *naadan* vegetables (aided: 5, government: 8). Aryad reported selling one vegetable but no private school reported selling vegetables.

Market-reliant private school groups in Aryad and Kottangal did not complain of cost and some in the private and aided schools in Naranganam said they would buy F&V irrespective of cost. Generally private school groups seemed to buy large quantities. While the government school group at Naranganam reported buying more types of commercial and *naadan* vegetables (6) than the government schools, they said they bought small amounts and one person reported buying only when guests came. They reported greater affordability during Onam, because of access to a seasonal Kudumbashree vegetable outlet.

7.2.2. On localizing food systems

Kanjikuzhi which reported growing and buying many vegetables was the only panchayat where there was localisation of production and consumption. In Kanjikuzhi where the availability of vegetables was said to have increased since everyone farmed, several people highlighted that depending on their own produce assured them safe and healthy food:

I grow ivy gourd, string beans, spinach and papaya at home. There are also tender leaves available. I only buy what I do not grow. If you have your own cultivation, you can eat healthy food. The farms use poisonous pesticides.

- Government School, Kanjikuzhi

Since everyone farmed, they were able to walk to local shops to buy affordable vegetables and neighbours frequently shared and bought and sold small quantities of vegetables from each other:

Ours is a village. So there is intense affection between the neighbours. What we have, we also share with our neighbours... If we collect spinach from home, we give it to neighbours also. They also will give us.

- Government School, Kanjikuzhi, Alappuzha

In Kanjikuzhi, community groups said they got vegetables from their own home-gardens and that neighbours shared or sold vegetables to each other. While no one talked about sharing any fruits, Aryad and Kottangal groups shared low-value vegetables,¹³⁰ curry leaves, or yams they could not sell, Naranganam also had almost no culture of sharing. Community members at the aided school there felt that even if they grew something, it wouldn't be enough to share with others. Another participant in the government school group told me they sometimes manage to get fruits by breaking off a pineapple growing on a hedge.

The Kanjikuzhi groups bought from the local farmer's market, from small shops, and from the small 'roadside' outlets at local junctions, or sometimes procured them from the nearest town. They could even buy small amounts close to their homes (as opposed to going to buy vegetable 'kits' in the nearest towns or junctions). They also sold vegetables in nearby cities — in Alappuzha, near the Collectorate; and at Vyttila and Kaloor junctions in Ernakulam. Local produce was also supplied for school mid-day meal programmes, as children

¹³⁰ Like brinjal

took vegetables (even chillies) from their home-gardens or from what their parents had purchased.

People in the other panchayats had to travel long distances to the nearest towns or to the few affordable government-supported outlets. Groups in Naranganam, Kottangal and Aryad travelled long distances to the few affordable government-supported outlets. To avoid paying for transport the community groups from government schools mostly walked to F&V outlets if they could. Both private and aided school groups usually used auto rickshaws and spent from Rs 20-70 to go to markets in the nearest town.

Lack of access was particularly distressing for market-dependent community members, especially when strikes and *hartal* caused by political disturbances or weather disrupted F&V supplies from Tamil Nadu. There was a perception especially in Naranganam, which had a VFPCCK-affiliated farmer group who sold their produce in weekly auctions, that farmers did not like selling small quantities and most people in the government school site in Naranganam did not know there was a regular VFPCCK market there:

Now if we ask for one kilogram or two kilogram of beans farmers will give. If we ask for quarter kg or half kg they will not give. They will sell it through the market. There is no small scale sale... Or else we would have bought from them. We usually buy vegetables for quarter kg. It is not profitable for them.

- Government School, Naranganam, Pathanamthitta)

Some people blamed VFPCCK's weekly auction to traders as preventing sales in the community. In any case VFPCCK farmers' market in Naranganam was inaccessible to community members at the government school as buses connected them to the nearest town rather than to the market at the centre of the panchayat. Lack of availability of small quantities of vegetables and inaccessibility to markets contributed to an artificially created low demand for F&V.

Agrarian reforms supported small farmers

Focus group participants in Kanjikuzhi, which received accolades for its innovation and received a prize for being the 'best panchayat', described how government policies and programmes encouraged collective farming, provided financial resources (incentives, subsidies, permanent wage scheme and compensation), and inputs, and marketing support including minimum support prices. These measures popularized farming and helped flood the

food environment with their produce. According to them panchayats and neighbourhood groups were vital in making farming successful and profitable. They underscored the importance of panchayat-wide efforts to make farming successful.

Every year Panchayat plan fund is utilized for buying seeds and it is distributed to farmers... During Onam and summer, vegetable seeds were given not only to farmers but also to ordinary people.

Panchayat distributed 10 plantain trees to every house.

- Charamangalam HSS, Kanjikuzhi

The Kanjikuzhi panchayat instituted local marketing and distribution, and provided minimum support prices for F&V, which helped farming be profitable and attracted more people to farming.

During the season CDS¹³¹ buys products from farmers for floor price.¹³²

- Charamangalam HSS, Kanjikuzhi

The government and aided school groups in Kanjikuzhi panchayat recommended other panchayats to encourage local farming and to ensure employment using MGNREGA¹³³ and panchayat funds:

The panchayat sends people to work for those who are interested in agriculture and cultivation. So those who are interested in cultivating their land can do it inexpensively. So the land that had been left uncultivated gets cultivated.

- Aided School, Kanjikuzhi

...the panchayat gives 100 days of work to these workers. They clean and plant long beans on private land...

- Government School, Kanjikuzhi

All panchayats highlighted the importance of easy access to good quality agricultural inputs (seeds, seedlings, fertilizers and organic manure) that they received through

¹³¹ CDS – Kudumbashree’s community development society

¹³² *Tharavila* – minimum support price, sometimes higher price than if sold to retailers in the open market

¹³³ Mahatma Gandhi National Rural Employment Guarantee Act

Kudumbashree and from the Krishi Bhavan. People from Kottangal panchayat told me with great excitement how they got good quality seeds¹³⁴ in sachets distributed in popular magazines or 'weeklies'. There was a great demand for these seeded-weeklies!

Yes, we got with Manorama magazine and Vanitha. (All)

Even the regular readers did not get that issue. We bought it all. (Laughing)

- Private School, Kottangal

They were good seeds and gave good yield.

- Government School, Kottangal

To increase domestic supply of F&V, counter the dwindling number of farmers due to uneconomical farming and low price of agricultural produce and sustain farmers, groups sought effective procurement policies and marketing support. These included minimum support and higher sale prices so farmers are not forced to exchange a bucketful of ivy gourd for a handful of carrots, as well as financial incentives as a reward for their effort, and assistance and compensation for issues like crop failure.

If there is a crop failure, they get compensation. The person does not have to bear any loss. (All)

- Aided School, Kanjikuzhi

Knowledge, skills and valuing women farmers

Participants from the Government schools in Kanjikuzhi, mostly women from Kudumbashree's *karshaka koottayma*¹³⁵ told me of their panchayat-wide cooperative-and need-based collective farming initiative. There was community mobilization with decentralized 'need-based' planning for public action and farmer-friendly initiatives. They told me how Mr. P.C. Swathantryam, a former panchayat president and Mr. Viswam, the agricultural officer at the time popularised collectivization of agriculture. Kanjikuzhi's innovative neighbourhood farming groups started over twenty years earlier when the traditional coir workers faced penury:

¹³⁴ Bitter gourd, cowpeas and ladies finger

¹³⁵ Farmers groups, a programme of Kudumbashree Mission.

They had no other means to live...In such a situation (they) developed the idea of the present farming scheme, and with the help of agricultural officer (we) implemented it... Conveners were appointed and seeds were made available to all...

- Government School, Kanjikuzhi

The co-operative collective farming model espoused by Kudumbashree not only intensified farming but also nurtured the leadership and confidence of women farmers. Groups at the aided school in Aryad and the private school in Kottangal also credited Kudumbashree with enabling women to leave the confines of their homes and nurture their leadership and confidence:

Look at me. I was confined to home. I stepped out of home and became the RT³⁶ of Pathanamthitta district. I have five panchayats under me...It is through the Kudumbashree programme that I developed the ability to speak in public. Even at home, you speak differently, not the way you spoke in the past. The kids and the society see you differently.... You won't get anything by sitting at home. You need to get out and work for it...

- Private School, Kottangal

Those who were part of Kudumbashree perceived collective farming and co-operation as essential to transformation. Co-operation was very important to the government and aided school groups in Kanjikuzhi and the two Aryad and Kottangal groups who took part in Kudumbashree's co-operative neighbourhood collective farming model (*karshaka koottayma*).

7.3. Discussion

The reports of community members in four panchayats — Kanjikuzhi, Aryad, Naranganam and Kottangal about fruits and vegetables they grew, bought, sold and valued, as well as their perceptions and experiences of F&V supply, production, prices and consumption showed several commonalities. Community members in all panchayats kept produce, particularly fruits, for their own use and did not buy or sell jackfruit, papayas or guavas. Community members in Kanjikuzhi mentioned more vegetables (including GLVs) they grew, sold and valued. Their reported vegetable sales were double than those of other panchayats. Even though community members in Aryad and Kottangal valued and relied more on homegrown

³⁶ Regional trainer

vegetables, they were market-dependant for most vegetables. All FGD groups said that significant barriers to F&V consumption were the scarcity and high prices caused by low domestic production, supply chain interruptions and high seasonal demand. They attributed low domestic production to unavailability of farm land, particularly due to the popularity of rubber cultivation. Another reason they gave was the shift of agriculture workers and land owners from unprofitable farming to other professions. This situation was made worse as local produce could not compete with cheap, out-of-state F&V imports. They attributed high prices also to high production costs.

Social, cultural and economic factors operating within the food system impact people's daily living conditions and food consumption patterns through their food environment (Friel *et al.*, 2015, Tian *et al.*, 1996). Food environments connect people and communities to sources of healthy food (Darmon and Drewnowski, 2008, Darrouzet-Nardi and Masters, 2017, Herforth and Ahmed, 2015, Turner *et al.*, 2017). Existing inequalities at the community or individual level such as lack of adequate marketing, transportation and nutrition knowledge, can impact food consumption patterns. Scholars argue that the agriculture sector can improve nutrition outcomes (Friel *et al.*, 2015, Gillespie and van den Bold, 2017, Wilkinson and Marmot, 2003) through policies that make nutrition the cornerstone of the food environment (Dei, 1992, Hartini *et al.*, 2003, Njoku and Nweke, 1994). Agriculture that focuses on food for people, localizes food systems and puts control locally, can increase F&V consumption and help bridge the continuing and widening gap of micronutrient deficits (La Via Campesina, 2016, Patel, 2009).

There has been a dearth of studies in Kerala on the links between agriculture and F&V availability and affordability. Of these studies, I am aware that evaluations of European Union funded KHDP/VFPCK (The Mid-Term Review Mission- European Union Mission in India, 2000), and other studies focused on capacity building and marketing (CEBECO India Private Ltd., 2010, Hall *et al.*, 2003, John, 2004, Sulaiman, 2012). These studies did not examine the impact of horticulture on availability and affordability of F&V. Among other studies that have examined availability and affordability, Pandey *et al.* found that home-gardens played a crucial role in the consumption of F&V¹³⁷ (Pandey *et al.*, 2016). There is considerable evidence that home-gardens link F&V supply with access (Headey *et al.*, 2011).

¹³⁷ Pandey quotes Adhiguru, P., Ramasamy C., 2003. Agriculture Based Interventions for Sustainable Nutritional Security. Policy Paper 17, National Centre for Agricultural Economics and Policy Research and Tamil Nadu Agricultural University, Coimbatore.

The analysis of perceptions of heterogeneous community members in Alappuzha and Pathanamthitta districts of Kerala about fruits and vegetables in their food environment confirms the key role of home-gardens to nourish people through linking agricultural production with the local food environment (Headey *et al.*, 2011, Pandey *et al.*, 2016).

Given the extensive literature about social gradients in F&V access, I expected the impacts of the food environment to vary between the different socio-economic groups. I expected to see private school groups (proxy for high-income) reporting more types of fruits and vegetables they grew, bought, and valued in their daily diet than aided and government school groups. However, F&V was generally much more affordable in Kanjikuzhi, where the community group at the government school reported a pattern of vegetable equity, with similar access to vegetables as the community groups at the aided and private schools.

7.3.1. On food for people

Supplies, production and consumption

Diets were most likely to match food supply. There was greater ability in all areas to get most of their fruits and some vegetables from their own home-gardens. Most barriers to availability were related to lack of land, supply chain interruptions, and lack of human resources and prices (Herforth and Ahmed, 2015). Greater F&V production without local retail was not reflected in greater access or affordability. Community members in Kanjikuzhi and those in Naranganam (during Onam) had a perception of greater diversity of available vegetables — home-grown, bought and sold — more *naadan* F&V than English F&V. Initiatives that intensified agriculture, especially collective farming in neighbourhood groups increased availability of and reliance on a variety¹³⁸ of indigenous F&V. Naranganam where the farmers' groups organised on the VFPC model based on the food security paradigm showed a lack of concern about the “social and economic conditions” and processes “under which food ends up on the table” (Patel *et al.*, 2007, pp. 90). The literature shows that some supply-side initiatives which result in higher production, do not increase affordability or consumption (Ackah and Appleton, 2007). There was evidence of lower vegetable availability even as production of high value F&V increased in Ghana (Dei, 1992), in Thailand (James *et al.*, 2010), in India and China, (Wang and Zhang, 2004). Export-friendly, profit-oriented agriculture policies (Itharattana, 1996, Khaliq Uz, 2011, Wang and Zhang, 2004) did not pay attention to household nutrition.

¹³⁸ Bananas, mangoes, jackfruit, papayas, guavas, pineapples, plantains, passion fruits and rose apples

The higher vegetable production in Thailand between 1970 and 2003 (1,934,000-3,236,000 tonnes per year), neither increased vegetable affordability nor consumption (James *et al.*, 2010).

Nutrition-sensitive practices led to recognizing the importance of sometimes neglected *naadan* F&V like papaya, jackfruit and jackfruit seeds and GLVs. Kanjikuzhi's experience of a panchayat-wide vegetable farming is based on a food sovereignty model which acts as a 'counterframe' to trade-based food security based on availability and access (Fairbairn, 2010, pp. 26). (Schanbacher, 2010)(Schanbacher, 2010)(Schanbacher, 2010)(Schanbacher, 2010). It is underpinned and built on "genuine agricultural reform, mutual dependence and local, small-scale community prosperity" (Schanbacher, 2010, pp. xiv).

The effect of prices on purchases

While in Kanjikuzhi the prices of vegetables with high production increased the least because they were available through small local retail or farmers' markets, this was not true in Naranganam where distribution was through auctions (Ackah and Appleton, 2007). The perceived 'affordability' of food items in the marketplace exerts a significant influence on what people purchase and eat (Global Panel on Agriculture and Food Systems for Nutrition, 2017) as it was in Pakistan during 1979 to 2010 there was a growth of profit-making crops like chillies, onions and tomatoes (Khaliq Uz, 2011). People substituted available vegetables like potatoes, tomatoes and carrots for unavailable ones like GLVs. Drewnowski and Darmon¹³⁹ as well as Mackenbach¹⁴⁰ and colleagues have stressed that among low-income groups this substitution is driven by food costs and high prices (Darmon and Drewnowski, 2008, Mackenbach *et al.*, 2019).

Strategies for coping

Coping mechanisms when F&V were less available or unaffordable were to reduce purchases, or substitute with home-grown and cheaper fruits and to avoid cooking mixed vegetable dishes. The coping strategies when faced with either high prices or lack of availability or access found in this study echoes findings by Yu that households cope with high food prices through shifting to less balanced diets (Yu, 2012).

¹³⁹ Based on studies in Europe and North America

¹⁴⁰ A systematic review based mostly on studies conducted in the USA, UK, Brazil and Australia. The systematic review also included one study each from Mexico, New Zealand, Finland, Canada, Hong Kong and France.

Disparities and social gradients

The FGDs indicated a disparity in Vitamin-A rich F&V intake. There were reports of increasing intake with increasing socio-economic status and income, similar to the social gradients in F&V intake that other studies in India had showed (Ramachandran, 2008, Sharma et al., 2006). In all panchayats except Kanjikuzhi community groups from private and aided schools valued, grew or bought more Vitamin-A rich F&V than those from government schools. In Kanjikuzhi, the community group at the government school valued, grew and bought as wide, or even wider variety of *naadan* vegetables as private and aided schools. In all panchayats except Kanjikuzhi there were food disparities among private, aided and government schools. Private and aided schools bought several commercial (cool-season) vegetables like carrots and beetroot. The aided school in Naranganam reported buying larger quantities than other groups. The market-reliant private schools groups in Aryad and Kottangal did not complain of cost and some in Naranganam said they would buy F&V irrespective of cost. Sharma and colleagues had found that expenditure on vegetables increased for the lowest economic quintile (who spent 3.75 times more in 1993-94 than in 1977-78) (Sharma et al., 2006). While private school groups seemed to buy large quantities, the government school group at Naranganam was only able to buy small amounts and one person only bought F&V when guests came. There is evidence that higher food prices widened intake and availability disparities among lower income groups in India (Mishra and Ray, 2011, Sharma et al., 2006), Sri Lanka (Gavan and Chandrasekera, 1979), Nigeria (Njoku and Nweke, 1994), and in several countries in Africa (Honfoga and van den Boom, 2003). The existing inequalities, production deficits, prices, marketing, transportation and nutrition knowledge exacerbated equity impact across groups, impacting food consumption inequalities (Levy-Costa et al., 2005, Mishra and Ray, 2011, Popkin, 2003, Ramachandran, 2008, Sharma et al., 2006). Transportation of food products to urban hubs (Florentino et al., 1992) promoted an 'urban-biased' food supply, increasing rural prices and decreasing availability, depriving rural populations of nutrition security (Florentino et al., 1992, Rahman et al., 2011).

The government's market intervention to subsidize F&V to the community during festivals increased equity and bridged equity gaps for the most vulnerable people. Besides these investments, savings because of the subsidised PDS helped people increase consumption expenditure. The Kerala government's investment that prioritized collective F&V farming reduced local market prices of produce from SHG groups and increased consumption. Several studies have validated the role of subsidies to increase F&V intake and dietary diversity (Afshin et al., 2017, Drèze and Khera, 2013, Global Panel on Agriculture and Food Systems for

Nutrition, 2017, Himanshu and Sen, 2013b, Kishore and Chakrabarti, 2015). Krishnamurthy in Chhattisgarh and Rahman in Odisha found subsidies had improved nutrient intake and diet quality (Krishnamurthy *et al.*, 2014, Rahman, 2016). As food prices vary according to time, place and type of food (Eggersdorfer *et al.*, 2016) interventions like the Chhattisgarh Food Security Act (2012), which aims to ensure adequate quantities of food and other requirements of good nutrition at affordable prices at all times (Banik, 2016), can impact food consumption.

7.3.2. On localizing food systems

The presence of commercially marketed F&V in local markets often alerted me, like a canary in the coalmine, to the possibility of strong trade networks and sparse F&V production and distribution. In areas with little local production and local distribution/ marketing — vegetables were unaffordable as people depended on commercially-marketed, cool-season vegetables with long supply chains, sourced from great distances — even internationally. They also relied on vegetable kits, bargained with retailers or bought produce from nearby towns. Indigenous F&V with short food chains were less visible in areas with little farming or areas with production-oriented agriculture (Global Panel on Agriculture and Food Systems for Nutrition, 2017). I began to wonder if it was a marker of an agricultural food desert. The FGDs highlighted that community members, who referred to F&V either as *naadan* or English vegetables (commercially marketed carrots and beetroot etc. which were introduced during British colonisation), generally preferred *naadan* fruits and vegetables.¹⁴¹ Everyone valued *naadan* fruits, especially local banana varieties. Government school groups valued, indigenous vegetables and in Kanjikuzhi there seemed to be less dependence on commercial vegetables. Such a preference for indigenous fruits and vegetables is what drove Mihesua, a member of the Native American Choctaw tribe who first came up with the term “decolonise your diet” in 2005 in an effort to restore ancestral knowledge and to resist the beliefs and practices imposed by colonisation (Kuhnlein *et al.*, 2013, Quintanilla, 2017).

The work of Englberger and colleagues in applying the go-local approach in the Pacific Islands, where dietary change contributed to an epidemic of health problems — including NCDs and micronutrient deficiencies, such as vitamin A deficiency and anaemia — has great relevance in other countries that are facing similar food and health challenges. Food composition data of the traditional foods, including breadfruit, banana, taro, yam, cassava and sweet potato and various fruits and vegetables including yellow-fleshed bananas provide

¹⁴¹ Community members valued, grew and bought these more.

evidence of their rich nutrient content and health benefits (Englberger, 2011, Kuhnlein *et al.*, 2013). Cultivating leafy greens locally was another approach taken to tackling NCDs in the Pacific Islands, with Kiribati's government promoting plants such as chaya, amaranth, kangkong, beach cowpea and purslane (Kenyon, 2018)

The agrarian reforms, apart from strengthening local food systems also enhanced the agency of women. This is corroborated by scholars who assert that women are more visible in panchayats which have had a history of strong political mobilization, and exemplify the results of a process of inclusive planning through neighbourhood groups and village assemblies that sought to overcome the inadequate participation of women in planning (Anitha *et al.*, 2008).

7.3.3. A tale of two panchayats

The Kanjikuzhi and Naranganam panchayats differed in their perceptions of F&V they valued, grew and purchased; and in their perception of how supplies and production affected F&V consumption; and also in how prices affected their purchases. These panchayats also highlighted differences in the disparities between different socio-economic groups, and in their attitudes.

First let us look at Kanjikuzhi. The community group in the government school in Kanjikuzhi reported similar access to vegetables as the community groups at the aided and private schools. They had much more equitable F&V access compared to the group in Naranganam. In Kanjikuzhi people preferred to walk to small neighbours' home-based shops to buy small amounts of fresh vegetables for their daily needs. They shared amaranth with their neighbours, telling me that after all it would go bad if it was not shared. In that group, they told me of their children rushing off with vegetables from home to deliver for cooking that day's school lunch.

Kanjikuzhi panchayat emphasized *why* farming was important. Their *raison d'être* for farming was F&V consumption, which later broadened to selling their produce. It took months and years of democratizing — community participation, community organization, community conversations, training, focus on women's empowerment and local marketing so that their local communities could enjoy the fruits of this labour (the findings in Chapter 6). The orientation of the horticulture programmes in Kanjikuzhi was based on food sovereignty and community-development. The panchayat placed technical undertakings in the service of the community. In so doing, they transformed the local food environment. Their success lay in the

inclusion of the priorities and aspirations of the underprivileged, in the decentralized agriculture planning and implementation process which gave voice and agency to small and marginal farmers and spurred the revival of a moribund agriculture sector (Dreze, 2004). This kind of deep democratic work is the cornerstone of greater equity.

This kind of vegetable equity was unknown in Naranganam where VFPCCK farmers (with land) auctioned their produce in large quantities, rather than selling in small quantities to their neighbours, vegetables were unaffordable, fruits were a luxury and they had less social relations. They reported getting affordable F&V only when the temporary Kudumbashree-led festival outlet operated. Surprisingly, despite having so much agricultural land most people in Naranganam were market-dependant and perceived low domestic production (partly due to people not being interested in farming because of other income sources), flooding of cheaper F&V from other states that made farming less profitable and disruptions to supply chain as factors that reduced F&V availability. This was paralleled by changing land use patterns as rubber cultivation became popular. Unlike in Kanjikuzhi, no one in Naranganam spoke about community mobilization and decentralized planning for public action. Instead the farmers' collective there concentrated on running a successful business with sound technical systems focusing on trading F&V, a high value commodity, to the highest bidder. The qualitative analysis revealed the exclusionary nature of commercial horticulture in Naranganam as a factor that may have limited F&V consumption there.

As I puzzled about these differences, I began to see that the differences in equitable F&V access and consumption in local food environments was due to the governance and the models of horticulture practiced. Besides practising a food sovereignty model of horticulture, Kanjikuzhi had an intensive panchayat-wide farming programme, with decisions arrived at through panchayat-wide participatory processes. This kind of responsive and participatory governance became a feature of Kerala after 1996, when decentralization devolved planning and plan funds to the local level elected bodies. This inclusive, democratic and responsive model envisioned local decisions for funds, along with local planning and implementation by the local bodies (Government of Kerala (GOK), 2006, UNDP, 2010). The differing emphasis on production, distribution and inclusivity impacted local food environments and equitable access by facilitating or exacerbating barriers to fruit and vegetable consumption (Herforth and Ahmed, 2015, Turner *et al.*, 2017).

7.4. Conclusion

Focus group discussions with community members from Kanjikuzhi and Aryad (Alappuzha district) and Naranganam and Kottangal (Pathanamthitta district) panchayats of Kerala alerted me to the key roles played by distribution of subsidized fruits and vegetables and home-gardens by linking agricultural produce with the local food environment (Headey *et al.*, 2011, Pandey *et al.*, 2016). Further, these FGDs also confirmed the discourses I identified through the witness seminar in Chapter 5, that production programmes that increase F&V production as an economic commodity (Fairbairn, 2010, Schanbacher, 2010) do not always assure nutrient-rich food for people. Instead, such production programmes can widen social disparities and increase nutrition insecurity through decisions about what to produce, how to produce and who produces and for what purpose. Organized public pressure, a feature of democratic politics, safeguarded some horticulture programmes against elitist biases and spurred effective F&V access. However, a vestige of the elitist orientation of public policy which according to Dreze (Dreze, 2004, pp. 1725) is seen in the disempowering ‘circle of exclusion and elitism’ that perpetuates deprivations, is also a feature in Kerala horticulture.

The analysis of focus group discussions also pointed to the need for Kerala state to identify diet gaps in the food system. The FGDs highlighted that community members, even as they welcomed commercially marketed vegetables like carrots and beetroot which were introduced during British colonization, preferred *naadan* fruits and vegetables¹⁴². Therefore, I suggest that it would be valuable to study and develop a classification scheme for local, tropical fruits and vegetables as had been done in the Pacific Islands.

The FGDs confirm that initiatives to grow better food through intensified nutrition-sensitive collective farming in neighbourhood groups have increased local availability of affordable F&V. Kanjikuzhi panchayat exemplifies a strategy for sustainable livelihood and an enabling environment for nutrition based on food sovereignty (self-reliance in organic, local vegetables)(La Via Campesina, 2016, Patel, 2009). This panchayat also showed evidence of more equitable F&V access as well as ‘community spirit’ as neighbours bought and sold vegetables — even small quantities of GLVs— from each other. It is imperative that Kerala overcome supply-side barriers and increase domestic F&V supply by promoting intensive vegetable cultivation and encouraging more people to enter co-operative farming. Kanjikuzhi panchayat and Kudumbashree initiatives in other panchayats have shown a way to do this.

¹⁴² Community members valued, grew and bought these more.

However, for such intensification to succeed, there needs to be easy access to land for F&V farming (rather than for rubber and other such cash crops); incentives for farmers — higher prices, assistance and compensation — and timely and affordable agricultural inputs and resources as well as incentives for production, storage and transportation infrastructure.

The findings of the FGDs that people's consumption of nutrient-rich F&V may depend on their nutrition awareness and the socio-economic context, points to the need to prioritize nutrition and food needs in the local environment, through nutrition-sensitive and equitable policy solutions that consider the social determinants of diet (Friel *et al.*, 2015, Tian *et al.*, 1996). In a context of rising NCDs (see pages 98 to 103), it is imperative that Kerala focus on growing 'better' food rather than 'more' food (Gillespie and van den Bold, 2017, Willett *et al.*, 2019).

In this and in the previous two chapters, I presented separately the findings from a witness seminar, in depth interviews with key stakeholders and focus group discussions with community members. In the next chapter, I will provide an integrated overview of stakeholder and community perceptions about the rationales that shaped Kerala's horticulture programmes, and use the food sovereignty framework to integrate their impacts on fruit and vegetable access in the local food environment.

Chapter 8. Overview of Findings

8.1. Introduction

The aim of this research was to examine the perception of stakeholders and community members about the contextual and historical factors that shaped Kerala's horticulture programmes in Kerala, India (between 1993 to 2012), and the perceived impact of these programmes on production, supplies, production and prices of fruits and vegetables in the food environment, and the differences in perception across heterogeneous groups. The research considered who had contributed, benefited or not benefited from these programmes and sought to uncover unintended consequences. It also sought to understand stakeholders' perceptions of goals for horticulture programmes and for future policies. Lastly, the research compared these perceptions *among* heterogeneous groups (from pages 160 to 167). In the previous three chapters, I presented findings separately from a witness seminar, in depth interviews with key stakeholders and focus group discussions with community members. In this chapter, I will draw together an integrated overview of findings from perceptions of both stakeholders and community members about fruit and vegetable access in the local food environment.

Research question 1

Research Question 1: What 'discourses' and rationales shaped the horticulture programmes?

In the first section I summarise the rationales for the horticulture programmes from the perspective of the stakeholders. In the next section I review the impacts of the horticulture programmes on fruits and vegetables in the food environment as food for people from the perspectives of both stakeholders and from community members in Kanjikuzhi, Aryad, Naranganam and Kottangal panchayats. My purpose is to examine the impacts of horticulture programmes on the food environment, and to understand heterogeneity of impact across groups. Further, I summarise their perspectives on localizing food systems, building knowledge and skills and on nutrition and gender relations. Finally, I summarise their perspectives on the unintended consequences, challenges, lessons and recommendations.

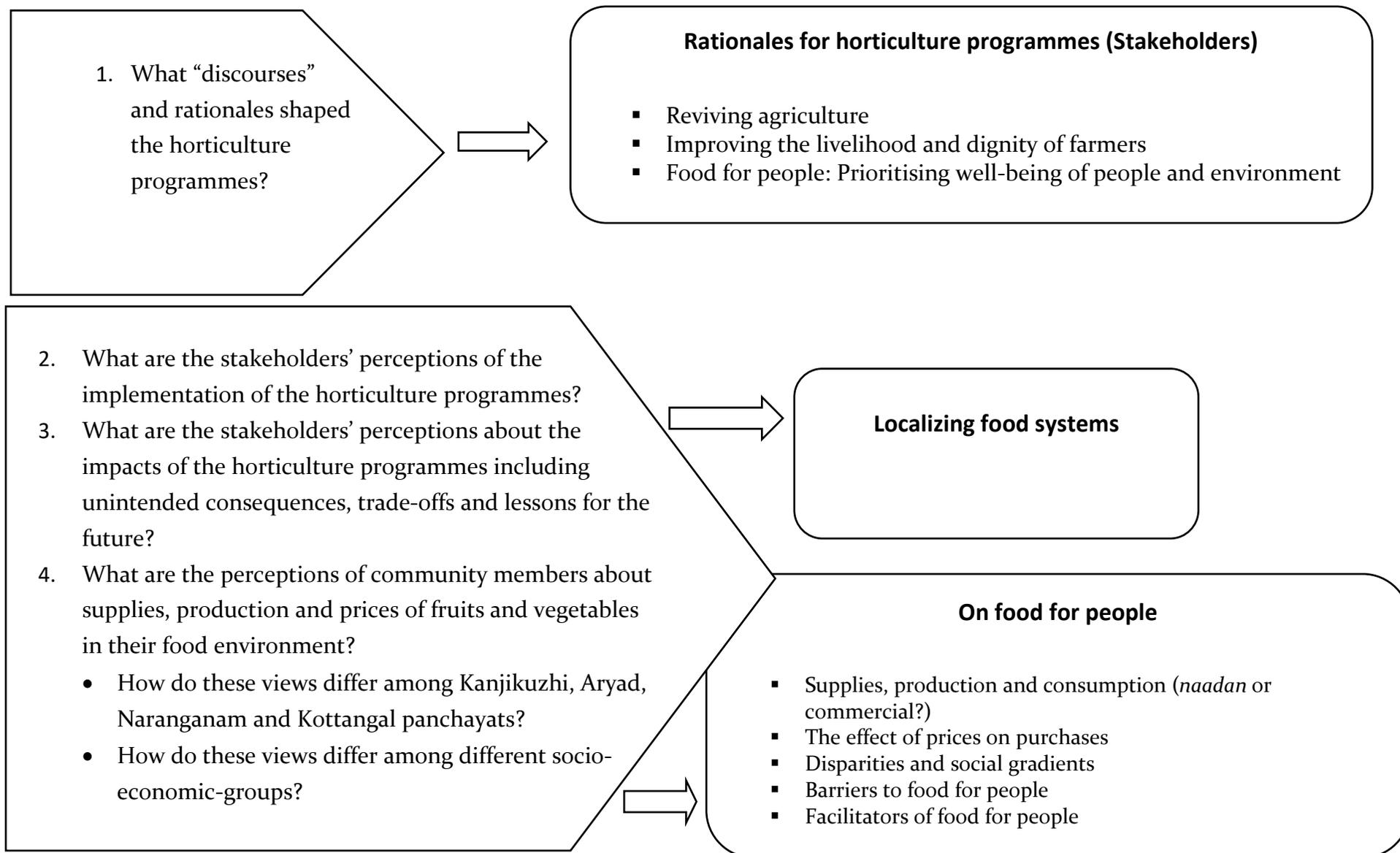


Figure 12: Research questions and findings

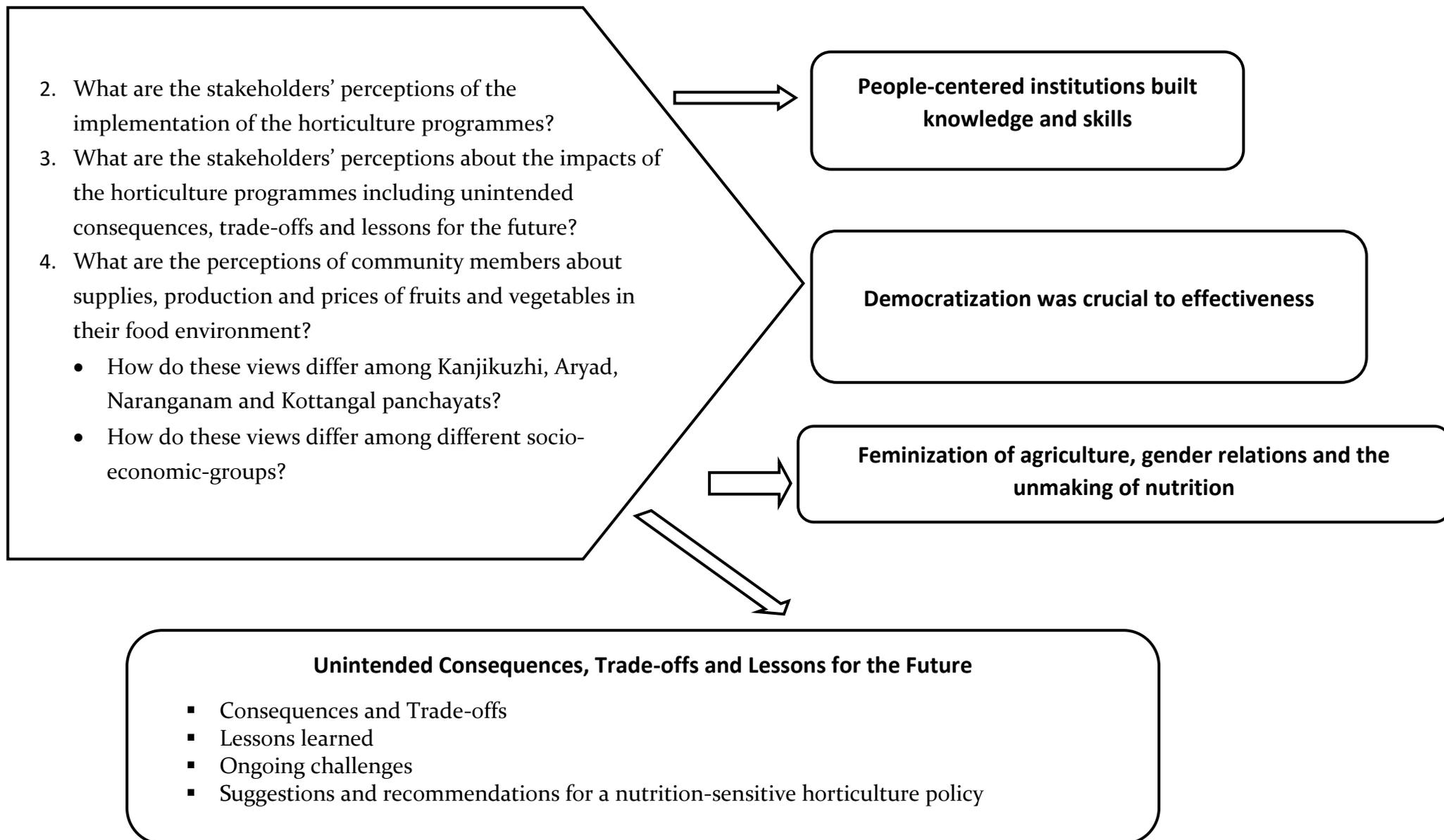


Figure 13: Research questions and findings (continued)

8.2. Rationales that shaped Kerala's horticulture programmes

Three main rationales that emerged as drivers of the horticulture programme were: 'reviving agriculture,' 'improving the livelihood and dignity of farmers through economic development,' and 'food for people' through prioritising well-being of people and environment through vegetable self-sufficiency and increasing consumption of affordable and safe fruits and vegetables. A comparison of these themes suggest an evolution of what was initially a plan to improve the livelihood and dignity of farmers, which morphed into a rationale to revive agriculture, and later evolved into a rationale that addressed food for people. Advocates of livelihood and economic development point out ways in which farmers could earn more income with appropriate marketing and limiting waste; while others who see 'prioritising well-being of people and the environment' raise red flags about pesticides and challenges to biodiversity. Even as these differing discourses exist concurrently, the creative tension generated through engaging with opposing views has stimulated unity around food sovereignty, as a common ground centered on people's well-being. Thus a synergy between the availability of funds, a highly profitable domestic market, fear of pesticide poisoning and shrinking supply of pesticide-free F&V fostered a movement for local organic fruit and vegetable self-reliance. This food sovereignty movement in Kerala is not without detractors who argue that Kerala must continue growing crops for export, while receiving essential F&V and other food crops from other states.

Reviving agriculture: Democratic decentralization and decentralized agriculture plans using 33% of the state budget that devolved to local level to grow vegetables helped spur the revival of agriculture.

Improving the livelihood and dignity of farmers: Agricultural reformers believed that helping farmers improve their livelihood, through export and sales of marketable surplus of desirable vegetables to urban areas and to the diaspora, would ensure both their freedom from exploitative moneylenders, and improve their dignity and stature in society. This 'dignity' approach, sought to change power relations between farmers and bankers, universities and bureaucrats.

Food for people: prioritising well-being of people and environment: Organic farming that ensured water, soil and F&V safety was a cornerstone of a rationale for growing F&V for the well-being of people and the environment. This rationale

emphasised biodiversity, ecosystem interdependence and local food culture and perceived the profit-seeking economic development model as harmful to 'agri+culture'. Instead, the focus was on increasing income of local communities who would primarily grow vegetables as food-for-people — catering to the table, not the market.

Research questions 2, 3 & 4

Research questions 2: What are the stakeholders' perceptions of the implementation of the horticulture programmes?

Research questions 3: What are the stakeholders' perceptions about the impacts of the horticulture programmes including unintended consequences, trade-offs and lessons for the future?

Research questions 4: What are the perceptions of community members about supplies, production and prices of fruits and vegetables in their food environment?

- How do these views differ among Kanjikuzhi, Aryad, Naranganam and Kottangal panchayats?
- How do these views differ among different socio-economic-groups?

8.3. Perception of implementation on localizing food systems

While horticulture programmes were not designed to improve nutrition, these culture-changing processes helped create an enabling environment for nutrition. As panchayats and women's self-help groups entered into collective F&V farming, the produce from smallholder agriculture proved an alternative to a purely market-oriented, trader-led, F&V distribution network. Supply chains varied from auctions that supplied traders, vegetable merchants buying directly from fields, supply and demand near production sites, supply to local festival fairs, temporary outlets, or to nearby cities. HORTICORP and KHDP-VFPCCK prevented extortion by traders by procuring produce from the farmer, and supplied fruits and vegetables through government-operated retailers.

Panchayat-wide efforts localized F&V production and consumption. In Kanjikuzhi panchayat, government policies and programmes¹⁴³ were credited with encouraging collective farming, providing financial resources (incentives, subsidies, permanent wage scheme and compensation), agricultural inputs, and marketing (including minimum support prices). These measures popularized farming and helped

¹⁴³ MGNREGA and panchayat funds were used to fund employment for local farming

flood the food environment with their produce. Kanjikuzhi was the only panchayat in this study where community members said the availability of vegetables had increased.

A sharper focus on demand-side factors could potentially have had further nutritional and health impacts. Supply interruptions were particularly distressing for market-dependent community members in the other panchayats who had to travel long distances to the nearest towns or to the few affordable government-supported outlets.

8.4. Perception of implementation on impact on food for people

Horticultural programmes assisted small farmers to increase their capability and livelihood and conserve, revive, and expand F&V farming. However, the study found that multiple, interrelated factors including prices, income, procurement systems and markets in Kerala had a mixed impact on F&V access in the local food environment. Decentralized planning for public action, community mobilization, collective farming and subsidies for F&V and agricultural inputs enabled access to F&V. Yet, affordability was the biggest barrier. Horticulture programmes do not seem to have affected F&V prices, which remained high except during festival season when the government supplied subsidized fruits and vegetables. For poor consumers, fruits and vegetables were a luxury they could not afford. As Kerala does not produce significant quantities of fruits or vegetables, high prices reserved F&V to those who could afford its cost, or had access to their own production, or had local F&V present in their food environment.

There were divergent and often conflicting views about the role of F&V as food for people. Nutritionists supported the view that increasing F&V production could not achieve nutrition security, without paying attention to barriers to F&V consumption. They were concerned about low F&V (especially *naadan* GLV) consumption, particularly in rural areas. Community members mostly wanted affordable *naadan* F&V. In contrast stakeholders from the agriculture sector seemed to conclude that people wanted desirable commercial F&V. Neglect of nutrition was associated with waste and not valuing locally-grown tropical (i.e. *naadan*) F&V. Horticulture planning based on improved incomes and livelihood, rather than improving nutrition, proved detrimental to the well-being of both producers and the community.

8.4.1. Perception of impact on supplies, production and consumption

Witnesses, stakeholders and community groups agreed that even though F&V farming in Kerala had expanded through intensified agriculture¹⁴⁴ it was unable to meet the demand. Nutritionists contended that F&V production which may have met 20% of the demand had assured neither adequate supply nor nutrition security.

However, horticulture programmes may have arrested the decline in F&V production and supply. F&V cultivation increased through interventions such as collective farming, increasing the number of home-gardens, farming on leased and vacant land, distributing grow-bags, seedlings and distributing seeds with popular magazines. F&V supply improved through marketing interventions that sourced produce from SHG groups,¹⁴⁵ efficient supply chains supplying HORTICORP mobile vans and the network of *Haritha* F&V stores, panchayat markets and farmer-cluster operated F&V outlets. Community members also credited the government's subsidized public distribution scheme for creating demand for F&V, as it enabled people to spend the savings on higher value foods.

Perception of impact on naadan fruits and vegetables

Community members in all panchayats, especially those from government schools valued *naadan* F&V and homegrown fruits such as local banana varieties¹⁴⁶, papayas, guavas, mangoes and jackfruits. Most community members kept vitamin A-rich fruits for their own use. Where there was intensified F&V farming as in Kanjikuzhi, community members relied more on homegrown *naadan* vegetables and there was more *naadan* F&V in panchayat markets. In other places, those who could afford had partially replaced *naadan* with commercial F&V. Moringa leaves, widely acknowledged for its nutritious value, were neither marketed nor consumed.

Agriculture stakeholders tried to propagate pineapple and bananas as commercial crops and produce and distribute 'desirable' commercial crops like tomatoes, cabbage and cauliflower while neglecting other *naadan* F&V. Community members said that pineapples plants which had served as hedges had disappeared outside the cash economy. Commercially grown vegetables like tomatoes were available in all panchayats. Some agriculture policymakers considered *naadan* F&V as 'common vegetables' meeting

¹⁴⁴ Through innovative initiatives such as the campaign for a thousand vegetable villages, farming in peri-urban areas to feed cities, distributing grow-bags and seedlings for terrace-farming in cities.

¹⁴⁵ Panchayat and farmer-cluster markets (*vipanis*).

¹⁴⁶ Poovan and jnalipoovan

the needs of certain segments of the population; they viewed Kerala's inability to produce desirable vegetables such as cabbages and cauliflower as a fundamental problem to overcome. They were proud that high value, non-native, 'fruits of the rich' like imported California or Shimla apples, and kinnow mandarin hybrid from Punjab were available at the panchayat-level. Yet while agriculture planners exhibited a class bias focused on production of commercial F&V mainly geared to the wealthier middle and high-income groups, community members searching for *naadan* vegetables were frustrated at finding only commercial F&V such as beans, carrot and cabbage in the government's own retail outlets.

8.4.2. Perception of effect of prices on purchases

Prices affected purchases in all panchayats, especially fruit purchases. In Naranganam there was a perception that fruits were a luxury and that exorbitant vegetables' prices never decreased. People in all socio-economic categories desired to buy expensive F&V like apples and commercial vegetables for their children. However most groups reported buying small quantities¹⁴⁷ of vegetables.

When F&V was either expensive or unavailable, community members in all panchayats substituted with home-grown produce, halved their purchases (even those from private and aided schools), or bought cheaper, prepacked vegetable-kits and avoided cooking mixed-vegetable preparations. Some avoided vegetables, switching to eating cassava and fish, or ate rice with dried fish or meat.

8.4.3. Perception of disparities and social gradients

Prices affected purchases. Some community members in the government school groups in Aryad, Kottangal and Naranganam bought as little vegetable as possible. Private school groups and the aided school group in Naranganam reported buying larger quantities of vegetables; they said they would buy F&V irrespective of cost. The Naranganam government school group reported greater F&V affordability during Onam when they had access to the seasonal Kudumbashree vegetable outlet selling subsidised F&V.

¹⁴⁷ Half the groups bought between a quarter and half a kilo.

There were less food system disparities in Kanjikuzhi. The community group at the government school in Kanjikuzhi, valued, grew and bought a wider variety of *naadan* vegetables and GLVs than private and aided schools. In comparison, the government school groups in Kottangal and Aryad panchayats did not have a panchayat-wide farming initiative and had fewer government-supported retailers.

There were more food system disparities in Naranganam. In Naranganam community members at the government school confessed that F&V were too costly and that they generally bought it in very small amounts.

Some prices hikes were seasonal, some were permanently expensive. Cowpeas and commercial vegetables were said to be always expensive in all panchayats. *Naadan* F&V was reputed to be expensive during Vishu, Onam festivals, and during the Sabarimala season.

Commercial vegetables were a ubiquitous marker of social disparities. More private and aided school groups reported buying more quantities and types of commercial fruits and vegetables than government school groups. *Government school groups grew and sold the most types of vegetables.* They generally did not value commercial vegetables much. No private school reported selling vegetables.

8.4.4. Barriers to food for people

Stakeholders and community members in all panchayats observed that low domestic production, and subsequent dependency on an exploitative and volatile sellers' market, left them a prey to powerful trade networks. Moreover stakeholders believed that in order to increase profits, these cartels created artificial scarcity by destroying excess F&V production. A weak government-supported marketing system was perceived as a barrier to F&V access. Community members attributed seasonal and festival-related price spurts to ineffective or skewed government policies, and scarcity caused by supply chain interruptions.

Further, the agri-business-oriented approach that favoured income and profits, dictated what crops were raised and where and to whom it was sold. Nutritionists felt that a widening of rural-urban disparities had taken root due to insufficient rural cultivation and supply of *naadan* F&V, coupled with marketing skewed in favour of urban areas.

Community members believed that policies of giving handouts to producers of exportable plantation crops, while denying F&V farmers necessary land and water caused low F&V supply. They noted that high input costs coupled with a minimum support price and competition from cheap, out-of-state F&V imports hurt local production. Thus both supply and demand barriers reduced F&V access in the food environment.

8.4.5. Facilitators of food for people

Community members observed that subsidised F&V from Government-supported wholesale and retail shops, farmers' markets and Kudumbashree kiosks and isolation from trader networks enhanced local distribution, sharing and consumption. However, stakeholders highlighted the role of imports and trader networks in increasing availability.

Nutrition-sensitive organic and traditional agriculture and local sales improved access to GLVs. While community members in all four panchayats stated that they generally relied on home grown fruit¹⁴⁸ for their consumption, witnesses and stakeholders thought that seasonal fruits were being wasted. Community members felt that subsidized PDS had enabled them to spend the savings on F&V. Distance to market and cost of travel were critical factors in facilitating access.

8.5. Perception of implementation: caring leaders and people-centered institutions built knowledge and skills

Stakeholders, witnesses and community members involved with panchayat-wide or Kudumbashree farming initiatives, credited visionary and democratic leaders with building people-centered institutions,¹⁴⁹ while implementing horticulture programmes. These leaders, seen as devoted to societal well-being were perceived by witnesses, stakeholders and by some community members as facilitating a transformation of F&V farming, enhancing nutrition in health care settings and advocating for nutrition-sensitive, safe agriculture. A stakeholder observed that these leaders brought back a sense of mission-driven togetherness to a society that was rapidly becoming focused on “self-centred, self-growth, self-perpetuity”.

¹⁴⁸ Seasonal tree fruits like mangoes, jackfruit, as well as bananas, papayas, guavas, pineapples, plantains, guavas, passion fruits and rose apples.

¹⁴⁹ KDHP/VFPCK, Kudumbashree, the Department of Agriculture, Kerala State Horticulture Mission, State Horticulture Mission, Horticorp, panchayats, NGOS, Krishi Vigyana Kendra (KVK), Organic Farmers Association and Prakrithi Jeevana Samithi and organic farmers.

The horticulture programmes prioritized need-based training for capacity building for farmers through participatory training for master farmers and training in organizational and practical skills, and through access to land, credit and other resources.

8.6. Perception of implementation: democratization was essential for effectiveness

By enhancing farmers' capabilities through democratizing and shifting power, agrarian reforms and decentralization gave voice and agency to small and marginal farmers and helped panchayats build an enabling environment for nutrition. Farmer-friendly processes helped to slowly diffuse and democratise power by transferring it from bureaucrats to peoples' representatives. KHDP leaders supported decisions made by farmers, not by experts, scientists, the officers or by the banks. Policymakers wanted farmers, not officials or experts, to decide what should or should not be done.

8.7. Perception of implementation on feminization of agriculture, gender relations and on unmaking of nutrition

Feudal attitudes toward women, as well as the absence of gender equity resulted in the absence of women academics and nutrition professionals at the higher echelons of decision-making. There was a perception that neglect of nutrition was primarily due to not recognizing nutrition professionals as key stakeholders in nutrition decisions. Humiliation, mudslinging and name-calling were tools of social control over vocal women. Though it allowed F&V farming to become more sustainable, inequalities based on gender and class discrimination influenced women farmers' access to technical, financial and other resources. Few male agriculture extension officers recognised women as farmers or visited the fields that women cultivated. Since 90% of the women's joint liability groups did cultivation on lease lands, the rising cost of land leases, insecurity of land access and inability to get cultivable land impacted women's involvement in F&V farming. Though there was hope that gender-based reservation in panchayat bodies would nurture women's political leadership, the intersectionality of gender, class and caste as well as the nexus between governance and professional elitism kept women out of decision-making and formulating policies on nutrition-sensitive agriculture.

8.8. Perception of impact on unintended consequences, trade-offs and recommendations for the future

In this section I summarise the stakeholder and community perceptions of unintended consequences and trade-offs of the horticulture programmes. I also provide a summary of the lessons, suggestions and future policy directions in nutrition-sensitive horticulture for Kerala's horticulture programmes.

8.8.1. Unintended consequences and trade-offs

The agribusiness model of horticulture was perceived to have several unintended effects. These included use of dangerously high levels of pesticides and fertilizers¹⁵⁰ associated with 'high-tech production' methods, lack of GLV availability, subsidy-driven monocultures of profitable F&V (especially bananas, pineapples and commercial vegetables like salad cucumbers and herbs) and replacement and neglect of *naadan* F&V (including fruits like jackfruit and berries¹⁵¹) with non-traditional, commercial F&V. There was a divergence between people's desire for *naadan* F&V and the commercial F&V favoured by the agricultural institutions to meet the demand in metros and urban areas.

Nutrition security was not a priority for the for-profit, market-driven-production strategy of horticulture programmes in Kerala and only a minority grew vegetables, while three-fourths of farmers in farmer-cluster markets (*vipanis*) grew bananas, and pineapple cultivation grew six times (2008-2012). There was a perception that excessive chemical and pesticide use by the horticulture programme itself may have negatively affected GLV farming, indigenous agricultural techniques and biodiversity conservation. The popularity and profitability of leased-land F&V cultivation, besides increasing cost of land rental, resulted in unplanned expansion that converted large tracts of land from paddy to monocultures of vegetables and bananas and also created marketing issues. A positive consequence was that horticulture reforms paved the way for many more women to enter governance structures at panchayat, district and block levels.

¹⁵⁰ There was widespread fear of pesticides and fear that the heavy metal toxicity would lead to NCDs.

¹⁵¹ Mulberry, gooseberry etc.

8.8.2. Lessons learned

Stakeholders were tenacious and committed change-makers who, after listening to all sides, tried to turn crisis into opportunities. They learned that community pride in agriculture would instil the capacity to work hard even in the face of challenges. These policy makers learned that having systems for policy monitoring could provide them feedback on policy effects earlier. Such policy monitoring systems could then help them reorient policy to face future challenges, provide clarity of vision and prevent unintended consequences.

8.8.3. Perceptions of ongoing challenges

There is evidence that the perceptions of *governance* challenges were related to the overall neglect of nutrition, gender discrimination, the functioning of agriculture sector and the lack of coordination between institutions and resistance from some people. The oral history interviews with stakeholders revealed that a key driver of the neglect of nutrition lay at the intersectionality of gender and the home science profession. These stakeholders felt that there had been little discussion or effort made to improve dietary diversity, prevent nutrition-related problems, or nurture nutrition education. Further they pointed out that what propelled policy formulation in the government health system were concerns about inadequate hygiene, and about pilferage and discrimination, rather than a desire to improve nutrition. When it came to decisions, some stakeholders felt that professionals experienced in public health nutrition were simply not at the decision-making table. There were no nutritionists within horticultural programmes, or in the agricultural sector (where stakeholders suggested nutrition ought to be within the health department). With Kerala social attitudes demanding that women stay at home, stakeholders from the nutrition sector suggested there was a link between their experience of playing insignificant roles in drafting Kerala's nutrition policy and their position in the intersection of nutrition and gender in the women-dominated home science profession.

Within the state-level agriculture sector there was a paucity of reliable agricultural data and the state agriculture department was considered lethargic, not focused on farmers' needs and insensitive to gender equity and nutrition. There were reports of lack of coordination and collaboration between institutions — between the Agriculture Department and the Agricultural University and between both and central

government institutions¹⁵²; nutritionists working on NCDs with NRHM¹⁵³ and those in Government Health Service as well as between nutrition and other departments. Stakeholders who had been involved with Kerala's People's Plan and policy makers who believed that "some change has to take place in Kerala" felt that there was resistance and opposition to innovation and change from leadership unsupportive of Kerala's decentralization and staff who were "just doing their work".

Marketing continued to be an ongoing problem. Waste, low prices, weak marketing, and cheating by traders prevented farmers, especially women farmers, from getting fair prices and created a barrier for the public to access F&V.

A key leadership change while implementing innovative marketing ideas was reported as blocking marketing initiatives. The absence of effective procurement systems created a gap in the supply chain between farmer-producers and the community; this gap was filled by a layered and extensive network of traders. Even though the media focused on stories of overproduction and wastage there was reportedly little ongoing public information about F&V production and prices.

There were reports about *barriers to resources*. Even in cases where access was available, it was insecure and discriminatory. Inequalities based on gender were reported to influence women's access to resources as did class and caste-based discrimination. According to stakeholders from Kudumbashree, women landless farmers' insecure access to cultivable land made it difficult for them to get government subsidies and loans.

8.8.4. Stakeholder and community recommendations for a nutrition-sensitive horticulture policy

Stakeholders argued that Kerala, with a high rate of nutritional deficiencies and NCDs, needed policies that harmonize and are congruent with putting health at the centre of development. They agreed unanimously for the critical need to incorporate nutrition security in horticulture programmes. They sought a reframing of horticulture to support human nutrition — by prioritizing fruits and vegetables for health instead of investments (agro processing, marketing and exports) for economic development. They wanted horticulture in Kerala to go beyond farmers' profits, to nutrition-sensitive

¹⁵² The agricultural department was supposed to implement research done by institutions under the central government like the Central Tuber Crops Research Institute in Thiruvananthapuram and the agricultural university.

¹⁵³ National Rural Health Mission

programmes that improve people's well-being and promote dietary diversity through growing *naadan* F&V appropriate for local health problems. They offered several policy interventions to further this goal, such as access to land and investments that encouraged dietary diversification and assured marketing systems. The first step they argued was to accept that nutrition was a problem, and do a nutrition audit of food-related policies, programmes, departments,¹⁵⁴ and institutions. They suggested a decentralized, inclusive planning process with input from diverse stakeholders, including health, nutrition and agriculture experts and farmers, with adequate participation from men and women from traditionally marginalized communities. Further, they said nutrition-sensitive horticulture would not be possible without women's participation in decision-making and leadership. They wanted to awaken people's interest in collective farming, especially in schools and colleges, and then to provide them access to financial resources, agricultural inputs and local marketing and distribution. Stakeholders perceived that such a policy to promote safe and affordable nutrition-rich F&V to those who needed it required strong political will.

As low domestic production was a particular concern in the Kerala context, several stakeholders stressed the following objectives to increase domestic production:

1. Switch production planning from crop-based systems to nutrition-focused,¹⁵⁵ integrated horticulture and nutrition planning in tune with local nutritional needs and investments in nutritious *naadan* F&V.
2. Prioritize diverse local varieties of nutritious F&V¹⁵⁶ from panchayat to state level, with local marketing linkages in tune with local nutritional needs.
3. Financial incentives (interest-free loans and subsidies¹⁵⁷ for wide-spread toxin-free, nutrition-sensitive F&V cultivation (especially GLVs) in community and home-gardens¹⁵⁸ in non-metro and rural areas — at least on par with rubber and other cash crops.
4. Flexible, farmer-friendly support programmes.

¹⁵⁴ ICDS

¹⁵⁵ F&V to prevent anaemia, calcium deficiency, hypertension and cholesterol at affordable prices.

¹⁵⁶ Especially reviving local endangered green leafy vegetables and fruit trees.

¹⁵⁷ Subsidies especially for organic nutritionally rich native vegetables, produced by ordinary farmers rather than for English vegetables produced through high-tech horticulture.

¹⁵⁸ Deemed to have best chance to increase diverse, safe, nutritious F&V for own use, combined with a supplementary income for farmers.

5. Procurement (assured buy-back and minimum support price), appropriate value addition and marketing through HORTICORP and marketing at panchayat, block, district and state-levels.
6. Widespread nutrition-sensitive agriculture¹⁵⁹ to encourage intensive farming of organic and diverse fruits and vegetables, including policy intervention to use unproductive land, stem the loss of farm land, for land acquisition, repurposing rubber and other plantations for F&V and for access to land for tenant farmers. Also if necessary an exclusive agency tasked with increasing area of F&V cultivation.

As *affordability* was recognized to be crucial, they suggested:

1. Subsidies and stronger marketing strategies for nutrition-rich local F&V¹⁶⁰ including year-round, convenient access to outlets such as Maveli and Neethi stores and kiosks managed by Kudumbashree.
2. Implementing a farm-to-table movement with community-supported-agriculture
3. Integrating horticulture with other programmes — e.g. distributing produce at wholesale rates to PDS outlets and local institutions¹⁶¹; medical practitioners to offer prescriptions for F&V.

To create *demand* stakeholders suggested:

1. State-wide community nutrition awareness¹⁶² programmes (to educate the public regarding the importance of eating 400 grams of F&V per day, including GLVs).
2. Nutrition education for farmers, women and children that helps people to “love vegetables”.

They proposed an inclusive and gender-just Nutrition in All Policy approach that met the key challenges of coordination. Such programmes, they said, would require effective institutional coordination and partnerships. They also recommended the employment of an adequate number of nutrition professionals¹⁶³ in schools and at every level of decision-making, and a nutrition unit within the agriculture department. It was

¹⁵⁹ Including planting fruit trees on all available land, and paired distribution of F&V and seedlings.

¹⁶⁰ To market the 35-43 varieties of GLVs in convenient packs.

¹⁶¹ Schools, mid-day meal programmes, hospitals, temples, shopping centres and malls

¹⁶² Campaigns and community nutrition programmes, particularly hands-on programmes to popularize consumption of locally nutritious F&V. Growing F&V in school gardens and organizing community feasts with traditional dishes.

¹⁶³ This function to be done by nutritionists and not just by professionals from medical, agricultural, social welfare or other areas.

recognized that nutrition could be a criterion to evaluate governance and promote policy cohesion, through this Nutrition-in-All policy approach

8.9. Conclusion

This chapter has provided an overview of findings about stakeholder and community perceptions about fruit and vegetables in the local food environment as an indicator of the impact of horticultural programmes in Kerala on enabling environment for nutrition. In rationales such as reviving agriculture, improving the livelihood and dignity of farmers and prioritising well-being of people and environment through increasing consumption of affordable and safe fruits and vegetables, there is a gradual move toward food sovereignty.

While these agrarian reforms implemented by these programmes were not designed to improve nutrition, they helped to preserve F&V farming in Kerala. Places with Kudumbashree and panchayat-wide, collective farming initiatives were more likely to have localized food systems with less disparities while market-oriented horticulture programmes were more likely to increase food disparities. There was a perception that rural-urban disparities had taken root and F&V distribution was favourable to urban areas.

Prices and interruption, low domestic supplies of indigenous (*naadan*) F&V, lack of government-supported retailers and increasing transportation and production costs and fear of pesticides were barriers to fruit and vegetable consumption. A high degree of political commitment and widespread government interventions such as subsidised F&V from government-supported retailers, subsidized PDS, local production and access to land and agricultural inputs, as increasing numbers of people taking up farming facilitated fruit and vegetable consumption. Health and nutrition experts recognized that production increases without focus on barriers to access would not achieve nutrition security. Ongoing challenges were related to governance — especially the overall neglect of nutrition, gender discrimination, marketing and access to resources.

In the next chapter I will discuss the public health implications of horticulture programmes in the context of low and middle-income countries undergoing nutrition transition. I will discuss the implications of the study's findings for future policies and research.

Chapter 9. Discussion

9.1. Introduction

The overall aim of this thesis was to examine the perception of stakeholders and community members about the contextual and historical factors that shaped the horticulture programmes in Kerala, India (between 1993 and 2012); and to explore the impacts of horticulture programmes on fruit and vegetable access in the food environment. I also drew attention to the food environment pathways in low and middle-income countries undergoing nutrition transition (Dahlgren *et al.*, 2006, Nugent, 2011, World Health Organization, 2004).

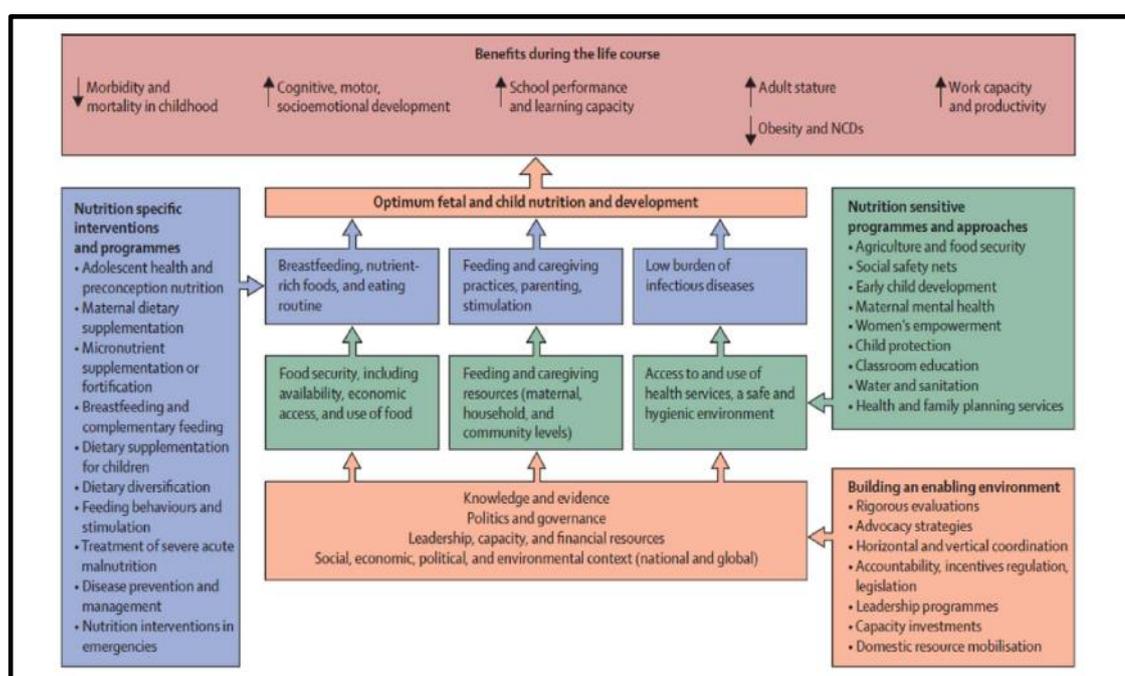
In Chapters 5, 6 and 7 I used a food sovereignty framework which (1) focused on food for people; and (2) built knowledge and skills; and (3) worked with nature; and (4) valued food providers and transformed gender relations; and (5) localized food systems; and (6) put control locally -- (Desmarais *et al.*, 2017, Edelman, 2014, Forum for Food Sovereignty, 2007, Park *et al.*, 2015) to analyse and discuss findings on the links between agriculture and F&V access from a witness seminar, in depth interviews with key stakeholders and focus group discussions with community members. In Chapter 8, I summarised the most important findings. In this chapter I discuss the overall public health implications of the key findings, and the study's strengths and limitations. The findings suggest that conflicting narratives generated a creative tension that spurred a focus on vegetables as food for people. I describe perceptions of F&V consumption and highlight how nutrition-sensitive and equity-oriented horticulture programmes may have helped bridge consumption-equity gaps in the local food environment. (La Via Campesina, 2016, Patel, 2009). Investments in subsidy-enabled interventions such as market intervention to control price rise increased affordability. Additionally, this study suggests that crosscutting issues such as democratization, policy-and-programme convergence and dissonance, neglect of nutrition, and gender bias dictated access to resources and food-system decision-making.

9.2. Conceptual framework

As I highlighted in Chapter 1, the conceptual framework developed by UNICEF (United Nations Children's Fund (UNICEF), 1990) adapted in the 2013 Lancet Nutrition Series (Black *et al.*, 2013) for optimum child nutrition and development focuses on both the

drivers of nutritional status at different levels and sectoral responses that can prevent and respond to these drivers (Gillespie and van den Bold, 2017). According to this framework the underlying layer forms the base that shapes food security and environmental conditions which affect the determinants of nutrition. This study examines how that underlying layer of economic and social contexts, leadership, capacity, financial resources, governance and knowledge played a role in building an enabling environment¹⁶⁴ supporting nutrition-sensitive agriculture and food sovereignty (and food security) approaches that enabled access to nutrient-rich F&V.

Figure 14: UNICEF's conceptual framework on child nutrition and development

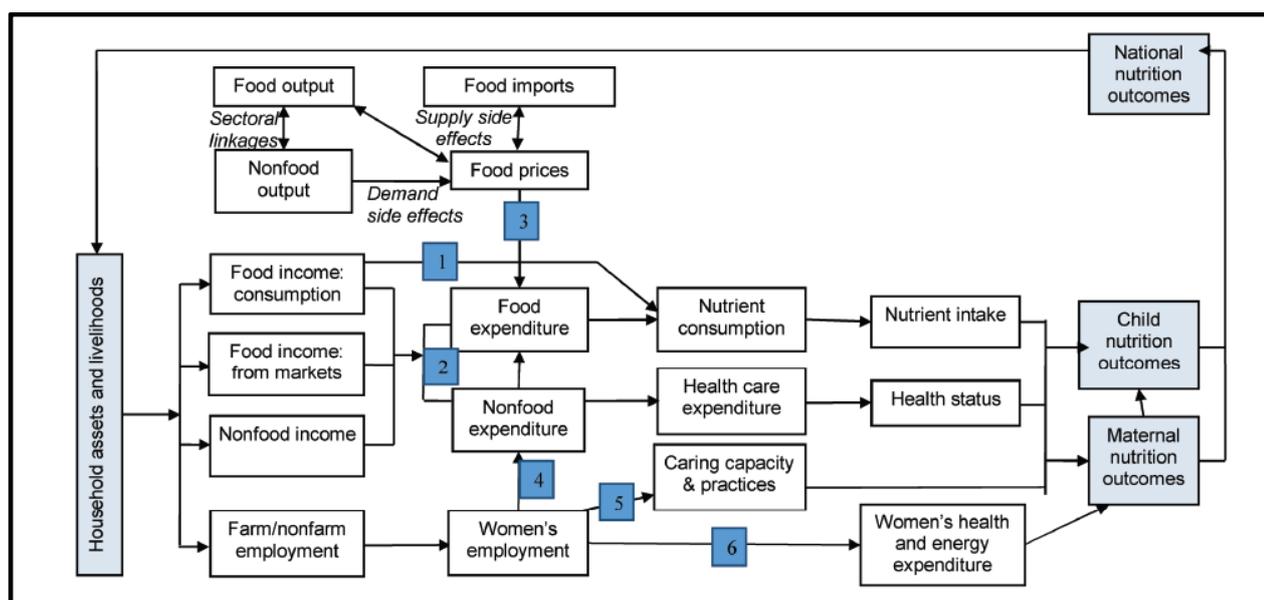


Source: (Black et al., 2013)

Moreover the Tackling the Agriculture–Nutrition Disconnect in India (TANDI) framework (Gillespie and van den Bold, 2017), which complements the more inclusive global framework in (Black *et al.*, 2013), conceptualizes pathways by which the agriculture sector enables nutrition-sensitive environments that impact nutrition outcomes (Gillespie *et al.*, 2012, Gillespie and van den Bold, 2017).

¹⁶⁴ Through advocacy strategies, coordination, accountability, incentives, legislation, leadership programmes, capacity investments and resource mobilisation.

Figure 15: The TANDI framework conceptualizing pathways and links between agricultural livelihoods and nutrition outcomes



Source: (Gillespie and van den Bold, 2017)

My findings suggest that Kerala’s horticulture programmes affected the following agriculture-nutrition pathways: Pathway 1: F&V cultivation as a source for household consumption; pathway 3: effects of agriculture and welfare policies and food prices (affecting purchasing power of buyers) on F&V consumption; and pathway 4: effects of women’s employment in nutrition-sensitive agriculture that influence the empowerment of women and their control over nutrition-relevant decision making and resource allocation. Thus these findings reveal that horticulture programmes in Kerala primarily affected pathways 1, 3 and 4.

9.3. Why we need to care about the food system

In Kerala, nutrition-related NCDs have become an emergency that accounts for over 90% of the deaths among those between 15 and 69 years of age (Indian Council of Medical Research *et al.*, 2017, Narayana, 2008, Sarma *et al.*, 2019, Soman, 2007, Thankappan *et al.*, 2010). As we saw in Chapter 1 (page 18) low F&V intake contributes to a large proportion of global micronutrient deficiencies, obesity and non-communicable diseases (Forouzanfar *et al.*, 2015, Global Panel on Agriculture and Food Systems for Nutrition, 2016a, Nugent, 2011, Ramachandran, 2006, Sesikeran, 2009, World Health Organization, 2004) and six of the top 11 risk factors for NCDs are diet related (Forouzanfar *et al.*, 2015, Global Panel on Agriculture and Food Systems for Nutrition, 2016a). Sivasankaran has

pointed to the changing patterns of food availability and low micronutrient consumption in Kerala as contributing to increasing rates of NCD mortality and morbidity, anaemia, malnutrition, and obesity (Sivasankaran, 2010).¹⁶⁵ With such grim NCD figures, it does not augur well that increased costs and low purchasing power was associated with low F&V consumption in Kerala or that most women did not include fruits and green leafy vegetables in their diet (Blossom *et al.*, 2014). There are social gradients in F&V intake, increasing intake with increasing family income (Aravindan, 2008, Kerala Sasthra Sahithya Parishad (KSSP), 2010), and in average monthly F&V expenditure, with access to fruits more unequal than access to vegetables (Kerala Sasthra Sahithya Parishad (KSSP), 2010).

Scholars argue that the agriculture sector can improve nutrition outcomes (Friel *et al.*, 2015, Gillespie and van den Bold, 2017, Wilkinson and Marmot, 2003) through policies that make nutrition the cornerstone of the food environment (Dei, 1992, Hartini *et al.*, 2003, Njoku and Nweke, 1994) and connect people and communities to sources of healthy food (Darmon and Drewnowski, 2008, Darrouzet-Nardi and Masters, 2017, Herforth and Ahmed, 2015, Turner *et al.*, 2017).

9.4. Horticulture: rationales, models *and* the local food environment— from livelihood to food sovereignty

Nutrition and health experts among the witnesses and interviewees advocated growing and marketing toxin-free F&V, instead of imported produce, easily accessible for people. Those who prioritized ‘well-being of people and the environment’ and pursued ‘vegetable self-sufficiency’ affirmed that a food sovereignty horticulture model might be a precondition for nutrition security (La Via Campesina, 2016, Patel, 2009). They focused food for people, localizing food systems and putting control locally (Desmarais *et al.*, 2017, Forum for Food Sovereignty, 2007, Jones *et al.*, 2015, Lee, 2007, Park *et al.*, 2015). Further, their yearning for well-being aligns with wanting to build an enabling environment for nutrition (Dei, 1992, Hartini *et al.*, 2003, Njoku and Nweke, 1994, Ramachandran, 2007, Sharma *et al.*, 2006, Thow *et al.*, 2011). In Kerala, such nutrition-sensitive and equity-oriented horticulture programmes prioritizing local F&V consumption that promoted intensive panchayat-wide, collective F&V farming have facilitated people’s access to fruits and vegetables.

¹⁶⁵ Dr. Beena stated this during the Witness Seminar.

This was not the sole rationale for horticulture in Kerala. As I described in Chapters 5, 6 and 8, two other rationales underpinned the horticulture movement in Kerala. A rationale to revive agriculture spurred it after a period of agricultural insecurity in the 1990s. The rationale of the pioneering KHDP (later transformed to VFPCCK) was on advancing *livelihood security*, and thereby enhancing and sustaining the *income* of fruit and vegetable farmers of Kerala. This was an ‘agri-business’ horticulture model which used agriculture reforms and interventions to harness the power of markets for income from ‘high value’ F&V production (Chapter 8). That such a model took root in Kerala was no accident. As we saw in Chapter 4, well before the initiation of horticulture programmes in Kerala, the state had a history of commercial agriculture and programmes that favoured production of revenue-oriented and export crops (Ramachandran, 2007). Studies associate a preference for commercial agriculture and low investments in food production with food production deficits, substitution and/or decreases in healthy food consumption (Dei, 1992, Honfoga and van den Boom, 2003, Khaliq Uz, 2011, Thow *et al.*, 2011) and high F&V prices especially for GLVs. These have impacted both urban and rural areas (Ackah and Appleton, 2007, Gaiha *et al.*, 2012b, Kumar *et al.*, 2009, Sharma *et al.*, 2006).

Evaluations of programmes and policies on increasing F&V output reveal that these do not always increase consumption or nutrition (Dei, 1992, James *et al.*, 2010, Wang and Zhang, 2004). Stakeholders perceived and community members seconded that, this type of agri-business horticulture programme effectively reduced access to GLV and other more nutritious crops by its choice of F&V and its method of infrastructure development for value addition marketing and distribution. Low-income groups in communities with this model of horticulture were forced to reduce or stop buying expensive fruits and vegetables from local vendors or to rely on low quality vegetable kits and potatoes, bought from nearby towns. Stakeholders from rural development, poverty eradication and gender backgrounds felt that the agribusiness model had also impacted biodiversity and obliterated indigenous agricultural techniques. This confirms Thow’s argument that production and livelihood-oriented horticulture programmes that do not prioritize local food, usually associated with large farms, and those that favour commodity markets and mono-cropping export crops, may make it difficult for the local population to meet their nutritional need for micronutrient rich F&V (Adamu, 1989, Chernomas and Hudson, 2009, Itharattana, 1996, Thow *et al.*, 2011). Furthermore, other scholars have attributed export-friendly, profit-oriented agriculture policies (Gavan and Chandrasekera, 1979, Kumar *et al.*, 2009, Rahman *et al.*, 2011, Ramachandran, 2008,

Wang and Zhang, 2004)¹⁶⁶ to changing cropping patterns. Potatoes, a market-friendly commodity vegetable, functions as a canary in the coal mine, in that a steep growth in potato production leads to higher consumption and substitution of potatoes for other nutritious vegetables and grains.

Scholars link produce from such programmes that prioritize the local food environment such as home-gardens with more F&V access (Headey *et al.*, 2011, Pandey *et al.*, 2016). Itharattana and Adamu state from the experience of Thailand and Nigeria that unlike plantation workers producing export crops, small holders consume a sizeable proportion of food crops they cultivate and sell the rest locally (Adamu, 1989, Itharattana, 1996). Pingali, Pandey and their colleagues also suggest that diversifying towards more F&V and promoting F&V in kitchen gardens in South Asia can lead to better nutrition (Pandey *et al.*, 2016, Pingali *et al.*, 2013). Kamphuis and colleagues suggest that this kind of easy F&V access in home, community and school gardens besides improving availability would increase F&V consumption in lower SES groups (Kamphuis *et al.*, 2006). However, Kadiyala's 2003 evaluation of Kudumbashree cautions against weakening nutrition focus even in successful nutrition-sensitive horticulture programmes through preoccupation with income-oriented microenterprise initiatives (Kadiyala, 2004).

This study found that the creative tension between concurrent but differing rationales — one about maximizing income and livelihoods, and the other that focused on food for people and well-being of both people and the environment — fuelled evolution and innovation of horticulture programmes. As these narratives evolved in interaction, each built on the previously articulated discourse, rejecting some elements and accepting others, and modifying or expanding them according to the context.

This kind of deeper ongoing engagement caused horticulture to morph from a purely commercial programme — rooted in a dominant economic growth ideology based on a grand political narrative of neoliberalism (that swept other ideas aside in the 1980s) — to programmes that can herald nutrition-sensitive agriculture. Health, nutrition, and gender experts and several stakeholders from agriculture and even government leaders, who recognized that commercial horticulture programmes widen existing inequalities (Batliwala and Dhanraj, 2004, Headey and Hoddinott, 2016, Kyprianou, 2005, Monbiot, 2017, 2018), acknowledged that farmers need income AND dignity AND nutrition variety,

¹⁶⁶ Gavan credits the public distribution system for rice with stimulating demand.

AND that people need F&V that are safe to eat AND that quality of the farm land and water must be protected.

This creative tension has pushed advocates of economic development to begin to support a rationale for self-reliance in organic, local vegetables as a strategy for sustainable livelihood. Unlike Nisbett's account of claims and counter claims and open hostility between the key proponents of competing narratives of political economy that shaped policy on child undernutrition in India, the fundamental differences between competing discourses in Kerala fuelled a creative tension for innovation and nutrition-sensitive agriculture that are responsible for the horticulture models that we see (Nisbett, 2017, 2018).

Stakeholders perceived that organic farming has become a cornerstone of an inclusive 'agri+culture' and 'horti+culture' based on a food sovereignty model that nurtures ecosystem-interdependence. Kerala's stated policy since 2010 (Singhal, 2016) to promote vegetable self-sufficiency through organic farming aligns with LVC's 1996 Nyéléni Declaration that sought to reorient agriculture toward agroecology (see page 94, and page 333) (Government of Kerala (GOK), 2010b, Thottathil, 2012).

9.5. Relevance of findings about focus on food for people

People's diets are most likely to match food supply. One of the major factors responsible for the low consumption of vegetables is the non-availability of vegetables, especially GLVs, throughout the year at an affordable cost both in urban and rural areas (Ramachandran, 2007). Domestic production, prices and availability were some of the determinants of F&V consumption (James *et al.*, 2010). As I explained in Chapter 1, people are more likely to consume F&V that are home grown, convenient, attractively marketed, cheap, and available in their local food environment. Policies that affect the food environment affect what is available. Therefore it is important to recognize that actions and policies across the food system through production, distribution, price and how F&V is sold, exert a significant influence on what, when and how much people purchase and eat (Global Panel on Agriculture and Food Systems for Nutrition, 2017). These measures determine whether the quality and diversity of F&V is adequate, its price affordable, and whether it can be procured and prepared conveniently (Dahlgren *et al.*, 2006, Florentino *et al.*, 1992, Hawkes and Ruel, 2006, Headey and Hoddinott, 2016, Herforth and Ahmed, 2015, Nugent, 2011).

9.5.1. Supplies, production and consumption

Horticulture models with deep connections to the social context and participatory and inclusive political processes have crystallized into institutions and programmes that have facilitated F&V availability and affordability (Batliwala and Dhanraj, 2004). This is exemplified by the perception of community members in Kanjikuzhi where the panchayat-wide programmes focused on food for people closed dietary gaps and led to nutrition-sensitive agriculture that recognized neglected *naadan* F&Vs (Global Panel on Agriculture and Food Systems for Nutrition, 2016a). As scholars have found buying produce at farmers' markets is linked to a higher likelihood of year-round F&V consumption (Gustafson *et al.*, 2013, Herforth and Ahmed, 2015). The findings about Kanjikuzhi reveal that these participatory and inclusive political processes was built on "genuine agricultural reform, mutual dependence and local, small-scale community prosperity" (Schanbacher, 2010, pp. xiv) that is a counterframe to trade-based food security based on availability and access (Fairbairn, 2010).

This study found evidence that horticulture programmes like Kerala's KHDP/VFPCCK that marketed F&V to maximize profits, have been less effective in promoting nutrition-friendly agriculture, or increasing F&V in the food environment, especially in rural areas. For example, in Naranganam, while *naadan* GLVs were absent, commercial English vegetables were present year-round. There the inclusion and participation was limited to the Onam-market, while for the rest of the year the VFPCCK farmers' groups seemed to show a lack of concern about the "social and economic conditions" and processes "under which food ends up on the table" (Patel *et al.*, 2007, pp. 90).

This finding supports scholarship that commercial F&V production programmes do not always improve consumption of nutrient-rich diets, and do not guarantee better nutrition (Dei, 1992, James *et al.*, 2010, Ramachandran, 2008, Sharma *et al.*, 2006, Wang and Zhang, 2004, Zhai *et al.*, 2014). Thus the impact of Kerala's early foray into agriculture production programmes confirms Ackah and Appleton's work that some supply-side initiatives which result in higher production do not increase affordability or consumption (Ackah and Appleton, 2007). For example higher vegetable production in Thailand between 1970 and 2003 (1,934,000-3,236,000 tonnes per year), increased neither vegetable affordability nor consumption (James *et al.*, 2010). Further, Eldis argues that increased production and supply of F&V as an economic commodity may not curb hunger and malnutrition (Eddis, 2014). Even as production increased of high value F&V in Ghana, Thailand, India and China, there was evidence of lower vegetable availability

(Dei, 1992, Wang and Zhang, 2004). Stakeholders' perceptions, similar to observations in other LMIC contexts, (Adamu, 1989, Itharattana, 1996, Rahman *et al.*, 2011, Wang and Zhang, 2004) hold that Kerala's profit-oriented agriculture reforms focusing on high value crops was perhaps detrimental to household nutrition (Gavan and Chandrasekera, 1979)¹⁶⁷ and may have led to promoting monocultures of certain F&V that replaced local, traditional varieties, neglecting GLVs and indigenous F&V such as jackfruit.

Agricultural reforms that favoured large farms (KHDP had required half an acre of landholding) and investment into income and export-oriented F&V were associated with growth of profit-making crops at the expense of diversity of F&V and smallholders (Adamu, 1989, Dei, 1992, Khaliq Uz, 2011, Thow *et al.*, 2011, Wang and Zhang, 2004). This study found that markets are crucial to the food environment. However, this study also revealed the importance of the types of F&V sold, their price, who sells them, the quantities, and the packaging in facilitating or creating barriers to F&V availability. This study found that markets may have become central to farmers, who preferred to sell their produce, rather than focus on household self-sufficiency. While the programme increased the income of marginal farmers, those farmers did not concern themselves with the nutritional or health status of the community members. Marketing to meet urban need through modernizing marketing interventions or 'rendering technical' interventions (as Li calls it)(Li, 2007) that expand urban retail networks backed by efficient logistics can exclude or almost completely bypass the local community through auctions to wholesale trader networks and retail supermarkets. Supply chains can take F&V from rural to urban areas or bring F&V from urban hubs to rural areas. For example, traders in rural areas brought commercially-grown F&V from urban hubs — carrots and other vegetables that were scarce a few decades ago (Panikar, 1971). The movement from farm to table became a movement from market to table, with the latter changing the types of available F&V, with 'modern' commercial, cool season F&V crowding out traditional F&Vs and prioritizing urban areas (Pingali *et al.*, 2013).

The Kerala government's investment that prioritized collective F&V farming and local marketing reduced local market prices of produce from SHG groups and increased consumption. Therefore, the Kerala State Planning Board's idea to open markets in each panchayat augurs well for F&V supply and consumption (Government of Kerala (GOK), 2017). Better access to markets in Benin meant greater biodiversity in farms, more buying and selling of biodiverse food, and added diversity to the diet of mothers (Bailey, 2016,

¹⁶⁷ Gavan credits the public distribution system for rice with stimulating demand.

Bellon *et al.*, 2016). In Nepal it also meant more affordable optimum diets (Biehl *et al.*, 2016).

Naadan or commercial?

The FGDs highlighted that community members preferred indigenous fruits and vegetables which they referred to as *naadan* (locally-grown traditional), over commercial, market-friendly ('cool season', Ooty or English) vegetables which were introduced during British colonisation. These *naadan* F&V had shorter food chains and were more visible in areas with more farming while English vegetables seemed to be more available in areas with little farming or areas with production-oriented agriculture. In areas with little local production and distribution people seemed to depend on commercial vegetables with long supply chains, sourced from great distances — even internationally. The presence of commercially marketed F&V in local markets often alerted me, like a canary in the coalmine, to the possibility of strong trade networks and sparse F&V production and distribution. I began to wonder if the presence of commercially marketed F&V in local markets was a marker of an agricultural food desert. To explore this tension further I had separated the F&V the community groups mentioned as either *naadan* or commercial vegetables.

My research revealed a divergence between people's desire for *naadan* F&V and the preponderance of commercial F&V favoured by the agricultural institutions to meet the demand in metros and urban areas. Joseph has highlighted the greater availability of commercially cultivated orange, grapes, mangoes, pineapples, bananas and apples in markets while *naadan* fruits like mangoes (indigenous varieties), jackfruits, anonna, papaya, guava, sapota, gooseberry and plantains had disappeared (Joseph, 2014). Some agricultural scientists mistakenly believed that the presence of imported 'high value fruits' favoured by 'the rich' in village markets was a marker of F&V access, when in fact it might have been a symptom of an agricultural and food desert, characterised by the absence of *naadan* F&V. While community members in the panchayats I studied preferred and, if available, relied on *naadan* (non-marketed) fruits and vegetables, commercial horticulture subsidized by the Horticulture Mission produced an oversupply of crops like salad cucumber, which was neither nutrient-rich nor desired locally. Most of this supply went to urban markets (Global Panel on Agriculture and Food Systems for Nutrition, 2017, Government of Kerala (GOK), 2017). *Naadan* vegetables like amaranth which was profusely available and cowpeas, that Panikar had included in a survey of food crop commodities over five decades before, were now being "treated as inferior", to be

replaced by “imported vegetables like tomato, onions and potato” (Venugopal, 2000, pp. 139) and others like carrots, cabbage and coriander that he had omitted because those were “not usually available in most parts of Kerala” (Panikar, 1971, pp. 18-19). I wonder if technocratic pride prevented agricultural scientists from appreciating what people really needed or wanted. Nutrition, which was underdeveloped even in the health sector, had become no one’s business in the agriculture sector (Babu *et al.*, 2015, Nisbett *et al.*, 2015, Swaminathan, 2009).

The absence of indigenous fruits and vegetables is what drove Mihesua, a member of the Native American Choctaw tribe who first came up with the term “decolonise your diet” in 2005 (Kuhnlein *et al.*, 2013, Quintanilla, 2017). In the Pacific Islands, Kiribati’s government tackled NCDs by promoting cultivation of their *naadan* leafy greens such as chaya, amaranth, kangkong, beach cowpea and purslane (Kenyon, 2018). The work by Englberger and by Kuhnlein and her colleagues provide evidence of food composition, nutrient content and health benefits of traditional fruits and vegetables in the Pacific Islands where, like Kerala, dietary change had contributed to an epidemic of health problems, including NCDs and micronutrient deficiencies such as vitamin A deficiency and anaemia (Englberger, 2011, Kuhnlein *et al.*, 2013). Their work has great potential in other countries and in Kerala which is facing a similar food and health challenge.

9.5.2. An affordability crisis: the effect of prices on purchases

The perceived affordability of food items in the marketplace exerts a significant influence on what people purchase and eat (Global Panel on Agriculture and Food Systems for Nutrition, 2017). Price influences what people can buy and eat, thus compromising their ability to secure minimally nutritious diets (French, 2003, Glanz *et al.*, 1998, Global Panel on Agriculture and Food Systems for Nutrition, 2016a, Global Panel on Agriculture and Food Systems for Nutrition, 2016b, Global Panel on Agriculture and Food Systems for Nutrition, 2017).

Kerala, with its low domestic F&V production, has faced an affordability crisis characterized by high mark-ups and long haul transportation costs, with prices of some vegetables increasing four-fold. F&V prices remained high, except during festival season when the government supplied subsidized fruits and vegetables. For poor consumers the for-profit, income-sensitive, market-driven approach to F & V marketing meant that these were a luxury they could not afford. There is extensive literature about production

influencing prices (Ackah and Appleton, 2007, Fuglie, 1991, Honfoga and van den Boom, 2003, Ivanova et al., 2006, James et al., 2010, Njoku and Nweke, 1994). According to Pingali and colleagues, where staple crops have had high production, as in India, the relative price of F&V is high (Pingali *et al.*, 2017). In India between 2005-06 and 2013-14, the doubling of food prices was a barrier to food access that made vegetables disappear from people's diet (Jawaharlal Nehru University Centre of Social Medicine and Community Health *et al.*, 2013, Mazumdar, 2014).

This study too showed a strong perception by non-agriculture-related stakeholders and poor community members that the pathways of price and income were significant barriers to F&V consumption. This finding is supported by Green and colleagues' study on the distinct effect of price on consumption in low-income countries (Green *et al.*, 2013) and the PURE study that F&V costs, relative to household income, facilitates F&V access (Miller *et al.*, 2016). Another study in Central West Africa attributed insufficiency of income as the single most important cause of inadequate food consumption (Honfoga and van den Boom, 2003).

Higher F&V prices may have stimulated dietary change as people ate affordable but less nutritious foods (Babu *et al.*, 1993, Honfoga and van den Boom, 2003, Njoku and Nweke, 1994, Simler, 2011). In Kerala, higher income groups were known to spend most for fruits (Kerala Sasthra Sahithya Parishad (KSSP), 2010) and low purchasing power was seen as a cause of low consumption (Blossom *et al.*, 2014). My findings that coping mechanisms when F&V were less available or unaffordable were to reduce purchases and no longer cook dishes of mixed vegetables, echo those of Yu that households shift to less balanced diets to cope with high food prices (Yu, 2012). While in Kanjikuzhi the prices of vegetables with high production increased the least because they were available through small local retail or farmers' markets, this was not true in Naranganam where distribution was through auctions (Ackah and Appleton, 2007). Therefore in Kerala, as has been the experience elsewhere, increasing F&V production accompanied by urban-facing marketing, has fuelled F&V price increases that profit farmers, while putting F&V out of the reach of poor consumers, and reducing F&V access in rural areas (Khaliq Uz, 2011, Simler, 2011, Wang and Li, 2008).

During 1979 to 2010 when there was a growth of commercial crops like potatoes, tomatoes and carrot in Pakistan, people substituted those for unavailable ones like GLVs (Khaliq Uz, 2011). Block found that rural households in Indonesia ate a third less dark GLVs during the financial crises in the late 1990s (Block *et al.*, 2004). In Andhra Pradesh,

rapid price changes during the 2007/08 food price crisis were associated with reduced food intake and increases in child wasting (Global Panel on Agriculture and Food Systems for Nutrition, 2016b).

9.5.3. Subsidy-enabled market interventions increased affordability

Several studies have validated the role of subsidies to increase F&V intake and dietary diversity (Afshin *et al.*, 2017, Drèze and Khera, 2013, Global Panel on Agriculture and Food Systems for Nutrition, 2017, Himanshu and Sen, 2013b, Kishore and Chakrabarti, 2015). Community groups were strongly in favour of Kerala's widespread equity-oriented, subsidy-enabled market interventions and policies such as subsidized PDS and agricultural inputs, distributing subsidised F&V from government-supported wholesale and retail shops to curb the rate of price rise during festival season, and to increase affordable F&V in the food environment. Further suggestions included year-round, convenient access to more government-subsidized F&V outlets. At a time of widening rural inequalities, Kerala's use of fiscal or price-control measures attempted to influence food prices selectively to bridge the equity gap. This attempt improved nutrition and health outcomes by reducing food consumption inequities and enhancing dietary diversification (Dilip *et al.*, 2013, WHO, 2016).¹⁶⁸ The government claimed that sometimes these subsidies made vegetables cheaper in Kerala than in the exporting states (Government of Kerala (GOK), 2012a, Government of Kerala (GOK), 2017). I have described this on page 91.

Decades of people-oriented development such as Kerala's large PDS¹⁶⁹ network have helped vulnerable people maintain calorie intakes¹⁷⁰ (especially during periods of price rise) and allowed more of their income to be used for nutritious micronutrient-rich foods (Drèze and Sen, 1989, Government of Kerala (GOK), 2012a, Government of Kerala (GOK), 2012b). Krishnamurthy in Chhattisgarh and Rahman in Odisha have also found improved nutrient intake and diet quality linked to PDS schemes (Krishnamurthy *et al.*, 2014, Rahman, 2016). As food prices vary according to time, place and type of food (Eggersdorfer *et al.*, 2016) interventions like the Chhattisgarh Food Security Act (2012),

¹⁶⁸ Some intervened directly in markets to ensure 'fair' food grain prices. WHO reported that 21% countries in the Americas and less than a tenth of other countries, reported price subsidies for healthy foods.

¹⁶⁹ The state government spent 400 crores (the highest amount ever spent) to provide rice at Rs. 2/per kg through the PDS.

¹⁷⁰ The Global Panel on Agriculture and Food Systems for Nutrition refers to a Cost of Diet Assessment done by Busquet E and Malam Dodo A in 2011 by Save the Children, UK and Niger.

which aims to ensure adequate quantities of food and other requirements of good nutrition at affordable prices at all times (Banik, 2016), can impact food consumption.

9.5.4. Disparities and social gradients affect diet quality

Existing inequalities, production deficits, prices, marketing, transportation and nutrition knowledge (Mishra and Ray, 2011) exacerbated equity impact across groups, impacting food consumption inequalities (Levy-Costa *et al.*, 2005, Popkin, 2003, Ramachandran, 2008, Sharma *et al.*, 2006). Higher food prices widened intake disparities (rice, vegetables, fruits, and dairy products) among lower income groups in India (FAO and Bioversity International., 2017, Mishra and Ray, 2011, Ramachandran, 2008, Sharma *et al.*, 2006), Sri Lanka (Gavan and Chandrasekera, 1979), Nigeria, Burkina Faso, Côte d'Ivoire, Ghana, Mali, and Togo (Gavan and Chandrasekera, 1979, Honfoga and van den Boom, 2003, Levy-Costa *et al.*, 2005, Njoku and Nweke, 1994, Popkin, 2003).

As other scholars have found (Dei, 1992, Florentino *et al.*, 1992, Honfoga and van den Boom, 2003, Rahman *et al.*, 2011, Ramachandran, 2008, Sharma *et al.*, 2006), in Kerala too there was a perception of urban/rural disparities in F&V prices and supply. Expenditure on vegetables increased in rural areas and decreased in urban areas. Consequently fruit consumption was found to be much higher in urban areas (Ramachandran, 2008). Transportation to and from urban hubs (Florentino *et al.*, 1992) increased rural prices and deprived people living in rural areas of nutrition security (Florentino *et al.*, 1992, Rahman *et al.*, 2011). This 'urban-biased' food supply also affects diet diversity and exacerbates inequalities in F&V consumption (Ivanova *et al.*, 2006, Levy-Costa *et al.*, 2005).

Social gradients in F&V intake

While private school groups seemed to buy large quantities, prices affected what and how much F&V the government school groups in Aryad, Kottangal and Naranganam bought. Some reported buying as little as possible, or reported occasionally eating a little F&V. The government school group at Naranganam was only able to buy small amounts. There was also a disparity in Vitamin-A rich consumption in all panchayats except Kanjikuzhi. Community members from government schools grew or bought less Vitamin-A rich F&V than those from private or aided schools. As I stated in Chapter 4, KSSP found greater inequality in access to fruits than to vegetables in Kerala (Kerala Sasthra Sahithya Parishad (KSSP), 2010). This finding is in alignment with other studies

which have found a correlation between household wealth and income with expenditure on F&V, with diet quality often following a social gradient (Darmon and Drewnowski, 2008, Honfoga and van den Boom, 2003, Kerala Sasthra Sahithya Parishad (KSSP), 2010, Mazumdar, 2014, Miller *et al.*, 2016). Blossom and colleagues pointed to low purchasing power as a cause of low F&V consumption in Central Kerala (Blossom *et al.*, 2014). Darmon and Drewnowski's review suggested that higher SES groups consumed more fresh F&V and lower SES groups consumed significantly more potatoes (Darmon and Drewnowski, 2008). The low F&V intake associated with low socioeconomic status is often due to limited access (Technical Staff World Health Organisation (WHO), 2014). In fact, Sharma in India had found that expenditure on vegetables increased for the lowest economic quintile (who spent 3.75 times more in 1993-94 than in 1977-78) (Sharma *et al.*, 2006). This is even more so when recommended diets cost many times more than the least costly diet (Panikar, 1971), or when the real cost of a nutritionally-adequate diet increases rapidly (Omiat and Shively, 2017). As we saw in Chapter 2, during times of economic crisis in Italy higher household income was associated with higher intake of fruits and lower income with lack of adherence to a Mediterranean diet (Bonaccio *et al.*, 2012, Bonaccio *et al.*, 2015).

Commercial vegetables (see page 82) were a ubiquitous marker of social disparities. The private and aided school groups in Naranganam reported buying more types of commercial vegetables. In all panchayats except Kanjikuzhi there were food disparities among private, aided and government schools. In Kanjikuzhi however, the community group at the government school valued, grew and bought a wider variety of *naadan* vegetables than at the private and aided schools. MGNREGA, India's employment guarantee scheme, which was used by several groups including in Kanjikuzhi, has been credited with reducing nutrition inequalities and enhancing dietary diversification (Dilip *et al.*, 2013). Yu says these and other policies that address food insecurity and malnutrition and target vulnerable groups are necessary (Yu, 2012).

As I said earlier, there was more food system equity in Kanjikuzhi which had panchayat-wide F&V farming. This was the reverse of all other panchayats. Concurrently there was a strong perception of food system disparities in Naranganam which had a functioning VFPCCK farmers' market with regular weekly auctions.

9.5.5. Working against nature does not protect biodiversity

While even those who recognized the environmental and health impacts of chemical inputs have not always agreed about the objectives and implementation Kerala's organic farming policy which was announced in 2010 (Singhal, 2016), the agriculture university and the government agriculture department have been accused of operating in silos without a clear vision, and that their strategies contradict the government's own goal of organic agriculture (Global Panel on Agriculture and Food Systems for Nutrition, 2016a, Pingali, 2015, Pingali *et al.*, 2013, Tontisirin *et al.*, 2002). The agriculture university and the department of agriculture, which are known to favour a technocratic, chemical-based agriculture for vegetable production, have seconded faculty who do not subscribe to the principles of agroecology to organizations like VFPCCK and the State Horticulture Mission. Perhaps due to the persistent focus on the Green Revolution narrative, and because of their earlier focus on plantation crops, they seemed to have emphasised production, rather than micronutrient outcomes (Pingali *et al.*, 2013). Whatever the reason, there is a strong perception that excessive use of agro-chemicals by horticulture programmes may have affected both GLV cultivation and biodiversity. There is also an awareness that mono-cropping of profitable non-traditional, commercial F&V may have led to displacement of *naadan* F&V varieties. These contradictions that plague Kerala could have a deleterious effect on the commendable aspiration after the endosulfan poisoning episode to convert all of Kerala to chemical-free agriculture and on Kerala's organic farming movement. If the horticulture programme helped increase the use of agrochemicals, then the programme itself is a threat to biodiversity.

9.6. On localizing food systems

A series of initiatives that began a process of agrarian reform in Kerala seems to fulfill the aspiration of LVC's 1996 Nyéléni Declaration to localize food systems (Edelman, 2014). Initiatives to improve F&V consumption through intensified agriculture, especially collective farming by neighbourhood groups, and those that were part of a panchayat-wide endeavour, increased local availability of *naadan* F&V through local markets and neighbourhood shops. Nutrition-sensitive practices also led to recognizing the importance of sometimes neglected *naadan* F&V and GLVs. These agrarian reforms strengthened local food systems and also enhanced the agency of women. This is corroborated by scholars who assert that women are more visible in panchayats which have had a history of strong political mobilization, and exemplify the results of a process

of inclusive planning through neighbourhood groups and village assemblies that sought to overcome the inadequate participation of women in planning (Anitha *et al.*, 2008).

On the other hand horticulture programmes for economic growth, initiated at a time of agricultural crisis when it was hard for small farmers to survive (Planning Commission Government of India, 2008, Thottathil, 2012), that supported trade (Fairbairn, 2010, Schanbacher, 2010), were less successful at localizing food systems.

9.7. Cross cutting issues

9.7.1. Democratization and governance

As I explain in Chapter 6, three factors — politics and governance, knowledge and evidence, and capacity and resources — are linked to an enabling environment for nutrition. The participatory governance and decentralised planning at the heart of the Kerala's inclusive democratic model (Government of Kerala (GOK), 2006, UNDP, 2010) enabled “political and policy processes that build and sustain momentum for the effective implementation of actions that reduce undernutrition” (Gillespie *et al.*, 2013, pp. 553). This not a ‘rendering technical’ intervention as Li calls it, which succeeded in achieving greater production, but failed to focus on fruits and vegetables as food for people (Li, 2007).

I argue that democratic leaders with a deep sense of empathy and solidarity with marginalized people, fostered community pride in F&V farming, eliminated the stigma of working on the land, and encouraged farmers to enter mainstream policy making. Through responsive and accountable governance (Nisbett *et al.*, 2015, Webb *et al.*, 2016) these tenacious leaders, turned crisis into opportunities by identifying, framing and implementing solutions to knotty challenges (Gillespie *et al.*, 2013, Kohli *et al.*, Lamstein *et al.*, 2016, Nisbett *et al.*, 2015, Pelletier *et al.*, 2013). They embodied Gillespie's idea of synergy through convergence at all levels. They leveraged resources and communicated evidence to those in power (Gillespie *et al.*, 2013, Government of Kerala (GOK), 2012b) and influenced their peers to mobilise around a cause (Nisbett *et al.*, 2015).

Even though strong, democratic leadership responsive to people's needs was key to the good governance in Kerala (Kohli *et al.*, Nisbett *et al.*, 2015, Pelletier *et al.*, 2013), resistance to innovation, combined with the inexperience of leaders, bureaucrats and departments in public health nutrition, have negatively impacted the food environment.

A vestige of the elitist orientation of public policy which, according to Dreze, is seen in the disempowering “circle of exclusion and elitism” that perpetuates deprivations is also a feature in Kerala horticulture (Dreze, 2004, pp. 1725). As Kohli and colleagues found in Odisha, stability of tenure of effective leaders and bureaucrats was critical to success; in Kerala, midcourse changes of institutional leadership hampered implementation of the initial vision to shorten the supply chains from farmers to the public. (Kohli *et al.*, 2017).

9.7.2. Collaboration and co-ordination: disconnect and challenges

This study points to two issues about collaboration. The first is that when and where horticulture programmes were successful, they owed a lot to convergence at the local level¹⁷¹ and extensive collaboration between institutions (Kadiyala, 2004). These partnerships, collaboration and coordination among diverse groups — institutional stakeholders, banks, agriculture universities, the media as well as a few NGOs — helped to popularize and spread F&V farming. This extends what was known before: that food systems that advance well-being need multi-sectoral platforms to catalyse and enable complementary, coordinated and integrated action across sectors that do not ordinarily work together (Gillespie *et al.*, 2013, International Panel of Experts on Sustainable Food Systems (IPES-Food) and The Global Alliance for the Future of Food, 2017). Growing evidence from India also shows that multi-sectoral convergence processes can scale up nutrition interventions (Kim *et al.*, 2017). The experiences of Thailand, Nepal, Haiti, Uganda and Kenya provide evidence of collaboration as a means to achieve enhanced nutrition and food security (Agaba *et al.*, 2016, Eggersdorfer *et al.*, 2016, Pomeroy-Stevens *et al.*, 2016, Tontisirin and Gillespie, 1999).

The second issue highlights a challenge. As scholars point out, there are a number of disconnects — between nutrition, agriculture, health, education, and infrastructure policies (Gillespie *et al.*, 2012, Joshi *et al.*, 2012). The divergent views among leaders from different professions are indicative of institutional gaps that pose barriers to coordination for nutrition policy (Gillespie *et al.*, 2013, Pingali *et al.*, 2017, Thow *et al.*, 2016). The lack of collaboration between nutrition and other departments, academic and implementing departments, and nutritionists working in state and central government institutions exacerbated the tendency to work in disconnected silos. For example, while nutritionists held that fruits were a luxury, and that many people could not afford 400 grams of F&V a day, bureaucrats considered vegetables cheap thanks to the increase in

¹⁷¹ MGNREGA and MKSP, a central government scheme for women farmers made local links stronger.

purchasing power driven by full employment and remittances — a view contested by nutritionists and health workers. Thus this study extends to Kerala the recognition that silo-like organizational structures (Shrimpton *et al.*, 2016) and institutional gaps in coordination, which arise when there is competition and divergence in goals and priorities, pose barriers to a coordinated nutrition policy (Gillespie *et al.*, 2013, Pingali *et al.*, 2017, Thow *et al.*, 2016).

9.7.3. Is the neglect of nutrition related to gender bias?

This research has found gender bias within the policy and academic environment as well as at the community level. While Kerala's experiment with food sovereignty and the entry of Kudumbashree enabled women farmers gain economic opportunities and access to F&V to feed their families and communities, it has brought women's rights and the struggle to transform gender relations which is seen as central to food sovereignty to the forefront (Desmarais *et al.*, 2017, Patel, 2012, Wittman *et al.*, 2010). As I described in Chapter 4, scholars have pointed out consistent gaps in women's agency, public participation and decision-making, alongside increasing violence against women in Kerala (Anitha *et al.*, Erwér, 2003, Erwér, 2011, Rose, 2014, Thampi and Devika, 2012). In Chapter 5 and 6 we saw that the persistence of patrifocal bias toward the interests of men and boys¹⁷² and class discrimination, systematically placed women in an inferior position, limiting women's access to leadership positions (La Via Campesina, 2014, Park *et al.*, 2015) and regulated their access to material and social resources (Eapen and Kodoth, 2002, Mukhopadhyay and Seymour, 1993).

Realizing the barriers women face in nutrition-sensitive agriculture and nutritional access, Pingali and Sunder acknowledge that policies that support women's empowerment and education are crucial to ensure a more nutrition-sensitive food system (Pingali and Sunder, 2017). Erwér points out that the perception of agency is crucial, (Erwér, 2003, Erwér, 2011). The agency revealed by women who were part of the panchayat-wide farming initiative in Kanjikuzhi is corroborated by scholars who assert that women are more visible in panchayats that have had a history of strong political mobilization.¹⁷³ They exemplify the results of a process of inclusive planning that sought

¹⁷² Mukhopadhyay and Seymour distinguish 'patrifocal' as more flexible than 'patriarchy' which implies that males always predominate in all settings, and contexts and at all stages of the life-cycle. Their patrifocal concept is more adaptable to pressures for change.

¹⁷³ Anthology of Abstracts of Panchayat-level Status of Women, Kerala Institute of Local Administration, SAKHI Women's Resource Centre, SDC-CAPDECK. 2007.

to overcome the inadequate participation of women in planning (Anitha *et al.*). As an unintended consequence of decentralization, women's leadership in local self-governments nurtured their leadership skills (Devika, 2012, Mansuri and Rao, 2013a, Nisbett *et al.*, 2017).

Why was nutrition neglected in horticulture programmes? This study found that nutrition work in Kerala is a segregated occupation — a sign of gender inequality. While Pingali and colleagues stressed the need to empower women as decision-makers (Pingali *et al.*, 2013), discriminatory practices and hostility toward assertive, vocal women, excluded public health nutrition professionals from access to public influence and positions of decision-making about society's well-being (Devika, 2006, Eapen and Kodoth, 2002, Erwér, 2003, Erwér, 2011, Jeffrey, 2003).

I argue that in Kerala misogyny was a tool of social control manifested as bullying, humiliation, sexual violence, and harassment that silenced and punished women who transgressed gender boundaries, discriminated against women's spaces and excluded women from leadership positions and access to resources (Anitha *et al.*, 2008, Chua, 2014, Thresia, 2014). Women's presence at decision-making forums did not ensure that their voices would be heard in the male-led governance and social development structures (Anitha *et al.*, Devika, 2010b). This gender-bias was at least partially responsible for the lack of nutrition input by nutrition professionals into food system decisions and policy making (Erwér, 2003, Jeffrey, 2003, Vaitla *et al.*, 2017).

This intersection between governance, professional elitism and gender bias operated to keep public health nutritionists out of leadership and participation in decision-making and setting policies. Therefore, the views of agricultural scientists who prioritized producing and distributing high monetary value F&V grown for the mass market — rather than nutritious “common vegetables” and fruits — took precedence. Doctors who were less concerned about nutrition than about hygiene, prevention of pilferage and food discrimination set the dietary policy in the government health system. This further highlights how the disempowering pervasiveness of violence mediates the attempts of women to contribute to nutrition-sensitive agriculture (Anitha *et al.*). This exclusion may have undermined not just horticulture programmes but also Kerala's nutrition status. This thesis builds on Erwér's assertion that formal equality does not produce changes in power relations between men and women. It extends this assertion past the areas of agriculture and nutrition into technical academic institutions and government policy making (Erwér, 2003).

9.8. Strengths and limitations of the study

I explained earlier how the various chapters in this thesis contribute to the development of a more coherent discourse on the food environment in Kerala. There has been a dearth of studies on the links between agriculture and fruit and vegetable availability and affordability as in the case of Kerala. Of the studies I am aware of, evaluations of European Union funded KHDP/VFPCK (The Mid-Term Review Mission- European Union Mission in India, 2000) and other studies focused on capacity building and marketing (CEBECO India Private Ltd., 2010, Hall *et al.*, 2003, John, 2004, Sulaiman, 2012). This study is perhaps the only one that examines the impact of horticulture on F&V availability and affordability in Kerala. The methods used in this study triangulate key findings. For example, some key perceptions uncovered in the witness seminar are validated in the interviews and in the focus groups. My knowledge of Malayalam, links with the community and the bureaucracy, and familiarity with Kerala's social and cultural context were strengths in understanding and interrogating the emerging analysis and later helped me consolidate the findings.

The strength of my thesis is the contribution it makes to the knowledge base about 1) the impacts of horticulture programme on food and nutritional outcomes through a food sovereignty framework; 2) the effect of narratives and rationales on shaping policies and programme orientation; and 3) the distribution impacts, including equity impacts on fruits and vegetables as people's food in the local food environment. Another key contribution this study makes is to clarify the pathways by which gender and professional status biases impact both food-system decisions and the food environment. Because the literature from a wide variety of low and middle-income countries supports the overarching themes in my findings, I propose that the findings are relevant and transferable to a broader context than that in which my study took place. In particular, it will be of particular benefit in low and middle-income countries with high rates of nutritional deficiencies and NCDs.

These findings need to be viewed along with theoretical limitations of the qualitative methods I used, as well as practical limitations I encountered while doing the study (described in Chapter 3 from pages 75 to 77). As I reflect on the research and particularly on the fieldwork, I wonder how gender bias and hierarchy operated in my interactions. Were the isolated instances of sexual harassment I faced another instance of the misogyny others had experienced? Perhaps. But finally, when I look back, my key

learning is that participatory democracy has the power to overcome entitlements bestowed by both gender and privilege.

9.9. Policy perspective and recommendations

The findings about gender, collaboration and governance indicate that Kerala needs to focus on creating multi-sectoral stakeholder participation to formulate participatory, inclusive, gender-just, system-wide changes in the food-system that strengthen nutrition sensitivity and equity in agriculture policy and horticulture programmes. These participatory processes need to harness input from the wide variety of stakeholders including farmers, especially women farmers and traditionally marginalized communities. The input of farmers into research and policies is vital.

To enable these changes, the Global Panel on Agriculture and Food Systems for Nutrition suggests identifying diet gaps and policy solutions to achieve sustainable healthy diets. The Global Panel recommends priority actions throughout the food system, particularly for children and women. They propose formulating nutrition objectives, improving nutrition knowledge and practices and monitoring nutritional impacts, concurrently with diversifying F&V production, expanding availability and affordability, ensuring safety, and reducing losses¹⁷⁴ (Global Panel on Agriculture and Food Systems for Nutrition, 2016a, VicHealth Victorian Health Promotion Foundation, 2011). This means that it is imperative that horticulture programmes be linked with health, nutrition, food safety and other programmes.

In a context where a large majority of people face constraints in access to F&V coupled with easy availability and access to junk food, there has been a strong political will in Kerala that has led the way toward progressive land reforms, improved education and health. This political environment can provide momentum to create more nutrition-sensitive food environments. All policies need to have a gender lens with constant monitoring of access to resources to prevent gender exploitation and promote uptake of resources by women.

¹⁷⁴ <http://www.fao.org/nutrition/policies-programmes/en/>

9.9.1. Implications for policy

This research offers three main suggestions for policy change. The first is to seek food systems solutions to address gaps in the food environment revealed in Chapters 4, 5 and 6. These could be achieved by overcoming supply-side barriers as happened in Kanjikuzhi, to make nutrient-rich and safe F&V more available, affordable and appealing. All stakeholders and FGD participants emphasized strategic marketing of toxin-free, subsidized and lower priced local produce (especially GLVs) in large numbers of convenient and accessible government-supported year-round farmers' markets, retail outlets, and bulk supply to other public and private programmes and institutions, as imperative steps to providing regular access. Regular year-round, farmer-led fruit and vegetable markets at the panchayat and block levels throughout Kerala could circumvent market-oriented, trader-led fruit and vegetable distribution networks. Further, such markets will promote more even supply and make F&V truly accessible and available to all people, especially to those who do not live in metropolitan areas.

While farmers need higher income, citizens (particularly lower-income and rural) need affordable F&V through short, direct supply-chains that avoid middlemen. This strategic marketing has the potential to raise fruit and vegetable consumption. Coupled with popularizing consumption of traditional F&V, community nutrition literacy and education are urgently needed.

The second recommendation, as suggested in Chapters 6 and 7, is to increase safe and nutritious traditional fruits and vegetables in the local food environment by continuing to encourage more people to grow F&V in home-gardens and do collective co-operative farming in panchayats using employment guarantee schemes like MGNREGA and to encourage farming programmes in schools and colleges. For this to be successful, investment in production, storage and transportation infrastructure are necessary, as are better procurement mechanisms, combined with incentives for farmers. Such incentives, as described in Chapter 7, could include higher prices for their produce, timely and affordable agricultural inputs and resources, financial incentives, and assistance and compensation for issues like crop failure (Global Panel on Agriculture and Food Systems for Nutrition, 2017, Organization, 2005).

Nutrition-sensitive horticulture must incorporate fiscal and land use policies to encourage dietary diversification. The witness seminar, interviews and focus groups highlighted land acquisition as crucial to stem the loss of farmland. A participant at the

witness seminar suggested land banking as a sound strategy. This would involve consolidating fallow land and allocating it to farmers, especially to women farmers who now have insecure access to farmland. Such widespread nutrition-sensitive horticulture is likely to increase farmers' livelihoods, raise people's nutrition status, and prevent or counteract health problems.

The third is to create coherence through integrated planning, action and access to resources in order to eliminate such barriers as the disconnect between stakeholders as revealed in Chapters 5, 6 and 7 and summed up in Chapter 8. Coherence among all nutrition-relevant sectors such as agriculture, health, education, social protection, commerce, public transport, and land use planning at all levels of government (including data access) is imperative. Inclusive and gender-just policy processes with input from a wider body of stakeholders drawn from health and nutrition, as well as the participation of farmers, especially women farmers and traditionally marginalized communities, in setting policies is needed.

9.9.2. Implications for practice

Implications for practice include nutrition-sensitive community strategies and systematically collected data. We saw in Chapters 3, 5 and 7 that many questions could not be answered adequately due to the absence of systematically collected data. A former member of the Kerala State Planning Board, Mridul Eapen, spoke of the challenge of capturing data and the current helplessness of planners:

We never seem to be able to capture it.... There is no way at the moment of measuring it.

- Dr. Mridul Eapen

In Chapter 5 the paucity of data was a challenge for both understanding the F&V landscape and alerting the public about F&V production and prices. Analysis of systematically collected data on sales, production, investment, output, exports and imports etc. would provide information that can be used to frame more effective policies.

Community-level interrelated strategies such as supporting nutrition-sensitive community gardens and collective farming, preventing waste through gleaning and F&V redistribution; local level initiatives for sharing and marketing in conjunction with innovative activities like community feasts, as suggested by an interviewee, can be used

for nutrition literacy. Community gardens have also been found effective in overcoming social and cultural barriers (VicHealth Victorian Health Promotion Foundation, 2011).

9.9.3. Implications for future research

The key areas for further research prompted by this analysis include examining the role of trade, welfare, transportation, food and agriculture policies and programmes in low and middle-income countries in order to transform the food environment in ways that encourage access and dismantle barriers to healthy food. This requires ongoing monitoring of the diet, nutrition and health implications of policy, plans and implementation, using health impact assessments, community based methods¹⁷⁵ and dietary diversity questionnaires¹⁷⁶ including biodiversity^{177,178} data (FAO and Bioversity International., 2017). Regular assessment and evaluation of how government departments, particularly agriculture and other allied departments, choose and implement policies can point to the positive and negative aspects of their implementation. Consumption data would also need to be compared with nutrition status¹⁷⁹ (FAO and Bioversity International., 2017). These measures will help policy makers recognize the challenges, understand how they affect ordinary people, take corrective action and frame future policy (FAO and Bioversity International., 2017, FAO and The World Bank, 2018, Kennedy *et al.*, 2011).

In light of the rapid nutrition transition underway in Kerala, further research is also needed to document changing local and regional food consumption patterns, including changes in dietary F&V intake. This research could assess whether increased fruit and vegetable production has any effect on consumption, and help formulate nutrition action plans. It could analyse routinely collected household expenditure, nutrition and other surveys to monitor changes in diet.

There is a need for researchers and farmers to document and revive traditional agricultural F&V knowledge and to support healthy diets and good nutrition. Research

¹⁷⁵ Focus group discussions, market surveys, key-informant interviews, free listings.

¹⁷⁶ Dietary diversity questionnaires (DDQs) are used to measure the number of food groups consumed by households (FAO, 2011), or by individuals including women of reproductive age (FAO and FHI 360, 2016) and children aged 6–23 months (FANTA, 2006).

¹⁷⁷ Kennedy *et al* noted there were no known studies in 2017 that had adapted a DDQ to measure the availability of food biodiversity (See Guidelines on assessing biodiverse foods in dietary surveys).

¹⁷⁸ Kennedy *et al* suggest that a multi-disciplinary team comprising of local leaders, anthropologist, nutritionist/dietitian, food composition expert, photographer, data collection assistants, community stakeholders should discuss and finalize the food list.

¹⁷⁹ Kennedy *et al* recommends using data for stunting, wasting and iron deficiency anaemia. Studies in Thailand and Peru used physical health indicators, as well as weight and height measurements from study.

on how traditional local F&V — especially GLVs — contribute to health and meet local nutritional needs can be used to guide local farming. It also might be worth developing a nutrition classification scheme for traditional fruits and vegetables that can be applied anywhere in the region.

9.9.4. Dissemination of findings

I aim to disseminate the study among academic, policy, programme, and community levels in Kerala in English and Malayalam. I also plan to write three or more academic papers for publication in academic journals.

9.10. Conclusion

The findings from this research suggest the need to shift from considering food as a commodity to considering food as a human right, and the need to shift to agriculture and horticulture policies that respond to local nutrition needs, and promote nutrition security and dietary diversification. The Kerala experience suggests that programmes can succeed in easing people's lives when there is a politically active population, women enjoy some autonomy, governance tends to be responsive and participatory, and government agencies have administrative vigour and capacity. These are all conditions for developing the political will and constituency to invest in people-friendly programmes and policies. Because the social, cultural and economic factors that operate within the food system impact people's daily living conditions and food consumption patterns (Friel *et al.*, 2015, Tian *et al.*, 1996), the agriculture sector can improve nutrition outcomes (Friel *et al.*, 2015, Gillespie and van den Bold, 2017, Wilkinson and Marmot, 2003) through policies that make nutrition the cornerstone of the food environment (Dei, 1992, Hartini *et al.*, 2003, Njoku and Nweke, 1994) and connect people and communities to sources of healthy food (Darmon and Drewnowski, 2008, Darrouzet-Nardi and Masters, 2017, Herforth and Ahmed, 2015, Turner *et al.*, 2017). Programmes that do this and expand fruit and vegetable production may improve the economic status of farmers. However, I argue that if these programmes and policies do not prioritize domestic nutrition security and dietary diversity, they are likely to have minimal impact on increasing F&V access. With nutrition related NCDs in Kerala becoming an emergency, the focus must be on growing 'better' food rather than 'more' food (Gillespie and van den Bold, 2017, Willett *et al.*, 2019) and to move from policy dissonance to policy

coherence by pursuing land use policies and people-centred models of development that put people's health at the centre of development.

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ANNEXURES

Annexure 1 Organisations

VFPCCK

Aim

To improve the *livelihood security*, and thereby enhance and sustain the *income* of fruit and vegetable farmers of Kerala.

SHGS: 6699 SHGs (women's SHG: 405), up from 1,886 in 2001

Commercial fruits and vegetables farmers: 130,000. (up from 40,958 in 2001)

Districts: 7 in 2001: Thiruvanthapuram, Kottayam, Ernakulam, Thrissur, Palakkad, Malappuram, Kozhikode districts¹⁸⁰.

National Horticultural Mission

Main objectives¹⁸¹

- a) Provide holistic growth of horticulture sector through: research, technology promotion, extension, post-harvest management, processing and marketing.
- b) Enhance horticulture production, improve nutritional security and income support to farm households;
- c) Establish convergence and synergy among ongoing and plan programmes, for horticulture development;
- d) Promote, develop and disseminate technologies for horticulture development, through seamless blending of traditional wisdom and modern scientific knowledge;
- e) Create employment generation opportunities for skilled and unskilled persons, especially unemployed youth.

¹⁸⁰ Directorate of Economics and Statistics, Government of Kerala

¹⁸¹ Source: Operational Guidelines, National Horticulture Mission

Annexure 2 Supplemental Information for Systematic Review

Protocol for systematic review

To identify upstream policy level social, structural, and economic drivers and determinants of diet in India and other developing countries.

Secondary Objective

To identify by what pathways these policy level determinants affect diet.

Inclusion Criteria

Intervention: Studies that look at and link policies to diet

Time and place: Home, community settings, large population groups

Study Participants: Adults of 18 years and over, both sexes and all races or ethnic groups in low-income economies (\$995 or less), lower-middle-income economies (\$996 to \$3, 945) and upper-middle-income economies (\$3, 946 to \$12, 195)

Countries: Low-income economies (\$995 or less) = 40

Lower-middle-income economies (\$996 to \$3, 945) = 56

Upper-middle-income economies (\$3, 946 to \$12, 195) = 48

(<https://datahelpdesk.worldbank.org/knowledgebase/articles/906519>)

– World Bank

Outcomes: Diet: change in food consumption (or in production and price), dietary pattern and nutrition

Study Design: Studies using primary and secondary data on diet which look at policy level determinants and link policies to diet (in how data is collected, analysed or discussed).

Quantitative Studies: Studies that monitor population level data of different population groups or sub-groups — of different ages, genders, places, ethnic backgrounds and socioeconomic or occupational groups — for factors including dietary intakes (dietary recalls, food records, dietary histories and food frequency questionnaires), anthropometric measures such as height and weight, biochemical measures of nutritional status or clinical assessments, or studies that use food consumption patterns and statistics.

Ecological studies such as periodic repeated surveys or other descriptive studies

Prospective cohort studies that collect information on study participants' dietary risk factors or exposure to risk factors and monitor participants for a period of time to see who develops the disease

Longitudinal studies

Sources: Peer-reviewed journals, academic research, studies by international agencies and local and government bodies, and grey literature.

Language: Studies with an English abstract published.

Exclusion Criteria

Study Participants:

Infants

Children

Adults in developed countries

Developed countries

Study Design: Studies of migrants

Countries: Countries with high-income economies¹⁸²

Outcomes: If data on diet or change of diet were not reported, if no data were reported on the relationship between exposure and outcome

Sources: Review papers, commentaries, editorials, essays, consensus statements, drug trials and treatment trials or drug studies conducted in patient groups or pregnant women.

¹⁸² A high-income economy is defined by the World Bank as a country with a gross national income per capita above US\$12,746 in 2013, http://data.worldbank.org/about/country-and-lending-groups#High_income (retrieved December 2, 2014)

Systematic review: search strategy

1.	Anthropology Plus	(kw: pattern* OR kw: trend* OR kw: chang* OR kw: driver* OR kw: determinant*) and (kw: diet OR (kw: nutrition* and kw: state) OR (kw: nutrition* and kw: status) OR (kw: nutritio* and kw: survey*) OR (kw: food and kw: consumpt*) OR (kw: food and kw: suppl*) OR (kw: nutrition* and kw: transition*) OR (kw: health and kw: transition*)) and (kw: India OR (kw: Developing and kw: Countr*)) and tl= "english"	9 (28/01/2011)
2.	BIOSIS preview	1. TS=(pattern* OR trend* OR chang* OR driver* OR determinant*) AND Language=(English) Databases=PREVIEWS Timespan=All Years 2. TS=("nutrition* transition" OR "health transition*" OR diet OR "nutritio* state" OR "nutritio* status" OR "nutrition* survey*" OR "food consumpt*" OR "food suppl*") AND Language=(English) Databases=PREVIEWS Timespan=All Years 3. #3 AND #2 AND #1 Databases=PREVIEWS Timespan=All Years 4. #3 AND #2 AND #1 Databases=PREVIEWS Timespan=All Years	1,634 (30/01/2011)
3.	CAB abstracts	1. (pattern\$ or trend\$ or chang\$ or driver\$ or determinant\$).mp. (mp=abstract, title, original title, broad terms, heading words) 2. exp India/ 3. exp Developing Countries/ 4. 2 or 3 5. diet/ or nutritional state/ or nutrition surveys/ or FOOD consumpt*.mp. or FOOD SUPPL*.mp. or nutrition\$ transition\$.mp. or health transition\$.mp. (mp=abstract, title, original title, broad terms, heading words) 6. 1 and 4 and 5 7. limit 6 to english language	4808 (28/01/2011); 372 (1/28/2012); 160 (5/29/2014)
4.	Cochrane Library	(pattern* OR trend* OR chang* OR driver* OR determinant*) AND (diet OR "nutrition* state" OR "nutrition* status" OR "nutritio* survey*" OR / "food consumpt*" OR "food suppl*" OR "nutrition* transition*" OR "health transition*") AND (India OR "Developing Countr*")	124 (28/01/2011)
5.	Econlit	1. (pattern\$ or trend\$ or chang\$ or driver\$ or determinant\$).mp. (mp=heading words, abstract, title, country as subject) 2. developing countries.mp. or exp developing country/ 3. india.mp. or exp INDIA/ 4. 2 or 3 5. nutrition\$ transition\$.mp. (mp=heading words, abstract, title, country as subject) 6. health transition\$.mp. (mp=heading words, abstract, title, country as subject)	76 (25/01/2011); 7 (1/28/2012); 20 (29/05/2014)

		<p>7. (FOOD consumpt* or FOOD SUPPL*).mp. (mp=heading words, abstract, title, country as subject)</p> <p>8. diet.mp. (mp=heading words, abstract, title, country as subject)</p> <p>9. nutrition* status.mp. (mp=heading words, abstract, title, country as subject)</p> <p>10. nutrition* survey*.mp. (mp=heading words, abstract, title, country as subject)</p> <p>11. nutrition* stat*.mp. (mp=heading words, abstract, title, country as subject)</p> <p>12. 5 or 6 or 7 or 8 or 9 or 10 or 11</p> <p>13. 1 and 4 and 12</p>	
6.	Embase	<p>1. developing countries.mp. (mp=title, abstract, subject headings, heading word, drug trade name, original title, device manufacturer, drug manufacturer)</p> <p>2. india.mp. (mp=title, abstract, subject headings, heading word, drug trade name, original title, device manufacturer, drug manufacturer)</p> <p>3. 1 or 2</p> <p>4. (pattern\$ or trend\$ or chang\$ or driver\$ or determinant\$).mp. (mp=title, abstract, subject headings, heading word, drug trade name, original title, device manufacturer, drug manufacturer)</p> <p>5. diet/ or nutritional state/ or nutrition surveys/ or FOOD consumpt*.mp. or FOOD SUPPL*.mp. or nutrition\$ transition\$.mp. or health transition\$.mp. (mp=title, abstract, subject headings, heading word, drug trade name, original title, device manufacturer, drug manufacturer)</p> <p>6. 3 and 4 and 5</p> <p>7. limit 6 to english language</p> <p>8. limit 7 to (adult <18 to 64 years> or aged <65, years>)</p>	212 (25/01/2011)
7.	Global Health (21/01/2011)	<p>1. (pattern\$ or trend\$ or chang\$ or driver\$ or determinant\$).mp. (mp=abstract, title, original title, broad terms, heading words)</p> <p>2. developing countries.mp. or exp Developing Countries/</p> <p>3. diet/ or nutritional state/ or nutrition surveys/ or FOOD consumpt*.mp. or FOOD SUPPL*.mp. or nutrition\$ transition\$.mp. or health transition\$.mp. (mp=abstract, title, original title, broad terms, heading words)</p> <p>4. 1 and 2 and 3</p> <p>5. limit 4 to english language</p>	4171 (25/01/2011)
8.	GreenFILE	(pattern* OR trend* OR chang* OR driver* OR determinant*) AND TX All Text (diet OR "nutrition* state" OR "nutrition* status" OR "nutritio* survey*" OR "food consumpt*" OR "food suppl*" OR "nutrition* transition*" OR "health transition*") AND TX All Text (India OR "Developing Countr*") TX All Text	252 (16/01/2011)
9.	IBSS (International Bibliography of the Social Sciences)	<p>Search Query #3 (pattern* OR trend* OR chang* OR driver* OR determinant*) and (diet OR "nutrition* state" OR "nutrition* status" OR "nutritio*n survey*" OR / "food consumpt*" OR "food suppl*" OR "nutrition* transition*" OR "health transition*") and (India OR "Developing Countr*") (Copy Query) 124</p> <p>Published Works results found in Multiple Databases,</p> <p>0 Web Sites results found in Web Resources Related to the Social Sciences/Humanities</p> <p>Date Range: Earliest to 2011</p> <p>Limited to: English Only</p>	124 (17/01/2011) 42 (30/05/2014)

10.	Index to theses / ProQuest Dissertations and Theses - UK & Ireland	1. (pattern* OR trend* OR chang* OR driver* OR determinant*) AND 2. (diet OR "nutrition* state" OR "nutrition* status" OR "nutritio* survey*" OR "food consumpt*" OR "food suppl*" OR "nutrition* transition*" OR "health transition*") AND 3. (India OR "Developing Countr*") ((pattern* OR trend* OR chang* OR driver* OR determinant*)) AND ((diet OR "nutrition* state" OR "nutrition* status" OR "nutritio* survey*" OR "food consumpt*" OR "food suppl*" OR "nutrition* transition*" OR "health transition*") AND ((India OR "Developing Countr*")) Database: Dissertations & Theses Look for terms in: Citation and abstract Publication type: All publication types	15 (26/01/2011)
11.	IndMED http://indmed.nic.in/	(pattern\$ OR trend\$ OR chang\$ OR driver\$ OR determinant\$) and (diet OR nutrition\$ state OR nutrition\$ status OR nutritio\$ survey\$ OR food consumpt\$ OR food suppl\$ OR nutrition\$ transition\$ OR health transition\$)/ diet OR nutrition OR food	1384 (04/02/2011)
12.	INFLIBNET http://www.inflibnet.ac.in. (doctoral dissertations submitted to the Indian universities)	diet OR food OR nutrition	2080 (09/02/2011)
13.	Medline	1. (pattern\$ or trend\$ or chang\$ or driver\$ or determinant\$).mp. (mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier) 2. developing countries.mp. or exp Developing Countries/ 3. India.mp. or exp India/ 4. 2 or 3 5. Nutritional Status/ or exp Health Transition/ or nutrition\$ transition.mp. or exp Diet/ or FOOD consumpt*.mp. or FOOD SUPPL*.mp. (mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier) 6. 1 and 4 and 5 7. limit 6 to English language 8. limit 7 to "all adult (19 plus years)"	329 (21/01/2011)
14.	Mahatma Gandhi University- http://www.mgutheses.in/print/?search=food,&page=1&rad=all	Query : food	183 (5/5/2011)
15.	New York Academy of Medical Grey Literature Report	diet OR nutrition state OR nutrition status OR nutrition survey OR	361 (08/02/2011)

		food consumption OR food supply OR Food supplies OR nutrition transition OR health transition OR	
16.	North American Dissertation Abstracts (Senate House Library)	1. (pattern* OR trend* OR chang* OR driver* OR determinant*) AND 2. (diet OR "nutrition* state" OR "nutrition* status" OR "nutritio* survey*" OR "food consumpt*" OR "food suppl*" OR "nutrition* transition*" OR "health transition*") AND 3. (India OR "Developing Countr*")	98 (25/01/2011)
17.	Popline	ABSTRACTS: pattern* / trend* / chang* / driver* / determinant* AND KEYWORDS: diet / "nutrition* state" / "nutrition* status" / "nutritio* survey*" / "food consumpt*" / "food suppl*" / "nutrition* transition*" / "health transition*" AND TITLE/KEYWORDS: India / "Developing Countr*" limited to LIMIT : English	992 (04/02/2011) 9 (2/2/2012) 342 (29/5/2014)
18.	Web of Science	1. TS=(pattern* OR trend* OR chang* OR driver* OR determinant*) 2. TS=(diet OR "nutrition* state" OR "nutrition* status" OR "nutritio* survey*" OR "food consumpt*" OR "food suppl*" OR "nutrition* transition*" OR "health transition*") 3. TS=(India OR "Developing Countr*") 4. #3 AND #2 AND #1	930 (28/01/2011) 140 (28/01/2012) 340 (29/5/2014)
19.	WHO (geographical specific – IMSEAR)	((pattern* OR trend* OR chang* OR driver* OR determinant*) AND (diet OR "nutrition* state" OR "nutrition* status" OR "nutritio* survey*" OR "food consumpt*" OR "food suppl*" OR "nutrition* transition*" OR "health transition*"))	496 (06/02/2011) 31 (29/05/2014)
		Total hits	18278 (2011) 528 (2012) 935 (2014)
	from hand search etc.		19 (2011)
	TOTAL		18288 (2011-2014)

Annexure 3 Ethical approval

LONDON
SCHOOL of
HYGIENE
& TROPICAL
MEDICINE



OBSERVATIONAL/INTERVENTIONS RESEARCH ETHICS COMMITTEE

17 November 2011

Darlana David

Dear Darlana

Study Title: Agriculture and Nutrition: The effect of a horticulture programme on vegetable price and availability — a study of the Kerala experience
LSHTM ethics ref: 6070
Department: Public Health and Policy

Thank you for your application of 28 October for the above research, which has now been considered by the Committee.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation, subject to the conditions specified below.

Conditions of the favourable opinion

Approval is dependent on local ethical approval having been received, where relevant.

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

<i>Document</i>	<i>Version</i>	<i>Date</i>		
LSHTM ethics application	n/a			
Protocol	V1.0			
Information Sheet	V1.0			
Consent form	V1.0			

After ethical review

Any subsequent changes to the application must be submitted to the Committee via an E2 amendment form.

Yours sincerely,



Professor Andrew J Hall
Chair

Local Ethical Approval

Local Ethical Approval

Email received from **S. Bala Ravi**, Advisor, M. S Swaminathan Research Foundation (MSSRF), Chennai, India:

From: "Balaravi-MSSRF" <sbala@mssrf.res.in>
To: <Darlena.David@lshtm.ac.uk>
Subject: Re: Ethics Review
Date: Mon, 28 Nov 2011 17:14:41 +0530

Dear Darlena
I here convey the Ethical approval of the 3 different Information and consent forms (witness seminar, key informant interviews and focus groups) from MSSRF.
All the best
Bala Ravi

----- Original Message -----
From: Darlena.David@lshtm.ac.uk
To: Balaravi-MSSRF20
Sent: Friday, November 18, 2011 11:35 PM
Subject: Re: Ethics Review

Dr Balaravi,

LSHTM has approved the ethical review. Could MSSRF also please approve it?

thanks

Darlana

>>> Darlena David 10/11/2011 2:18 PM >>>

Dear Dr Balaravi

As always it was good to talk with you earlier today. I am attaching the ethics review form I am submitting to LSHTM ethics review and 3 different Information and consent forms (witness seminar, key informant interviews and focus groups).

Could you let me know if you need anything more for the ethics review?

Darlana

Darlana David

PhD student

London School of Hygiene and Tropical Medicine
Faculty of Public Health and Policy
Department of Social and Environmental Health
G-29, 15 - 17 Tavistock Place
London, WC1H 9SH

Local Ethical Approval

MEDICAL TRUST HOSPITAL & DIABETES CARE CENTRE

Kulanada - 689 503, Pathanamthitta Dist., Tel :04734 260431, 262531
E-mail : mthdcc@gmail.com



Dr. G. Vijayakumar, MD, DTM&H, G.Dip.D.C.
Chairman & Managing Director

30 November 2011.

On behalf of The Ethics Committee, Medical Trust Hospital And Diabetes Care Centre, Kulanada, I am happy to approve the Ethical Approval application by Darlena David for the information and consent forms for the Witness Seminar, Key Informant Interviews and for the Focus Groups Discussion for the project : **Agriculture and Nutrition: The effect of a horticulture programme on vegetable price and availability — a study of the Kerala experience.**



Dr G Vijayakumar

Dr. G. VIJAYA KUMAR
Chairman
Medical Trust Hospital
And Diabetes Care Centre
Kulanada P.O., Pathanamthitta (Dist.)
Pin : 689 503

Annexure 4 Witness seminar invitation and background documents



Pearl Hill, Near Gowri Theatre,
Attingal,
Thiruvananthapuram-695101
Ph: 9947460075

Shri. R. Hefi

Sir,

Sub: SHM-Kerala-Conduct of witness seminar - Participation Request- reg;

Ref: Arising

Mrs. Darlena David, a PhD scholar in the London School of Hygiene & Tropical Medicine, is doing her doctoral studies in "Agriculture and Nutrition: The effect of horticulture programme on price and availability of fruits and vegetables – a study of the Kerala experience". This study has been approved by the London School of Hygiene and Tropical Medicine, and by M. S. Swaminathan Research Foundation, Chennai, India. She has requested the assistance of State Horticulture Mission-Kerala, in her studies. In this regard, SHM-K has agreed to host the Witness Seminar of her PhD programme on **19th July, 2012, 10.30 AM, at the Banquet hall, Government Guest House, Thycaud, Thiruvananthapuram.**

In this regard, your participation as a panel member is solicited. You are requested to kindly make it convenient to attend the seminar and contribute valuable suggestions. It is also informed that no TA/DA will be borne by SHM-K. A brief description of the witness seminar is also enclosed.

Yours faithfully,

Sd/-

Mission Director

Letter to Panel Members

The purpose of the witness seminar on the development of horticulture in Kerala will be to gather oral testimony both from the panel and from the selected audience (with backgrounds and perspectives in agriculture, health, food and nutrition and gender) to provide a detailed view of the decisions, and series of events that led to shaping the horticulture programme. The Seminar will be facilitated by Dr K.N Harilal, former member (Agriculture) of the Kerala State planning board.

The panel members will have 10-15 minutes to will explore and discuss the issues surrounding the historical context that shaped the development Kerala's horticulture programme.

The issues to be explored in the Witness Seminar are outlined below:

1. The context: The historical (economic, agricultural, trade and socio-political) context.
2. Implementation: intentions and hopes (behind starting / changing / developing) the horticulture programme; what did it / you hope to do? Why did things happen the way they did? How did change begin? Where did change come from? Experiences of early opportunities and challenges.
3. Impact and Evaluation: successes, major achievements and milestones; looking back: Who contributed? Who benefited? Who did not benefit? Who lost? Trade-offs – gains and losses.
4. Role of horticulture in nutrition and availability & affordability of fruit and vegetables.
5. Current and future opportunities and challenges.
6. Lessons for future policy.

Prepared scripts, slides or other visual material and papers are neither expected nor needed as they may disrupt the flow of the meeting. However, we can photocopy and circulate any key illustrations, graphs or figures to the participants.

The meeting will be fully recorded, the tapes transcribed and unedited transcript sent to you so you can check your own contributions and provide brief biographical details which will be incorporated into the text. You will be able to correct and amend anything you have said in the transcript which you are unhappy with, and to add any further details which can be included as appropriate.

The Witness Seminar will feed into a doctoral thesis and into potential publications for wider dissemination. The document that results from this meeting will provide a historical view of the context, intent, process and the series of events that led to shaping the horticulture programme (cultivation of fruits and vegetables) in Kerala.



GOVERNMENT OF KERALA

STATE HORTICULTURE MISSION- KERALA

THIRUVANANTHAPURAM- 695 034

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e-mail: mdshmkerala@yahoo.co.in



Dr. K. PRATHAPAN
MISSION DIRECTOR
42/SIIM/12

4th July, 2012

To

Dr. S Usha,
Programme Co-ordinator,
THANAL, H-3, Jawahamagar,
Trivandrum-3,
Ph: 0471-2727150

Madam,

Sub: SIIM-Kerala-Conduct of witness seminar - Participation Request- reg:

Ref. Arising

Mrs. Darlena David, a PhD scholar in the London School of Hygiene & Tropical Medicine, is doing her doctoral studies in "Agriculture and Nutrition: The effect of horticulture programme on price and availability of fruits and vegetables – a study of the Kerala experience". This study has been approved by the London School of Hygiene and Tropical Medicine, and by M. S. Swaminathan Research Foundation, Chennai, India. She has requested the assistance of State Horticulture Mission-Kerala, in her studies. In this regard, SHM-K has agreed to host the Witness Seminar of her PhD programme on **19th July, 2012, 10.30 AM, at the Banquet hall, Government Guest House, Thycad, Thiruvananthapuram.**

In this regard, your participation in the seminar is solicited. You are requested to kindly make it convenient to attend the seminar and contribute valuable suggestions. It is also informed that no TA/DA will be borne by SIIM-K. A brief description of the witness seminar is also enclosed.

Yours faithfully,

Sd/-

Mission Director

Why is the Witness Seminar being done?

Agricultural policies — specifically horticulture programmes that contribute to dietary diversity can ensure affordable year-round supply of food crops, vegetables and fruits. Research is needed on the role of policies (especially agriculture and food policies) in transforming the food environment to encourage access or to create barriers to healthy food. It is especially important to understand why and how horticultural programmes influence the pathways to nutritional status. It is vital to understand the effect of horticulture programmes on the local availability and affordability of fruits and vegetables in communities experiencing high rates of non-communicable diseases.

The aim of this research is to examine the development and consequences of the horticulture programme in Kerala. Using the Kerala state in India as an example, I propose to try to fill gaps in knowledge on the role of horticulture programmes in transforming the food environment to encourage access or to create barriers to healthy food. I will seek to answers to the following questions:

1. How do horticulture development programmes emerge in the context of the array of development interventions used in developing countries? What are the “discourses” and (implicit or explicit) rationales/motivations that drive the design and implementation of these programmes? To what extent is the design of these programmes influenced by potential nutritional and health impacts?
2. What are the impacts of production or income generation oriented horticulture programmes in a developing country context on p rice and availability of fruits and vegetables? What are the pathways of impact of these programmes on participant and non-participant groups in programme areas? What are the factors that determine these impacts?

Witness Seminar

Historical analysis of agricultural programmes and policies and personal accounts from policy makers who were involved in spearheading the horticulture programme and who witnessed its recent history can inform decision making about nutrition security helping to understand how we arrived in the present circumstances, and what strategies have been tried, successfully or unsuccessfully, in the past.

The Witness Seminar is an oral history group interview facilitated by a senior academic. It explores a research question by asking key participants to “meet around the seminar table to discuss and debate the issues surrounding the chosen topic as they remember them”. Since 1986, this contemporary form of historical research has been popularized by the Centre for Contemporary British History, and from 1993 by the Wellcome Trust History of Twentieth Century Medicine Group, where the focus is on medical science.

Many political decisions are taken because of what the people involved in making policies bring to the table. These personal perspectives gleaned through oral history methods combines public, private and social memory. The interaction between the witnesses is often extremely valuable (5, 82, 84, 85). A witness seminar can facilitate understanding policy processes at important junctures (82), (86).

This is oral history at its best... because the participants tended to “let their hair down” and talk more freely than they would have at a scientific meeting... They are, primarily, important historical records.
- Irvine Loudon, medical historian (87).

The limitations of this method are similar to other methods of oral history. Participants may have forgotten important details, or may repeat what they believe to be correct. As in all group settings individuals may be less forthcoming than in a one-to-one interview (90). The role of the Chair is crucial. The validity of a Witness Seminar depends to a great deal on the presence of key witnesses.

The purpose of the witness seminar on the development of horticulture in Kerala will be to gather oral testimony both from the panel and from the audience to provide a detailed view of the series of events that led to shaping the horticulture programme.

Illustrations, graphs or figures will be photocopied and placed on every chair, so material can be referred to easily and when appropriate. Slides or other visual material may disrupt the flow of the meeting.

Letter to participants

The Witness Seminar is an informal and flexible method of oral history with participation from key stakeholders who were witnesses to the development of the programme. This Witness Seminar will explore, and discuss the issues surrounding the historical context that shaped the development Kerala’s horticulture programme as you remember it. The Seminar will be facilitated by Dr K. N Harilal, former member (Agriculture) of the Kerala State planning board.

The issues to be explored in the Witness Seminar are outlined below:

1. The historical (economic, agricultural, trade and socio-political) context.
2. Intentions and hopes (behind starting / changing/ developing) for the horticulture programme.
3. Why things happened the way they did.
4. Early opportunities and challenges
5. Successes, achievements and milestones
6. How change began and from where.
7. Who contributed? Who benefited? Who did not benefit? Who lost?
8. Trade-offs— gains and losses
9. Role of horticulture in nutrition and availability, affordability of fruit and vegetables.
10. Current and future opportunities and challenges.
11. Lessons for future policy.

The Witness Seminar will be recorded for the purpose of analysis, and will feed into a doctoral thesis and into potential publications for wider dissemination. The transcript and final thesis will be made available to all participants.

List of Witness Seminar Participants

Panel 1: Context, implementation, impact and evaluation

Chairperson: Dr. K.N Harilal, an associate professor of economics at the Centre for Development Studies, Thiruvananthapuram From 2006-2011, Dr. Harilal was responsible for agriculture at the Kerala State Planning Board. In the 1970s and 80s Harilal was a student leader in the Communist Party of India- Marxist's (CPI-M) Student Federation of India (SFI). He was involved in the democratic decentralization experiment in Kerala popularly known as the 'Peoples' Campaign for Planning'. He describes himself as an 'academic activist' in a state renowned for 'public action.' His main area of specialization is trade policy and how global and regional developments affect Kerala's economy.

Witnesses:

1. **K. Prathapan**, Mission Director, State Horticulture Mission (SHM)- Kerala.
2. **V.K Sasidhar** is a retired professor who worked with Jacob Thomas as the vegetable expert to start Kerala Horticulture Development Programme (KHDP), the forerunner to VFPCCK in 1993. Sasidhar stayed with the Vegetable and Fruit Promotion Council of Kerala until 2002.
3. **R. Hali**: a former director of agriculture who has effectively never retired. After the formal retirement, worked for about 15 years with M. S Swaminathan and also with Malayala Manorama, the leading daily newspaper to popularize and bring honour to the Kerala farmer, behind the scenes creator of the annual "KarshakaSree" award for best farmer. Though in his 70s still very active.
4. **Bindu P.** is assistant district mission coordinator, in Trichur for Kudumbashree Mission

Panel 2: Horticulture and nutrition

Chairperson: Dr. M. Beena IAS is Kerala state's mission director at the National Health Mission (formerly National Rural Health Mission - NRHM) , the world's largest public health program, with an annual budget equivalent to US\$ 3.5 billion. NRHM seeks to provide accessible, affordable and quality health care and improve the health status of vulnerable people by facilitating their access to quality primary health care. The mission focuses on establishing a functional, community owned, decentralized health delivery system with inter-sectoral convergence at all levels, to ensure simultaneous action on a wide range of determinants of health such as water, sanitation, education, nutrition, social and gender equality.

Witnesses:

1. **S. Varadachary IAS** (Retd) is a former finance secretary of the government of Kerala. Art attacks, he is now deeply involved in food policy and nutrition issues.
2. **Dr. T.G Vinodkumar** (also known as Green Vinod) is an Ayurveda physician and scientist who works with Jawaharlal Nehru Tropical Botanic

Garden and Research Institute. The institute aims to conserve threatened species and promote sustainable utilization of the plant biodiversity for people's well-being. Dr Vinodkumar is involved in using local biodiversity for the health, well-being and income generation of local communities.

3. **Dr S. Sivasankaran** is a professor of cardiology at Sree Chitra Tirunal Institute of Medical Sciences, Thiruvananthapuram who has published papers on Trivandrum interested in diet and lifestyle issues. Shri. Varadachary IAS
4. **Dr. Beela G.K** is a faculty member of the Kerala Agricultural University and the of the Centre for Disability Studies in Thiruvananthapuram. Beela promotes horticulture therapy (using any part of the live form of a plant to cure, or to help cure, a person) an interaction with the plants that helps both mentally and physically. Beela has been a trainer in horticulture therapy among children with disabilities for about nine years.

Panel 3: Lessons for future policy: challenges and lessons

Chairperson: R Sridhar, is a policy research Coordinator at Thanal, an environmental research organization based in Thiruvananthapuram that works with farmers and schools to popularize organic farming and has spearheaded campaigns against endosulfan poisoning. Thanal is part of Alliance for Sustainable and Holistic Agriculture (ASHA), a large, nation-wide network committed to sustainable farming, income security for farm households, rights of farming communities over productive/livelihood resources, and safe, nutritious, diverse and adequate food.

Witnesses:

1. **Shri. Mullakara Ratnakaran** is a member of the Communist Party of India (CPI) and a former agriculture minister in the left democratic government in Kerala from 2006-2011. Agricultural output increased as the left front government promoted schemes to achieve vegetable self-sufficiency. There were efforts to promote organic farming and to revitalize paddy cultivation in fallow lands by making the state "fallow land free". The agriculture department practiced grassroots decentralised democracy through karshakasangamoms (farmer meet-ups) naattukoottams (village forums) on river banks. Farmer suicides dropped in this period and innovative farmer friendly policies including retirement benefits, subsidised insurance, higher procurement prices for paddy and debt relief measures were implemented. The department conducted vegetable fairs during festival season to bring down vegetable prices.
2. **Dr. K. Saradamoni** is an economist, writer and social scientist who has contributed to the understanding of women and agrarian relations in Kerala.

Other Witnesses

1. **Dr. P. Rajasekharan Nair:** is the chief of agriculture department at the State Planning Board, Kerala. He has held this position for over a decade and has in-depth understanding of issues related to the state's agriculture.

2. **Dr Gopimony:** retired as professor of Plant Breeding and Genetics at the College of Agriculture. He is interested in organic farming and promoting indigenous knowledge.
3. **Mr Jose Joseph** is a director responsible for projects at Vegetable and Fruit Promotion Council, Keralam (VFPC).
4. **Dr. S Usha:** is program director at Thanal, an environmental research organization based in Thiruvananthapuram that works with farmers and schools to popularize organic farming and successfully spearheaded a worldwide campaign against endosulfan poisoning. Thanal has led the 'Save Rice Campaign' and poison-free holistic agriculture for more for several years. Usha who has a PhD in agriculture, and is national co-ordinator of 'Save Our Rice Campaign' brings a holistic perspective to the links between agriculture and nutrition in Kerala.
5. **Mr. Gopalakrishnan Nair:** In 1989, when Kerala State Horticultural Development Corporation (HORTICORP) was established, served as its first managing director. In order to popularise orchid and anthurium cultivation we trained 1,000 farmers and distributed plants to them. Organisations such as the Kerala Cut Flower Producers' Society was also formed," says Dr. Gopalakrishnan Nair, who has written books on orchid and anthurium cultivation.
6. **Dr Sajjan Kurian:** is a professor of horticulture (homestead farming) and associate director of research at Kerala Agricultural University. He is interested in the area of gender and agriculture.
7. **Dr Ramankutty V:** is a professor at Achutha Menon Centre for Health Science Studies, Sree Chitra Tirunal Institute for Medical Sciences and Technology, He is also involved with popular science movement Kerala Sastra Sahitya (KSSP) Parishad and an NGO, Health Action by People (HAP). KSSP and HAP have done several cross sectional surveys related to nutrition in Kerala. Dr Ramankutty is a paediatrician trained in economics and public health.
8. **Dr Rajamohanan K:** is the director of clinical epidemiology at Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram. Rajamohanan has done research in non communicable diseases(NCD) risk factors.
9. **Mr. G Dileepkumar:** a former principal and professor of English led the Medical Trust Hospital and Diabetes Care Centre, Kulanada's "Walk to Health" campaign for several years . The campaign reached students, teachers and parents in Pathanamthitta and Alappuzha districts.
10. **Dr. Mary Ukkuru:** is the head of the department of Home Science and Nutrition at the College of Agriculture, at Vellayani in Kerala.
11. **Mridul Eapen:** is an economist associated with the Centre for Development Studies who was a member of the State Planning Board, Thiruvananthapuram during the term of the left democratic government in Kerala from 2006-2011. She is a policy maker with background in gender and agriculture.
12. **Dr. Shamsiya A.H** teaches home science extension education and food and nutrition at the Government College for Women, Thiruvananthapuram.

13. **Ms. Prema Nair** is an independent researcher who works on gender and tourism issues. She is associated with the Sakhi Resource Centre for Women in Thiruvananthapuram.

INVITED Witnesses who sent apologies

1. **Dr. Jacob Thomas:** Initiated Kerala Horticulture Development Programme in 1991 – known as the father of the Horticulture programme. Is a member of the Indian Police Service and has a research degree in Agriculture. Now director of ports in Kerala.
2. **T. K. Jose, IAS:** He was the director of Kudumbashree Mission when the Mission initiated horticulture programmes for women's self-help group. He is currently the director of the Coconut Development Board, where he is involved in innovative training programmes to train people to harvest coconuts.
3. **Dr P.K Kesavan:** Energized the KHDP in 1997. The period is known for initiating farmers self help groups. Member of the Indian Forest Service, now on deputation with the Central government as private secretary to the Minister of State for Power.
4. **K. Jayakumar:** a civil servant who was formerly the Agricultural Production Commissioner, he is currently serving as the Additional Chief Secretary, Government of Kerala. He is critical of some of the horticulture initiatives, which he calls distressing.
5. **Dr M. S Swaminathan:** is an agricultural scientist credited food security initiatives through the green revolution. He is the President, M. S Swaminathan Research Foundation in Chennai and a member of the Indian parliament. He is a very busy person and I propose to interview him.
6. **Dr Vijayakumar:** heads the community health department at Trivandrum Medical College. He is also involved with popular science movement Kerala Sastra Sahitya (KSSP) Parishad and an NGO, Health Action by People (HAP).
7. **N. Jagajeevan:** works with, State Poverty Eradication Mission (Kudumbasree) Kerala with self help groups involved in horticulture.
8. **Nirmala Sanu George:** is a Thiruvananthapuram-based gender and livelihoods consultant who worked for many years with SDC - Swiss Agency for Development and Cooperation. She was a member of a jury for Green Kerala Express, a social reality show, the state run Malayalam television channel, to identify the "greenest" panchayat in Kerala (panchayats with sustainable agriculture, organic farming, water conservation, health, food and social security etc.). Nirmala has also been a consultant with Kerala government and has a background in gender and local self governments.
1. **Professor K.V Peter:** was formerly the Vice chancellor of Kerala Agriculture University, Indian Institute of Spices Research, Calicut and professor of horticulture from 1979. He is currently the director, of the World Noni Research Foundation, Chennai. His bother K.V Thomas the Minister of Food in the Indian cabinet has been instrumental in getting a food security legislation off the ground. Dr Peter is currently the director of World Noni Foundation is v ery active on many agriculture related forums, where he emphasises nutrition security.

INVITED Witnesses Witness Seminar Audience who sent apologies

1. **S.M Vijayanand IAS:** former additional Chief Secretary of Kerala Government who was very involved both with agriculture development and local self-government initiatives.
2. **V.V Pushpangadan:** was the CEO VFPCCK and is on deputation from Kerala Agriculture University.
3. **Dr B. Ekbal:** a former Vice Chancellor of Kerala University is a neurosurgeon associated with the People's Health Movement. He has been involved in several studies on health in Kerala.
4. **Dr. C.P Robert:** heads the CARD-Krishi Vigyan Kendra, a farm science centre, set up by the Indian Council of Agricultural Research (ICAR). They are involved with horticulture in Pathanamthitta district.
5. **Dr T. R Gopalakrishnan:** is the director of research, a key position in the Kerala Agriculture University and is a Fellow of Indian Society of Vegetable Science.
6. **Subramanian Pattabiraman:** is a former staff member of KHDP till 2000. He is currently with the Delegation of the European Union in India where he is responsible for the management of NGO co-financed projects and supports the thematic team – Education, Health and Human rights.
7. **Dr Mala Ramanathan:** is a health researcher and faculty member of Achutha Menon Centre for Health Science Studies and the Sree Chitra Tirunal Institute of Medical Science and Technology, Thiruvananthapuram. Her current interests are gender and diabetes in rural Kerala.
8. **Dr K R Thankappan:** is head of the Achutha Menon Centre for Health Science Studies. His research interests are chronic non-communicable diseases and their risk factors particularly tobacco.
9. **Dr T.K Sundari:** a gender and health specialist who has worked with WHO, Sundari currently teaches at Achutha Menon Centre for Health Science Studies. She has many years of experience working with women's movements.

Coding Structure — Witness Seminar

Name	Sources	References
CONTEXT THAT SHAPED	0	0
Evolution of horticultural programmes	7	13
Department of agriculture	1	6
Women in agriculture	1	4
Evolution of Kudumbashree	11	38
Horticulture Mission	4	9
Inclusion	1	1
Janasree	1	1
Kerala Context	1	1
Agriculture	13	22
Agriculture-rubber	3	3
Pesticides	1	1
Economics	5	5
Health	4	6
Land	4	6
Nutrition & Food	15	25
Political	2	4
Land reforms	1	1
Social	2	2
KHDP- VFPCK	12	35
National	1	1
Political involvement student leader	0	0
Public action	1	1
Decentralization	4	4
Peoples Plan process	2	2
Through panchayats	3	3
Gender	1	1
What are implicit or explicit rationales/motivations (the "discourses") that were and are driving these programmes~	2	2
Academic interest	1	1
Avoid accusation of inaction and laziness	1	1
Avoid price crashes linked to international trade agreements	1	1
Commercial cultivation	1	2
Decentralization	1	1
Food processing	0	0

Name	Sources	References
For economic development (not just livelihood)	1	1
For the poor	1	1
Horticulture programme intentions	1	1
Import substitution and Self-reliance	3	3
Fruit and vegetable self-sufficiency	6	10
Improving the livelihood and dignity of farmers (marginal) through economic development (giving them inputs)	7	13
Keep prices affordable	3	3
Land	1	1
Make good use of the natural resources for the well-being of all	3	3
MARKET	0	0
Market driven and profit driven	1	1
Never say die	2	3
Only farmer can sustain	1	1
Prioritising well-being of people and environment	11	12
Nutrition more recent concern- apart from nutritionists)	4	4
To what extent are these programmes influenced by potential nutritional and health impacts	1	1
Safe food	2	2
Promote homestead farming	1	2
Revive agriculture	3	6
This has a good market in the Gulf	1	1
IMPACT AND EVALUATION- PERCEPTIONS	3	6
Achievements	5	8
Access to vegetables	5	6
Controlled price	3	4
Diversity	2	2
For nutrition security	2	2
Home consumption	1	2

Name	Sources	References
Homestead	1	1
Local availability	3	4
Marketing	13	28
Achieve objectives	6	6
Affordable	6	10
Attitudes	3	5
Consumption	1	1
Credit and access to resources	4	5
Access to insurance-etc- for crop loss	1	2
Human resources	2	3
Income	3	3
Local	1	2
More agri- land use	9	20
Diversification	2	2
Horticulture therapy	1	2
Production	7	9
Organic	8	11
Publicity-awareness	1	2
Awareness- sensitization	10	12
Nutrition awareness	1	2
Seeds	1	1
Streamlined	1	1
Women in agriculture	8	16
Opportunity to Kerala women to come into the public.	0	0
Challenges	0	0
Agri resources for non agri purposes	0	0
Agriculture department	4	9
Available	12	15
Access	2	3
Affordable	10	24
Local availability and traditional varieties-	10	17
Rural areas more	1	1
Coordination	6	7
Credit	1	1
Diet and the hospital	1	1
Fruit and vegetable consumption	4	5
Gender	6	10

Name	Sources	References
Academic professionalism- agency	2	3
Human resources	1	1
Lack of nutrition education	1	1
Land	2	2
Marketing	17	35
Attitude toward farmers	2	2
Food processing	1	2
Media	1	1
Mix of Organics and chemically produced	3	6
Monoculture	1	2
Nutrition status	1	1
Politics	5	15
Price	10	15
Production	8	12
Selfishness- rooted on a chair	2	4
TOPIC-5 EARLY Challenges	3	3
TOPIC-5 EARLY Opportunities	2	2
Traders and middle men	2	2
Uneven group quality	0	0
Value addition	1	1
Wastage	2	2
Waste	1	1
For availability and access to fruits and vegetables	0	0
HORTICULTURE AND NUTRITION	0	0
Barriers created	1	1
Current status of availability and access	6	8
Encouraged access	0	0
Factors that determined impacts	0	0
Research	2	2
Transformation of food environment	0	0
Impact for farmers	7	9
Impact for nutrition-friendly agriculture	8	12
Impact for women farmers	5	5

Figure 16: Witness Seminar — coding structure -1

Name	Sources	References
Not achieve	3	3
Personal involvement	1	2
Society-wide impact	1	1
The winners and losers	1	1
Contributors	22	45
Did not benefit & losers	13	29
Lost	14	25
Trade-offs	2	2
Gained	20	49
Benefit from commercial farming	5	6
Benefited from homestead	7	8
Maybe lower middle class	3	3
Consumers	12	16
Increased Purchasing power	1	1
Urban	8	11
Middleman and shopkeepers	10	17
TOPIC-4b Like to Change	0	0
IMPLEMENTATION- PERCEPTIONS OF PROGRAMME	0	0
Characteristics	1	3
Agriculture dept.	2	3
Chemicals	1	1
Collectiveness	2	3
Continuity- or the lack of continuity	3	3
Coordination and synergy	1	2
Crisis as opportunity	3	5
Diffusion of innovation	1	1
Dignity and equality	1	2
Evaluation and Course correction	1	1
Export	1	1
Gender and type of farming	1	2
Humility	4	5
Or the lack of it...-The I -	1	1
Independence	2	2
Innovation	6	9
Instilling pride	2	2

Name	Sources	References
Investment in Infrastructure	0	0
Marketing-Minimizing intermediaries	2	2
Participation	4	13
Partnerships	2	2
Academics and implementing groups	3	3
Media	8	11
TOPIC-6 Evaluation and Impact- Karshakashree	1	1
NGOs	1	1
Non-Indians	1	1
Pesticide use-- connected to profit...maybe	1	1
Professionalism- Every time he stands with the farmer only.	10	14
Capacity building for farmers	6	10
Efficient Management and change agents	2	5
Supporting with tech advice	1	1
Research	1	1
Responsive governance	4	10
Support	2	2
Access to resources	4	7
Chemicals and technology	1	1
Exposure and training	2	2
Marketing	4	7
Training	1	2
Team	3	5
Thinking differently	3	6
Trust	1	8
Winds from outside- Non GMO	2	4
Women - gender-feminization of agriculture	11	21
DO-TOPIC-5 EARLY Opportunities and Challenges	0	0
Intention-horticulture-for jobs	1	1
INTERVIEWS- NOT BEING USED	0	0

Name	Sources	References
Food processing	1	2
TOPIC-1 Position~ Role~ Motivation	24	29
Background	1	2
Involvement	0	0
Position and Role	2	4
TOPIC-1 Motivation	8	10
Training & Background	6	7
IN-VIVO CODES	0	0
18 May 2006.	1	1
1992	1	1
1993	1	1
1996 to 2006.	1	1
1997	1	1
2001	1	1
2002, 2003	1	1
2002-3	1	1
And without alienating the department, we sort of brought in this new approach.	1	1
Bharathapuzha was the witness for all this.	1	1
But we'll not accept it.	1	1
Every problem, and every crises is converted into an opportunity	1	1
Fruits they may postpone	2	2
Good policies, excellent executions, accurate monitoring	1	1
Like yeast.	1	1
My whole life is spoil, is it not.	1	1
Nobody believed that a change can happen in Kerala	1	1
Prosperity in Kerala is transparent.	1	1
See there is nobody to lose out in this process.	1	1
Stories of women power,	1	1
That started with me	2	2
On Govt. depts.	1	1
Outsider energy	1	1
Relationships F & V and NCDs	8	13

Name	Sources	References
UNINTENDED CONSEQUENCES, TRADEOFFS & LESSONS FOR FUTURE	0	0
Consequences and Trade-offs	4	7
Bananas	8	10
Market-driven production strategy not in tune with nutritional needs	4	4
Negative	3	4
Higher land rent	1	1
Land conversion-affecting paddy and agri	2	3
Monoculture	1	4
Pesticides	4	5
Rise of the traders--- middlemen	1	2
Sell most	1	2
Nutritional security	1	1
Pineapple and medicinal	3	4
Status depends on expense	1	1
Temperate climate veg	1	1
LESSONS FOR FUTURE	0	0
Goal of horticulture policy	21	44
Learning from experience	0	0
Admin and finance	1	1
Attitudes	1	3
Attitude and commitment	1	3
Collect from farmers	1	2
Decisions	2	2
Document	1	1
Externally aided- changes	1	1
Gender	6	11
Motivation continues	1	1
No senior professional	2	2
Professional - marginalization	2	2
Horticulture for economic development-not nutrition-friendly	1	1
Leadership + management	1	1

Figure 17: Witness Seminar — coding structure (continued)

Name	Sources	References
Nutrition disastrous policy	1	2
Participatory democracy	1	1
Pleasure and agriculture	1	1
Prepare for instability	1	1
Prepare for unintended consequences	2	2
Professionalism	1	3
Support farmers	2	2
Teamwork and an idea	1	1
Work through difficulties	1	1
Work with Media	1	1
Working with all spectrums	2	2
Learnings for policy	2	2
Affordability	3	5
Avoid middlemen- higher prices for farmers	4	6
Mararikulam experience	1	1
Community-based primary health care	2	2
Coordination	2	3
Create demand	5	7
Decentralized support+ local planning	2	3
Ensure Sustainability	1	1
Exposure to innovation	1	2
For every nutrition maladies, there is a horticultural remedy	1	1
Gender	2	4
Political involvement	1	1
Increase availability	6	11
Adequate- appropriate infrastructure	1	2
And create demand	2	2
By responding to local needs	1	1
Collect and distribute	3	4
Create agricultural awareness	3	4
Increase production	5	8
Good quality inputs	1	1
Monitoring	1	1
More intensive agriculture	1	1

Name	Sources	References
Rural areas	1	1
Local level planning	2	2
Of local nutritionally rich vegetables + organic and diverse	12	20
Support homestead cultivation	7	12
Organic or less chemical	2	3
Regulate export	1	1
Stop Waste	3	3
Land	7	12
Local	2	4
Marketing	12	24
Micro enterprise	1	1
Monitor exclusion	1	1
Monitor pesticides	1	1
Multi-sectoral planning	1	1
Need for data	1	1
Nutrition policy	7	15
Academic- Nutrition	2	6
Affordable	3	5
Choice of veg	3	3
Nutrition awareness and policy input	16	32
Agriculture department	3	5
Intra-household availability	1	1
Kudumbasree	1	2
Millet	1	1
Offering comfort at affordable rate	2	2
Training for farmers	1	2
Previous challenges- how met	1	1
Safe f & V- control pesticides	2	2
Self-sufficiency	1	1
To increase consumption	1	1
Participation	1	3
Partnerships	0	0
Local self-government	0	0
Partner with media	2	2
Policy congruence and coordination	2	3
Procurement	1	1

Name	Sources	References
Promote Homestead farming	8	10
Responsive governance	8	12
Solutions	2	2
Stabilize supply chains	1	1
Substitute F and V for rice farming...maybe	1	1
Support producers	9	13
Term limit	1	1
Training and exposure for gramsabhas	1	1
Value addition- agro-processing	2	3
Views on future policy interventions	7	12
Vision brings change	2	2
Microcredit	0	0
Recommendations for research	8	18
Subsidies	1	1
TOPIC-10 Opportunities and solutions to increase local availability~ affordability	0	0
Opportunities	0	0
Ongoing Challenges	0	0
Application of studies to Kerala	1	3
Banks	1	2
Consumption	2	2
Coordination	2	2
Data	1	1
Food and nutrition security	1	1
Food consumption patterns	1	1
Gender	0	0
Governance	3	7
Human resources...agriculture lack of nutrition	0	0
Labour	1	1
Land and resources	3	7
Leadership- Appropriate qualified people	4	4
Marketing	1	1
Pesticides	1	1

Name	Sources	References
Procurement and marketing	2	2
Production	3	3
Resistance and jealousy	1	1
Rubber	1	2

Figure 18: Witness Seminar — coding sStructure (continued)

Annexure 5 Stakeholder interviews — Information and list

Information Sheet and Consent Form for Oral History Interviews

1. INFORMATION SHEET

Agriculture and Nutrition: The effect of a horticulture programme on vegetable price and availability— a study of the Kerala experience

I, Darlena David am a PhD student from the London School of Hygiene and Tropical Medicine in the UK would like to interview you with regards to development and consequences of the horticulture programme in Kerala, India focusing on the local availability and price of vegetables and fruits.

You have been approached to take part in an interview because I believe you may be able to contribute to my understanding of the circumstances and intentions that led to developing the horticulture programme in Kerala.

Why is the study being done?

Agricultural policies — specifically horticulture programmes that contribute to dietary diversity can ensure affordable year-round supply of food crops, vegetables and fruits. It is vital to understand the effect of such horticulture programmes on the local F&V availability and affordability in communities experiencing high rates of non-communicable diseases. The aim of this research is to examine the development and consequences of the horticulture programme in Kerala. This project will explore the historical context that shaped the development of Kerala's horticulture programme and the consequences of the horticulture programme on the local price and availability of fruits and vegetables in areas where the horticulture programme is implemented and where it is not. The project will document the experiences and impressions of community members and investigate the price and availability of fruits and vegetables in local markets. The findings of this study will derive lessons for potential relationship of horticulture programmes with equitable access to healthy food.

The issues to be explored with the oral history interviewees are:

1. Position and roles
2. Intent of the horticulture programme
3. Involvement and motivations

4. Programme fit with the then context (probe: economic, agricultural, trade and socio-political context)
5. Opportunities and challenges
6. Success, achievements and milestones.
7. Who contributes? Who benefits? Who did not benefit?
8. What are the trade-offs? (probe: what was gained, or lost?)
9. Future opportunity and challenge
10. Role of horticulture in nutrition and fruit and vegetable availability and affordability .

These interviews will be tape recorded for the purpose of analysis, and will feed into my doctoral thesis for the London School of Hygiene and Tropical Medicine (LSHTM), and into potential publications and wider dissemination. My final thesis will be made available to all participants.

Your involvement

I hope that you will agree to be one of the 'key informants' for the research. The interview can be as long or as short as you like and you are free to say as little or as much as you like within what you feel comfortable saying. It will be conducted by Darlena David, a PhD student at the LSHTM, and/or by a research assistant.

No quotes or other results resulting from your participation in this study will be included in any reports, even anonymously without your agreement. Please indicate your wishes on the consent form.

Storage of data

The data would be kept in a locked filing cabinet and, material held on a computer would be password protected, stored in our office at the London School of Hygiene and Tropical Medicine. While I am in Kerala, the files will be backed up to a portable hard disk till it is possible to back it up on to the LSHTM server.

We would like to ask your permission to archive the oral history interview transcripts and/or audio-recordings at a later date after our study. The reason for archiving material is for that data to be available in future to other researchers or members of the public that wish to explore similar issues, and in which the data would be valuable. Interview data will not be archived without your agreement.

Ethical approval

This study has been approved by the London School of Hygiene and Tropical Medicine, by Institutional Review Board (Ethics Committee) of the Medical Trust Hospital and Diabetes Care Centre, Kulanada, Pathanamthitta - 689 573, Kerala, India.

For more information please contact:

Darlana David, Department of Social and Environmental Health Research, London School of Hygiene and Tropical Medicine, 15-17 Tavistock Place, London WC1H 9SH, UK

Phone: Kerala: (0) 469 260 2956; UK: +44 (0) 75 7662 1344, or; Email: darlena.david@lshtm.ac.uk

CERTIFICATE OF CONSENT

Agriculture and Nutrition: The effect of a horticulture programme on vegetable price and availability— a study of the Kerala experience

Interviewer's name:

Darlana David, Department of Social and Environmental Health Research, London School of Hygiene and Tropical Medicine, 15-17 Tavistock Place, London WC1H 9SH, UK

Phone: +44 (0) 75 7662 1344, or +91 469 260 2956; Email: darlena.david@lshtm.ac.uk

The purpose of this form is to allow the use of your interview for research purposes. Please fill in the form according to your wishes.

I have been invited to take part in a study on the development and consequences of the horticulture programme in Kerala and its effect on vegetable price and availability.

1. I have read the information sheets.
2. I have had the opportunity to ask questions about it. Any questions I have asked have been answered to my satisfaction.
3. I consent voluntarily to be a participant in this study and understand I have the right to withdraw at any time without consequence.
4. I agree that the researcher is allowed to tape the interview.

Please mark one of the following:

- ◆ I agree to my name being used with quotes from the interview, in reports about it.
- ◆ I wish quotes to be used anonymously in reports about it.
- ◆ I do not agree to quotes or other results arising from my participation in the study being included even anonymously in any reports about the study.

Archiving. Please mark one of the following:

- ◆ I agree to a transcript of my interview being archived at a future date. ()
- ◆ I agree to an audio-recording of my interview being archived at a future date. ()
- ◆ I do not wish the archived transcript to be labelled with my name. ()

Name of participant: _____

Address/ email/ phone number:

Signed: _____ **Date:** _____

Interviewer's statement

I, THE UNDERSIGNED, HAVE DEFINED AND EXPLAINED TO THE VOLUNTEER IN A LANGUAGE THAT SHE/HE UNDERSTANDS THE PROCEDURES TO BE FOLLOWED AND THE OBLIGATIONS OF THE INTERVIEWER.

Name of interviewer (s) : (1) _____ (2)

Signed: _____ **Signed:**

Date: _____

Date: _____

List of Oral History Interviewees

1. Ajith Kumar was director of the Department of Agriculture, Kerala.
2. Anitha Mohan was a nutrition specialist. She was the senior most nutritionist working in Kerala's Directorate of Health Services in the state programme control in the Iodine Deficiency Disorder control cell. Dr. Mohan was the author of around 50 books.
3. Anonymous food and nutrition researcher previously associated with Kerala Agricultural University.
4. K.V Dayal was an organic farmer and was former president of Kerala Organic Farmers' association.
5. Dr. Geethakutty was Professor of Gender Studies Centre at Kerala Agricultural University, Thrissur.
6. Dr. Indira V, Department of Home Science at the College of Horticulture, of Kerala Agricultural University, Thrissur
7. Dr. M. S Swaminathan: is an agricultural scientist credited food security initiatives through the green revolution. He is the President, M. S Swaminathan Research Foundation in Chennai and a former member of the Indian parliament.
8. Dr. P.K Kesavan: Energized the KHDP in 1997. The period is known for initiating farmers' self-help groups. Member of the Indian Forest Service, now on deputation with the Central government as private secretary to the Minister of State for Power. Could not come to the Witness Seminar.
9. Dr. Prathapan, is the director of State Horticulture Mission, Kerala. Was also at the Witness Seminar.
10. Dr. Prema, was a former professor and head of Department of Home Science, Kerala Agricultural University, Vellayani, Trivandrum.
11. Dr. Rajamohanan, was the director clinical epidemiology at Sree Chitra Tirunal Institute for Medical Sciences and Technology. He worked on the NCD risk factor survey 2007-08. Was also at the Witness Seminar
12. Dr. S. Sivasankaran, is a professor of cardiology at Sree Chitra Tirunal Institute of Medical Sciences Trivandrum interested in diet and lifestyle issues. Was also at the Witness Seminar.
13. Dr. Thomas Isaac, was former Minister of Finance in the previous Left ministry credited as being one of the best finance ministers of Kerala. Budgets funded horticulture, and self-sufficiency in vegetables. Also involved in his constituency to popularize vegetable in the panchayats. He was a member of the State Planning Board in from 1996-1999. Could not come to the Witness Seminar.
14. Dr. Vijayakumar, headed the community health department at Trivandrum Medical College. He is also involved with popular science movement Kerala Sastra Sahitya (KSSP) Parishad and an NGO, Health Action by People (HAP). KSSP has done several cross sectional surveys on Kerala, including an survey that has just begun.

15. Dr. K V Peter, was formerly the Vice chancellor of Kerala Agriculture University, Indian Institute of Spices Research, Calicut and professor of horticulture from 1979. He is currently the director, of the World Noni Research Foundation, Chennai. His brother K.V Thomas the Minister of Food in the Indian cabinet has been instrumental in getting a food security legislation off the ground. Dr. Peter is currently the director of World Noni Foundation is very active on many agriculture related forums, where he emphasises nutrition security.
16. Dr. P. Rajasekharan Nair: is the advisor (Agriculture) Kerala Planning Board.
17. K. Jayakumar IAS, a civil servant who was formerly the Agricultural Production Commissioner, he is currently serving as the Additional Chief Secretary, Government of Kerala. He is critical of some of the horticulture initiatives, which he calls distressing.
18. Mullakara Ratnakaran, was a minister of agriculture in the Left Democratic coalition government for the 12th Kerala Legislative Assembly 2006- 2011. Was also at the Witness Seminar.
19. Mumtaz Khalid Ismail, was a consultant nutritionist for the National Rural Health Mission, Kerala and for UNICEF.
20. N. Jagajeevan works with the State Poverty Eradication Mission (Kudumbashree) Kerala with self-help groups involved in horticulture.
21. Nirmala George, was a Thiruvananthapuram-based gender and livelihoods consultant who worked for many years with SDC - Swiss Agency for Development and Cooperation. She was a member of a jury for Green Kerala Express, a social reality show, the state run Malayalam television channel, to identify the “greenest” panchayat in Kerala (panchayats with sustainable agriculture, organic farming, water conservation, health, food and social security etc.).Nirmala has also been a consultant with Kerala government and has a background in gender and local self-governments.
22. V.V Pushpangadan, is the current director of VFPCCK and is on deputation from Kerala Agriculture University.
23. R. T. Ravi Varma 'Seeri', was editor-in-charge of Karshakasree, the farm magazine of the Malayala Manorama group with widest circulation among farm magazines in Malayalam. Recipient of the Karshaka Bharathi award given by the State Government to the best farm journalist in Malayalam. Ravi Varma has also written a number of books on agriculture for the common people. He taught at the Journalism Department of the Kerala University, was editor in the Publications Division of the Kerala Agricultural University.
24. S.M Vijayanand IAS, was then the Additional Chief Secretary of Kerala Government. Has been very involved both with agriculture development and local self-government initiatives. Could not come to the Witness Seminar.
25. T. K. Jose, IAS, was the Director of Kudumbashree Mission when the Mission initiated horticulture programmes for women’s self-help group. At the time of the interview he was the Director of the Coconut Development Board, where he was involved in innovative training programmes to train people to harvest coconuts. Could not come to the Witness Seminar.

Coding Structure — Stakeholder interviews

Name	Sources	References
CONTEXT THAT SHAPED	0	0
Evolution of horticultural programmes	7	13
Department of agriculture	1	6
Women in agriculture	1	4
Evolution of Kudumbashree	11	38
Horticulture Mission	4	9
Inclusion	1	1
Janasree	1	1
Kerala Context	1	1
Agriculture	13	22
Agriculture-rubber	3	3
Pesticides	1	1
Economics	5	5
Health	4	6
Land	4	6
Nutrition & Food	15	25
Political	2	4
Land reforms	1	1
Social	2	2
KHDP- VFPC	12	35
National	1	1
Political involvement student leader	0	0
Public action	1	1
Decentralization	4	4
Peoples Plan process	2	2
Through panchayats	3	3
Gender	1	1
What are implicit/explicit rationales/motivations (the "discourses") that were and are driving these programmes?	2	2
Academic interest	1	1

Name	Sources	References
Avoid accusation of inaction and laziness	1	1
Avoid price crashes linked to international trade agreements	1	1
Commercial cultivation	1	2
Decentralization	1	1
Food processing	0	0
For economic development (not just livelihood)	1	1
For the poor	1	1
Horticulture programme intentions	1	1
Import substitution and Self-reliance	3	3
Fruit and vegetable self-sufficiency	6	10
Improving the livelihood and dignity of farmers (marginal) through economic development (giving them inputs)	7	13
Keep prices affordable	3	3
Land	1	1
Make good use of the natural resources for the well-being of all	3	3
MARKET	0	0
Market driven and profit driven	1	1
Never say die	2	3
Only farmer can sustain	1	1
Prioritising well-being of people and environment	11	12
Nutrition more recent concern- apart from nutritionists)	4	4
To what extent are these programmes influenced by potential nutritional and health impacts	1	1

Name	Sources	References
Safe food	2	2
Promote homestead farming	1	2
Revive agriculture	3	6
This has a good market in the Gulf	1	1
IMPACT AND EVALUATION- PERCEPTIONS	3	6
Achievements	5	8
Access to vegetables	5	6
Controlled price	3	4
Diversity	2	2
For nutrition security	2	2
Home consumption	1	2
Homestead	1	1
Local availability	3	4
Marketing	13	28
Achieve objectives	6	6
Affordable	6	10
Attitudes	3	5
Consumption	1	1
Credit and access to resources	4	5
Access to insurance-etc.- for crop loss	1	2
Human resources	2	3
Income	3	3
Local	1	2
More agri- land use	9	20
Diversification	2	2
Horticulture therapy	1	2
Production	7	9
Organic	8	11
Publicity-awareness	1	2
Awareness- sensitization	10	12
Nutrition awareness	1	2

Name	Sources	References
Seeds	1	1
Streamlined	1	1
Women in agriculture	8	16
Opportunity to Kerala women to come into the public.	0	0
Challenges	0	0
Agri resources for non agri purposes	0	0
Agriculture department	4	9
Available	12	15
Access	2	3
Affordable	10	24
Local availability and traditional varieties-	10	17
Rural areas more	1	1
Coordination	6	7
Credit	1	1
Diet and the hospital	1	1
Fruit and vegetable consumption	4	5
Gender	6	10
Academic professionalism- agency	2	3
Human resources	1	1
Lack of nutrition education	1	1
Land	2	2
Marketing	17	35
Attitude toward farmers	2	2
Food processing	1	2
Media	1	1
Mix of Organics and chemically produced	3	6
Monoculture	1	2
Nutrition status	1	1
Politics	5	15
Price	10	15

Figure 19: Stakeholder interviews - coding structure

Name	Sources	References
Production	8	12
Selfishness- rooted on a chair	2	4
TOPIC-5 EARLY Challenges	3	3
TOPIC-5 EARLY Opportunities	2	2
Traders and middle men	2	2
Uneven group quality	0	0
Value addition	1	1
Wastage	2	2
Waste	1	1
For availability and access to fruits and vegetables	0	0
HORTICULTURE AND NUTRITION	0	0
Barriers created	1	1
Current status of availability and access	6	8
Encouraged access	0	0
Factors that determined impacts	0	0
Research	2	2
Transformation of food environment	0	0
Impact for farmers	7	9
Impact for nutrition-friendly agriculture	8	12
Impact for women farmers	5	5
Not achieve	3	3
Personal involvement	1	2
Society-wide impact	1	1
The winners and losers	1	1
Contributors	22	45
Did not benefit & losers	13	29
Lost	14	25
Trade-offs	2	2
Gained	20	49

Name	Sources	References
Benefit from commercial farming	5	6
Benefited from homestead	7	8
Maybe lower middle class	3	3
Consumers	12	16
Increased Purchasing power	1	1
Urban	8	11
Middleman and shopkeepers	10	17
TOPIC-4b Like to Change	0	0
IMPLEMENTATION- PERCEPTIONS OF PROGRAMME	0	0
Characteristics	1	3
Agriculture dept.	2	3
Chemicals	1	1
Collectiveness	2	3
Continuity- or the lack of continuity	3	3
Coordination and synergy	1	2
Crisis as opportunity	3	5
Diffusion of innovation	1	1
Dignity and equality	1	2
Evaluation and Course correction	1	1
Export	1	1
Gender and type of farming	1	2
Humility	4	5
Or the lack of it... The I -	1	1
Independence	2	2
Innovation	6	9
Instilling pride	2	2
Investment in Infrastructure	0	0
Marketing- Minimizing intermediaries	2	2

Name	Sources	References
Participation	4	13
Partnerships	2	2
Academics and implementing groups	3	3
Media	8	11
TOPIC-6 Evaluation and Impact- Karshakashree	1	1
NGOs	1	1
Non-Indians	1	1
Pesticide use-- connected to profit...maybe	1	1
Professionalism- Every time he stands with the farmer only.	10	14
Capacity building for farmers	6	10
Efficient Management and change agents	2	5
Supporting with tech advice	1	1
Research	1	1
Responsive governance	4	10
Support	2	2
Access to resources	4	7
Chemicals and technology	1	1
Exposure and training	2	2
Marketing	4	7
Training	1	2
Team	3	5
Thinking differently	3	6
Trust	1	8
Winds from outside- Non GMO	2	4
Women - gender- feminization of agriculture	11	21
DO-TOPIC-5 EARLY Opportunities and Challenges	0	0

Name	Sources	References
Intention-horticulture- for jobs	1	1
INTERVIEWS- NOT BEING USED	0	0
Food processing	1	2
TOPIC-1 Position~ Role~ Motivation	24	29
Background	1	2
Involvement	0	0
Position and Role	2	4
TOPIC-1 Motivation	8	10
Training & Background	6	7
IN-VIVO CODES	0	0
18 May 2006.	1	1
1992	1	1
1993	1	1
1996 to 2006.	1	1
1997	1	1
2001	1	1
2002, 2003	1	1
2002-3	1	1
And without alienating the department, we sort of brought in this new approach.	1	1
Bharathapuzha was the witness for all this.	1	1
But we'll not accept it.	1	1
Every problem, and every crises is converted into an opportunity	1	1
Fruits they may postpone	2	2
Good policies, excellent executions, accurate monitoring	1	1
Like yeast.	1	1
My whole life is spoiled, is it not.	1	1

Figure 20: Stakeholder interviews - coding structure (continued)

Name	Sources	References
Nobody believed that a change can happen in Kerala	1	1
Prosperity in Kerala is transparent.	1	1
See there is nobody to lose out in this process.	1	1
Stories of women power, That started with me	1	1
On Govt. depts.	2	2
Outsider energy	1	1
Relationships F & V and NCDs	8	13
UNINTENDED CONSEQUENCES, TRADEOFFS & LESSONS FOR FUTURE	0	0
Consequences and Trade-offs	4	7
Bananas	8	10
Market-driven production strategy not in tune with nutritional needs	4	4
Negative	3	4
Higher land rent	1	1
Land conversion-affecting paddy and agri	2	3
Monoculture	1	4
Pesticides	4	5
Rise of the traders--- middlemen	1	2
Sell most	1	2
Nutritional security	1	1
Pineapple and medicinal	3	4
Status depends on expense	1	1
Temperate climateveg	1	1
LESSONS FOR FUTURE	0	0
Goal of horticulture policy	21	44
Learning from experience	0	0

Name	Sources	References
Admin and finance	1	1
Attitudes	1	3
Attitude and commitment	1	3
Collect from farmers	1	2
Decisions	2	2
Document	1	1
Externally aided- changes	1	1
Gender	6	11
Motivation continues	1	1
No senior professional	2	2
Professional- marginalization	2	2
Horticulture for economic development- not nutrition-friendly	1	1
Leadership+ management	1	1
Nutrition disastrous policy	1	2
Participatory democracy	1	1
Pleasure and agriculture	1	1
Prepare for instability	1	1
Prepare for unintended consequences	2	2
Professionalism	1	3
Support farmers	2	2
Teamwork and an idea	1	1
Work through difficulties	1	1
Work with Media	1	1
Working with all spectrums	2	2
Learnings for policy	2	2
Affordability	3	5
Avoid middlemen- higher prices for farmers	4	6
Mararikulam experience	1	1
Community-based primary health care	2	2
Coordination	2	3

Name	Sources	References
Create demand	5	7
Decentralized support+ local planning	2	3
Ensure Sustainability	1	1
Exposure to innovation	1	2
For every nutrition maladies, there is a horticultural remedy	1	1
Gender	2	4
Political involvement	1	1
Increase availability	6	11
Adequate- appropriate infrastructure	1	2
And create demand	2	2
By responding to local needs	1	1
Collect and distribute	3	4
Create agricultural awareness	3	4
Increase production	5	8
Good quality inputs	1	1
Monitoring	1	1
More intensive agriculture	1	1
Rural areas	1	1
Local level planning	2	2
Of local nutritionally rich vegetables + organic and diverse	12	20
Support homestead cultivation	7	12
Organic or less chemical	2	3
Regulate export	1	1
Stop Waste	3	3
Land	7	12
Local	2	4
Marketing	12	24
Micro enterprise	1	1
Monitor exclusion	1	1

Name	Sources	References
Monitor pesticides	1	1
Multi-sectoral planning	1	1
Need for data	1	1
Nutrition policy	7	15
Academic- Nutrition	2	6
Affordable	3	5
Choice of veg	3	3
Nutrition awareness and policy input	16	32
Agriculture department	3	5
Intra-household availability	1	1
Kudumbasree	1	2
Millet	1	1
Offering comfort at affordable rate	2	2
Training for farmers	1	2
Previous challenges- how met	1	1
Safe f & V- control pesticides	2	2
Self-sufficiency	1	1
To increase consumption	1	1
Participation	1	3
Partnerships	0	0
Local self-government	0	0
Partner with media	2	2
Policy congruence and coordination	2	3
Procurement	1	1
Promote Homestead farming	8	10
Responsive governance	8	12
Solutions	2	2
Stabilize supply chains	1	1
Substitute f and V for rice farming...maybe	1	1
Support producers	9	13

Figure 21: Stakeholder interviews - coding structure (continued)

Name	Sources	References
Term limit	1	1
Training and exposure for gramsabhas	1	1
Value addition- agro-processing	2	3
Views on future policy interventions	7	12
Vision brings change	2	2
Microcredit	0	0
Recommendations for research	8	18
Subsidies	1	1
TOPIC-10 Opportunities and solutions to increase local availability~ affordability	0	0
Opportunities	0	0
Ongoing Challenges	0	0
Application of studies to Kerala	1	3
Banks	1	2
Consumption	2	2
Coordination	2	2
Data	1	1
Food and nutrition security	1	1
Food consumption patterns	1	1
Gender	0	0
Governance	3	7
Human resources....agri culture lack of nutrition	0	0
Labour	1	1
Land and resources	3	7
Leadership- Appropriate qualified people	4	4
Marketing	1	1
Pesticides	1	1

Name	Sources	References
Procurement and marketing	2	2
Production	3	3
Resistance and jealousy	1	1
Rubber	1	2

Figure 22: Stakeholder interviews - coding structure (continued)

Annexure 6 Information about Focus Groups

Description of Pathanamthitta and Alappuzha Districts

Table 33: Description of Pathanamthitta and Alappuzha Districts

Description of Pathanamthitta and Alappuzha Districts						
Description	Alappuzha		Pathanamthitta		Kerala State	
Area Sq. Km	1,415		2,652		38,852 Sq. Km	
Density/km2	1,504		452		860	
Female Literacy	94.24%		95.83%		92.07%	
Description	Rural	Urban	Rural	Urban	Rural	Urban
Population (%)	46.04%	53.96%	89.01%	10.99%	52.30%	47.70%
Total Population	979,643	1,148,146	1,065,799	131,613	17,471,135	15,934,926
Population Growth	-4.47%	84.57%	-4.16%	6.19%	-25.96%	92.72%
Male Population	464,713	548,429	499,820	61,896	8,408,054	7,619,358
Female Population	514,930	599,717	565,979	69,717	9,063,081	8,315,568
Sex Ratio	1108	1094	1132	1126	1078	1091
Child Sex Ratio (0-6)	955	947	977	973	965	963
Literates	852,470	1,000,327	945,351	117,202	14,549,320	13,586,504
Average Literacy	95.76%	95.68%	96.50%	96.90%	92.98%	95.11%
Male Literacy	97.24%	97.46%	97.33%	97.64%	95.35%	96.95%
Female Literacy	94.44%	94.07%	95.78%	96.25%	98.73%	102.99%

<http://www.census2011.co.in/census/district/281-alappuzha.html> accessed June 5, 2018 (Government of India, 2011a)

<http://pathanamthitta.gov.in/physiography1.htm> accessed June 5, 2018

<http://alappuzha.gov.in/aboutalpy/topography.htm>, accessed June 5, 2018

List of towns and villages in Pathanamthitta and Alappuzha Districts

Table 34: List of towns and villages in Pathanamthitta and Alappuzha Districts

Description	Alappuzha		Pathanamthitta	
Taluks	6	Ambalapuzha Chengannur Cherthala Karthikappally Kuttanad Mavelikkara	5	Ranni Kozhencherry Adoor Thiruvalla Mallappally
Blocks	12	Ambalappuzha Arayad Bharanikkavu Chambakkulam Chengannur Harippad Kanjikkuzhi Mavelikkara Muthukulam Pattanakkad Thaikkattusseri Veliyanad	9	Parakode Pandalam Kulanada Elanthoor Konni Mallappally Ranni Koipuram Pulikkeezhu
Panchayat	73		54	
Revenue Division	2	Alappuzha Chengannur	2	Thiruvalla Adoor
Panchayats	91		68	
Municipalities	5	Alappuzha Chengannur Cherthala Kayamkulam Mavelikkara	3	Adoor Thiruvalla Pathanamthitta
Corporations	Nil		Nil	

Request for permission

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India: 91- (0) 469-260 2956, Cell: 91- (0) 86 0689 7417

Faculty of Public Health & Policy
Social & Environmental Health Research Department

To The Principal
Matha School
Alappuzha

11/07/2018

Dear Sir,

Re: Focus group discussion on Agriculture and diet

I would like to request your permission to conduct a focus group discussion on agriculture and diet with 8-12 parents of children studying in your school. This is for my PhD research on the links between agriculture and diet.

I aim to do focus group discussions in government, aided and unaided schools in panchayats of Alappuzha and Pathanamthitta districts that have high vegetable production and those that do not. Your school has been chosen as it falls within Aryad panchayat, which does not have much vegetable production.

Thanking you

sincerely

Darlana David
PhD candidate

Bethania
Paliakara
Tiruvalla
Kerala
689101

0469-260-956
8606897417

Information Sheet and Consent Form for Focus Groups

INFORMATION SHEET

Agriculture and Nutrition: The effect of a horticulture programme on vegetable price and availability—a study of the Kerala experience

I, Darlena David am a PhD student from the London School of Hygiene and Tropical Medicine in the UK would like to interview you with regards to development and consequences of the horticulture programme in Kerala, India focusing on the local availability and price of vegetables and fruits.

You have been approached to take part in a focus group because I believe you may be able to contribute to my understanding of the consequences of the horticulture programme in Kerala on the price and availability of vegetables and fruits.

Why is the study being done?

Agricultural policies — specifically horticulture programmes that contribute to dietary diversity can ensure affordable year-round supply of food crops, vegetables and fruits. It is vital to understand the effect of such horticulture programmes on the local availability and affordability of fruits and vegetables in communities experiencing high rates of non-communicable diseases. The aim of this research is to examine the development and consequences of the horticulture programme in Kerala. This project will explore the historical context that shaped the development of Kerala’s horticulture programme and the consequences of the horticulture programme on the local price and availability of fruits and vegetables in areas where the horticulture programme is implemented and where it is not. The project will document the experiences and impressions of community members and investigate the price and availability of fruits and vegetables in local markets. The findings of this study will derive lessons for potential relationship of horticulture programmes with equitable access to healthy food.

What will the focus group involve?

I would like to ask your permission to take part in the focus group, however you are under no obligation to participate. An outline of the types of questions you’ll be asked is outlined below:

TOPIC GUIDE FOR FOCUS GROUP

1. Do you eat vegetables every day/ fruits every day?
2. What vegetables/ fruits are the most important in your families’ diet?
3. What fruit/ vegetable do you buy most?
 - a. why? (probe: cost/ availability?)
 - b. how do you buy (*Probe* as kits or loose/ what quantities/ how often /who makes the decisions about choice.)
4. Where do you get the majority of your vegetables/ fruits? (*Probe* buy/ gift/ home-grown.)
 - a. If home-grown:
 - i. what do you grow?
 - ii. Do you use at home?
 - iii. Do you sell (where?)
5. How long is the travel time for you to secure fruits/ vegetables?
 - a. What is the cost of travel?
6. How do you use vegetables/ fruits in your cooking? (what dishes?)
7. Do you eat vegetables/ fruits apart from your meals? (*Probe* not cooked/ as snacks/where)
8. Are there times of the year when some fruits/ vegetables are not available? (*Probe* seasonality and festival related cost and availability.)
 - a. what times?

- b. which vegetables / fruits
 - c. what substitutes do you use?
9. Do you know of factors that affect the price or reduce the amount of vegetables/ fruits available here? *Probe* (weather/farmers/ retailers/ government policy)
 10. Can you give examples of initiatives that have helped improve the supply and lower the price of vegetables and fruits?
 11. What are your views on the relationship between consumption of fruits and vegetables and the emergence of non communicable diseases such as diabetes, hypertension etc.?

These interviews will be tape recorded for the purpose of analysis, and will feed into my doctoral thesis for the London School of Hygiene and Tropical Medicine (LSHTM), and into potential publications and wider dissemination.

Your involvement

I hope that you will agree to take part in the focus group. The focus group will take around 1.5 to 2 hours. It will be facilitated by Darlena David, a PhD student at the LSHTM, and/or by a research assistant.

No quotes or other results resulting from your participation in this study will be included in any reports, even anonymously without your agreement. Please indicate your wishes on the consent form.

Storage of data

The data would be kept in a locked filing cabinet and, material held on a computer would be password protected, stored in our office at the London School of Hygiene and Tropical Medicine. While I am in Kerala, the files will be backed up to a portable hard disk till it is possible to back it up on to the LSHTM server.

Ethical approval

This study has been approved by the London School of Hygiene and Tropical Medicine, by Institutional Review Board (Ethics Committee) of the Medical Trust Hospital and Diabetes Care Centre, Kulanada, Pathanamthitta - 689 573, Kerala, India.

For more information please contact:

Darlena David, Department of Social and Environmental Health Research, London School of Hygiene and Tropical Medicine, 15-17 Tavistock Place, London WC1H 9SH, UK

Phone: Kerala: (0) 469 260 2956; UK: +44 (0) 75 7662 1344, or; Email: darlena.david@lshtm.ac.uk

CERTIFICATE OF CONSENT

Agriculture and Nutrition: The effect of a horticulture programme on vegetable price and availability— a study of the Kerala experience

Interviewer’s name:

Darlena David, Department of Social and Environmental Health Research, London School of Hygiene and Tropical Medicine, 15-17 Tavistock Place, London WC1H 9SH, UK
Phone: +44 (0) 75 7662 1344, or +91 469 260 2956; Email: darlena.david@lshtm.ac.uk

The purpose of this form is to allow the use of your interview for research purposes. Please fill in the form according to your wishes.

I have been invited to take part in a study on the development and consequences of the horticulture programme in Kerala and its effect on vegetable price and availability.

- ◆ I have read the information sheets. ()
- ◆ I have had the opportunity to ask questions about it. ()
- ◆ Any questions I have asked have been answered to my satisfaction. ()
- ◆ I consent voluntarily to be a participant in this study and understand I have the right to withdraw at any time without consequence. ()
- ◆ I agree that the researcher is allowed to tape the interview. ()

Please mark one of the following:

- ◆ I agree to my name being used with quotes from the focus group, in reports about it. ()
- ◆ I wish quotes to be used anonymously in reports about it. ()
- ◆ I do not agree to quotes or other results arising from my participation in the study being included even anonymously in any reports about the study. ()

Name of participant: _____

Address/ email/ phone number: _____

Signed: _____ **Date:** _____

Interviewer’s statement

I, THE UNDERSIGNED, HAVE DEFINED AND EXPLAINED TO THE VOLUNTEER IN A LANGUAGE THAT SHE/HE UNDERSTANDS THE PROCEDURES TO BE FOLLOWED AND THE OBLIGATIONS OF THE INTERVIEWER.

Name of interviewer (s) : (1) _____ (2) _____

Signed: _____

Signed:

Date: _____

Date: _____

Coding Structure — Focus Group Discussions

Name	Sources	References
Name	Sources	References
Topic 4 Sources of vegetables and fruits (Probe buy-gift-home-grown)	25	118
Bought	3	6
Fruits bought	11	20
Vegetables bought	12	20
Home grown veg and fruits	12	28
fruit	8	12
Sale of homegrown Vegetables and fruits	16	27
vegetables	12	35
How buy	1	1
Decisions about purchase	16	22
Frequency	5	8
Kit	17	35
quantity	10	11
Reasons	11	22
Topic 5 Travel time and costs	24	34
Where	4	4
neighbours and gifts	1	1
Topic 11- relationship between consumption of fruits and	23	33

Name	Sources	References
vegetables and NCDs		
NCD	4	5
Topic 10 Initiatives to improve supply and lower prices	27	44
Topic 9 Factors that affect the price or reduce availability	24	41
Topic 8- Availability (seasonality and festivals)	26	100
Onam	12	33
Substitution	2	2
forego	1	1
On consumption	0	0
Topic 6- Use of vegetables and fruits (dishes)	24	103
spinach	1	1
Topic 7 a- Apart from meals	24	34
Topic 1-Eat fruits & vegetables - frequency	14	27

Name	Sources	References
Topic 1-Eat vegetables - frequency	19	46
Topic 1b -Eat fruits - frequency	18	31
Topic 2 b-Most important fruits	21	40
Topic 2 a- Most important vegetables	24	40
Rice and fish	8	24
Participants	14	18
land	1	1
Nutrition education	1	3
Children	16	29
Marketing	1	1
Gender	2	2
husband	15	29
Autonomy	7	10
Kudumbashree	3	8

Annexure 7 Kerala State Organic Farming Policy, Vision and Background

Kerala State Organic Farming Policy, Strategy and Action Plan

Vision

Make Kerala's farming sustainable, rewarding, and competitive, ensuring poison-free water, soil and food to every citizen

Background

India has a glorious history of farming, starting probably from the 6th millennium BC in the Indus Valley, harnessing the annual floods and the subsequent alluvial deposits. The Indus Valley Civilization was founded on sustainable farming practices. Subsequently, our culture and ethos became reflections of the agricultural practices and it became mutually inseparable till recently. Harvest of the main crops is celebrated through out the country.

In Kerala, it went to the extent of identifying the farmland with Mother God or a female. Just like the female has to take rest after delivery, the farm land has also to be given rest for three months after the harvest; tilling is strictly prohibited during this period. Although it may look superstitious, the ecological reason behind this ritual is that tilling during monsoon leads to severe soil erosion and thus, is an unsustainable practice. Therefore, sustainability has been the hallmark of our farming system from time immemorial, growing the time tested, weather suited, traditional crops with or without additional organic inputs, but deeply interwoven with the ecological systems and climatic conditions.

The once flourished *Pokkali* cultivation in the coastal districts and the *Kaipad* farming system in Kannur district are testimonials to man's ingenuity in harnessing the natural events for farming, that too integrated farming, without affecting the natural ecological processes and without even any external inputs.

However, many of these century old systems have disappeared in the wake of post-independent era when the main thrust was, and correctly so, to produce more food for the ever growing human population. The Green Revolution, with a single slogan of 'grow more food', was only a natural outcome of a national challenge to meet the growing food requirements. The nation saluted the tireless efforts of the committed agricultural scientists who could find a way to provide food for all. The production of food grains from 50.8 million tonnes during 1950 rose to 108 million tonnes in 1970-71 and, 208.6 million tones in 2005 -06. An envious achievement, indeed!

However, this development - unmindful of the ecosystem principles so revered and practiced for centuries- led to seemingly irrevocable ecological and environmental catastrophes in the country. The green revolution essentially replaced the traditional varieties with high-yielding ones. These high yielding varieties now recognized as 'high input varieties' needed tonnes of fertilizers, to achieve the target growth. The crops and varieties alien to the soil attracted new pests and diseases and also outbreaks of existing pests. To combat them, came in huge quantities of pesticides. Input of these "exotic" elements into the traditional farming led to multitude of environmental issues.

The microorganisms declined; the soil lost its fertility and vitality; water demand increased and, the time tested traditional varieties disappeared. In short, the century old practices came to a halt. The eternal relationship between the farmer and farm land was lost. More importantly, sustainability of the agriculture systems collapsed, cost of cultivation soared, income of farmers stagnated and, food security and food safety became a daunting challenge.

Biodiversity in the agricultural fields has now become a history of the past. The farmland became silent; devoid of the croak of frogs, chattering of warblers, whistling of Whistling Ducks. The long tubular straw striven nests of the Baya weaver bird hanging on the fronds of palm—a once spectacular sight—have disappeared from most localities. The insectivorous birds such as drongo, bee-eater, even the house sparrow became rare or locally extinct, indicating the collapse of the entire food webs of the farm land.

In the forestry sector, fortunately the use of pesticides has been much less. However, the aerial spraying of pesticides in India was first tried in Kerala in 1965 to control the teak defoliators in Konni forest division. It was noted that with in 48 hours nearly 162 non-target species of arthropods were knocked down.

The mentally and physically retarded and handicapped children in Padri village in Kasergod tell the world in unequivocal terms the tragedies and disasters that aerial spraying of pesticides could inflict on human life.

As a result of all these "modern" techniques, the air, water and the soil were polluted; most food grains and farm products were contaminated by pesticides. The run off from the farm land contaminated the wetlands - rivers, tanks, ponds, reservoirs, lakes and all water bodies—and the life in them. Fishes carried high levels of pesticides and also heavy metals, the latter as a result of the many chemical industries that sprang up to provide chemical fertilizers.

Health hazards became unimaginably high. Incidence of fatal diseases rose. Hospitals with modern amenities came up in the cities as profit making industries. Pharmaceuticals flourished.

Food crops became non-attractive, while cash crops became more remunerative. Rice fields have been filled up for non-agricultural activities. The area under cash crops expanded during the last 20 years (16% under rubber alone), while that under food crops plummeted (to just 9% of the total cultivated area). The monoculture of such economically valuable crops led to soil erosion and loss of soil fertility to a great extent. The advent of chemical intensive farming and its prevalence in Kerala for the past 50 years have resulted in the near stagnant levels of productivity of many of these economically important crops such as coconut, cashew, pepper, coffee, tea, cardamom and arecanut. Besides these, many regions in Kerala, like Wayanad started facing acute water scarcity. The State has taken note of it and given priority in the Eleventh Five Year Plan.

Over and above, the economic liberalization and WTO policies added to the woes of the farmers by bringing down the prices of agriculture commodities. They are caught in the debt trap owing to the loan taken to meet the high cost of farming, as it demanded more external inputs such as

fertilizers, pesticides and water. These led to increasing instances of suicide by farmers. Investment in agriculture has essentially changed from the farmer to the industries supplying input to the farmer, and as a direct consequence, net income for farmers decreased while the industries supporting agriculture in the country flourished.

The national policies of opening retail sector to national and multinational companies pose great threat to our food sovereignty and right to safe food. The enhanced 'food miles' led to increased carbon emission, further increasing the load of green house gases. The potent danger of introducing Genetically Modified crops, monopoly of seeds by national and multinational corporate bodies could very well be the last straw on the camel's back for the farmers of Kerala.

Many farmers have realized that they are fighting a losing battle with the "high yield variety - fertilizer-pesticide pack" of Green Revolution. They have also realized that the degradation and disruption of the fragile ecosystems of the 'God's own country' are the chief culprits for the water scarcity, nutritional insecurity, loss of primary productivity and agrarian crisis being faced by the State.

The farmers in Kerala are convinced that the only way is to return to the traditional sustainable ways of cultivation without harming the ecosystem. Thus the organic farming, a system with the broad principle of 'live and let live', came up which was recognized nationally and internationally. Organic agriculture is not limited to crop production alone, but encompasses animal husbandry, dairy, fisheries, poultry, piggery, forestry, bee keeping, and also uncultivated biodiversity around.

By and large, there is an increasing awareness among the consumers also on the deleterious effects of pesticides and hence, there has been a high demand for organically cultivated food produces. Therefore it has become a solemn responsibility of the Government to encourage organic farming to ensure poison-free food at affordable price to every citizen.

There have been demurs and doubts on the practicability of organic farming on the ground that the production would plummet and the country would once again be forced to yet another food crisis. This is quite unfounded. Success stories on high productivity of organic farming are now abundant. The Food and Agriculture Organization reports at the International Conference on Organic Agriculture and Food Security 2007 as follows: "*Conversion of global agriculture to organic management, without converting wild lands to agriculture and using N-fertilizers, would result in a global agricultural supply of 2640 to 4380 kcal/person/day. Sustainable intensification in developing countries through organic practices would increase production by 56 per cent. Organic yields on average are comparable to conventional yields; although yields do decline initially when converting from high-input systems and almost double when converting from low-input systems*". It also has found that organic farms use 33 to 56 per cent less energy per ha than conventional farms.

Worldwide, as of now, more than 22.81 million hectares of land area is managed organically and the market of organic food is around \$30 billion. It may be noted that Cuba, a country with 42,402 sq. miles of land and with 11.3 million people, is completely organic.