LINKAGES BETWEEN AGRICULTURE AND HOUSEHOLD FOOD SECURITY: A STUDY OF KUTTANAD

Thesis Submitted to the

Cochin University of Science and Technology

In partial fulfillment of the requirements
for the award of the degree of

Doctor of Philosophy

in

Applied Economics

Under the Faculty of Social Sciences

By

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January 2019

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Certificate

This is to certify that the thesis titled **"Linkages between Agriculture and Household Food Security: A Study of Kuttanad"** is a record of bonafide research work carried out by Mr. Mohammed Kasim C. under my supervision and guidance. This is an original piece of research and it has not previously formed the basis for award of any degree, diploma, associateship, fellowship or other similar title of any other University or Board. It is worth submitting for the award of Doctor of Philosophy under the Faculty of Social Science of Cochin University of Science and Technology. All the relevant corrections and modifications suggested by the audience during the pre-synopsis seminar and recommended by the Doctoral committee have been incorporated in the thesis.

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I hereby declare that the dissertation titled **“Linkages between Agriculture and Household Food Security: A Study of Kuttanad”** is a record of the bonafide research work done by me and that it has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or any other title or recognition from any university or Institution.

Kochi **Mr. Mohammed Kasim C.**
15-01-2019

Acknowledgement

It would not have been possible for me to complete this thesis successfully without the cooperation and encouragement of many people who extended their unconditional support at various levels of my study. Of course it is virtually impossible to recollect all of them and to record my gratitude. However I wish to mention a few important people and my apologies are to those who are inadvertently excluded.

At first, I express my deepest sense of gratitude to my supervisor and mentor, Prof. S. Harikumar for his continuous support, motivation and valuable guidance, which made the study possible. His critical interventions and suggestions have greatly helped in forming the conceptual and analytical framework of the study. Further, discussions with him have brought in deep insights about the study area, especially its topographical features and socio-economic conditions. He has devoted much time to go through the empirical analysis of the study and his comments and suggestions made the findings and inferences more meaningful.

I express my gratitude to Prof. P. Arunachalam, Prof. D. Rajasenan, Prof. Meera Bai and Dr. Manoj P.K, the members of faculty in the Department of Applied Economics for their comments during the progress presentations and other assistances they offered.

I am fortunate to have been assisted a lot by many of my friends and colleagues. Dr. Sagi T.G. has always found time to listen to my queries on statistical analysis. I am grateful to him for clarifying my doubts and inspiring me to complete the work. I am indebted to Dr. Shelly M.K. for providing advises on the structure of the thesis and organization of the study. I am grateful to Dr. Lagesh M.A, Dr. Sunil Paul and Dr. Santhoshkumar P.K. for their comments on econometric analysis of the study and also for their continuous motivations throughout my career. Thanks are also due to Dr. Shaji P.N for providing instructions during the primary survey and also for being a source of support and motivation.

I have received assistances on NSSO methodology from a number of people. I am indebted to Prof. M.H. Suryanarayana of IGIDR, Mumbai, for his guidelines on the methodology of estimating per capita calorie and nutrient intakes. I am thankful to Dr. Shyjan D. for the fruitful interactions that I had with him about employment concepts of NSSO. I also thank Dr. Vineeshkumar for his suggestions on the estimation of nutritional status.

I owe much to the two Principals of Farook College, under whom I have worked. Thanks are due to the former Principal Prof. E.P. Imbichikoya and the present Principal Prof. Dr. K.M. Naseer for extending unconditional support and encouragement.

I am grateful to my colleagues in the Department of Economics, Farook College, Muhammed Rasheed P., Shajitha K., Dr. Abdul Jabbar A.T., Shihabudheen M.T., Sahadudheen I., and Dr. Yazir P. for their support and motivation.

I thank Dr. Habeeb C., Assistant Professor of English, Farook College, for carefully going through the draft of the thesis and suggesting improvements in the style of presentation. I also thank all my other colleagues at Farook College, especially Abdul Shafeek C.H, Dr. M. Abdul Jaleel, Mohamed Nishad M., and Dr. Shafeeq T., for their encouragement.

The required materials for the study were collected from various Libraries. At first, I thank Balachandran K., the former Librarian, Department of Applied Economics, who had supported a lot during the initial period of my research. Thanks are also due to the staff of the central library, CUSAT for their assistance. I also express my gratitude to the Librarian and the Staff of Centre for Development Studies (CDS), Trivandrum. Thanks are also due to Dr. M.G. Sreekumar, the Librarian and the Staff of the Indian Institute of Management Kozhikode (IIMK) for their assistance in collecting the materials.

The office staff of the Department of Applied Economics have been highly supportive, special thanks to them. I thankfully acknowledge the assistances provided by my friends at CUSAT and other institutes. Premkumar, Sanoj Raju, Subash, Prajeesh, Izudheen, Nalinam, Aravind and Emilson are to be specially mentioned.

The primary survey in Kuttanad would not have been successfully and smoothly undertaken without the cooperation and support of many people. The households and Padashekharam Chairmen had provided all the required information without any hesitation. I express my sincere gratitude to all of them.

I am greatly indebted to my Parents, my Wife and Son for their support throughout my academic career. Finally I thank the Almighty for all His blessings.

Mohammed Kasim C.

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INTRODUCTION

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1.1 Introduction

A general attention given to agriculture, especially in the policy framework of developing countries like India, is largely based on the various roles played by agriculture in economic development. The progress of agriculture is crucial for developing countries, as it is reflected in the words of the Nobel Laureate Gunnar Myrdal that "It is in the agricultural sector that the battle for long-term economic development will be won or lost" (cited in Todaro and Smith, 2012, p. 431). Agriculture is still the predominant sector in most of the underdeveloped and developing countries, as it contributes a major share of total output of the economy. Further, it provides employment and income to unskilled workers in the rural areas, and transfers surplus labour to Industry in the process of mechanisation of farm activities. Similarly, it provides food to the growing population, and raw materials to the manufacturing sector. India is no exception to this general condition; though the share of agriculture in total output has been declining, majority of population depends on agriculture for their livelihood.

Of greater importance of these contributions is the role of agriculture in ensuring food and livelihood security of the rural poor. As per 2011 census about 58 per cent of total workforce and 72 per cent of female workforce depend on agriculture as their main source of livelihood. Thus, food security and livelihood of majority of Indian households depends on the performance of agriculture (Dev, 2012). Further, majority of the people dependent on agriculture are small holder farmers and landless labourers. Small holder farmers consist of small and marginal farm households that own and cultivate less than 2.0 hectare of land (Singh et al., 2002). They constitute more than 80 per cent of Indian farmers and significantly contribute to the total food production. Thus, any policy aiming towards inclusive growth, by reducing poverty and food insecurity and promoting sustainable livelihood and balanced agricultural development, should accord highest priority to small holder agriculture. Nonetheless, notwithstanding their remarkable contribution to the food production, welfare of these farmers have deteriorated due to the neoliberal policies and adverse production conditions such as shortage of rainfall, drought, poor infrastructure etc..Resultantly, these small holder farmers and landless labourers form a major chunk of nation's poor population.

Earlier studies on the linkages between agriculture and nutrition show that faster economic growth experienced by the Indian economy during the reform period has not contributed to the reduction of poverty and undernutrition[1] (Gillespie and Kadiyala, 2011; Headey et al., 2011; Dev, 2012). It is now widely recognised that economic growth during the reform

[1] Nutritional status is the outcome measure of food security and therefore food insecurity and undernutrion are used interchangeably.

period has been neither inclusive nor pro-poor. Having employed the majority of rural population, sustainable growth of agriculture is essential for inclusive growth and reduction of poverty and undernutrition in India. But, the public policies since 1991 tend to promote manufacturing and service sectors and neglected agriculture and allied activities and rural development. Public investment in irrigation and water management and in agricultural research has been declining since reforms. As a result, agriculture experienced a deceleration in the growth rates of crop yields as well as total agricultural output in most of the states (Bhalla and Singh, 2009). Thus the persistence of food insecurity, indicated by the unprecedented rate of undernutrition among children, is partly attributed to the stagnation of agriculture.

The present study is an attempt to examine the linkages between agriculture and household-level food security in Kuttanad situated in Southern Kerala, in the context of the larger crisis experienced by the Indian agriculture during the neoliberal regime. Kuttanad is widely known as the Rice Bowl of Kerala and it occupies a central place in the agricultural map of Kerala.[2] Similar to the general Indian context, Kuttanad is also experiencing an agrarian distress and livelihood crisis, making agriculture an unviable occupation. The study is important because there is hardly any evidence for the issue, how the institutional, technological and policy changes related to agriculture have affected the livelihood and household level food security of farmers and agricultural labourers. More specifically, the study tries to address the research question how far agriculture is capable of enhancing food and livelihood security to the rural households in Kuttanad? Further, the study also analyses the role of Public Distribution System in improving household-level food security.

[2] A detailed description about the study area is provided in chapter 3.

1.2 Changing Perspectives on Food Security

The concept of food security has been subjected to significant changes, as the focus of analysis shifted from national level to household and individual level. Maxwell (1996) identified three main shifts in thinking about food security since the world food conference of 1974[3]. The first shift was from food supply at global and national level to food entitlement at household and individual level. The second one has been from food first perspective to livelihood perspective. The third is from objective indicators to subjective indicators.

1.2.1 From Food Supply at Global or National Level to Food Entitlement at Household and Individual Level.

The term 'food security' emerged only after 1980s as Amartya Sen (1981) shifted the discourse from food availability to entitlement and access (Maxwell and Slater, 2003). Before this, the term 'food policy' was given prominence by the developing countries and aid agencies. Until 1970s food availability and stability in production and prices were considered as the integral components of food policy (Radhakrishna, 2005). Then most of the developing countries attempted to achieve self-sufficiency in food production. In India also self-sufficiency in food production was a major aim of planning. Towards this end, India embarked on a new agricultural policy with the application of modern agricultural technology, seed-firtilisers and high yielding variety seeds. As a result, there was phenomenal increase in food production and India became self-sufficient in food production by 1970s.

[3] The first world food conference was held in Rome in 1974 by the United Nations under the auspices of UN Food and Agriculture Organisation (FAO), in the wake of devastating famine in Bangladesh. This was followed by establishment of the International Food Policy Research Institute (IFPRI) in 1975, and of the journal *Food Policy in* 1976.

Despite the achievements of self sufficiency in food production at the national and international level, millions of people remained starving and chronically food insecure. The credit for resolving this puzzle of coexistence of adequate food supply and wide spread hunger goes to Amartya Sen (1981). He introduced the concept 'food entitlement' as a key element in the study of food insecurity and famine. To Sen (1981, p. 1) "Starvation is the characteristic of some people not having enough food to eat. It is not the characteristic of there being not enough food to eat. While the latter can be a cause of the former, it is but one of many possible causes". It is therefore evident that availability of food is only one factor affecting food security or starvation. He stated that food insecurity is not only caused by non-availability of food but also by entitlement failure.

Entitlement refers to the resources over which a person has ownership right given the legal, political, economic and social arrangements of community in which he or she lives. The resources include not only monetary but also land, and traditional rights and transfer resources. The entitlement approach brings forth the significance of adequate resources (entitlement), which enable a person to access food. Further, Social and institutional arrangements are also important since we are all members of different groups, ranging from family to wider associations. Broca (2002) stated that food security status also depends also on these associations and the extent to which a person can draw up on resources from the different groups to which he or she belongs.

Self-sufficiency at the national level is not sufficient to achieve food security. At the national level food security means availability of sufficient stock of food to meet domestic demand obtained from either domestic production or imports. At the individual level, it means that all members of the society have access to the food they need, either form their own production or from the market or from the government mechanisms. National self-sufficiency is neither necessary nor sufficient to guarantee food security at the individual level. Because even after the national self-sufficiency is achieved, the individual can still go hungry in the absence of adequate resources. Likewise, even if national self-sufficiency is not attained people can access food if they have sufficient purchasing power. On this backdrop, there was a shift in the literature as the studies started analysing demand side factors at household or individual level.

1.2.2 From Food First Perspective to Livelihood Perspective.

Food insecurity is now days considered as a livelihood failure. This may arise from short term vulnerabilities such as famine, crop failure, job loss etc.. The second paradigm shift, from food first perspective to livelihood perspective, emerged out of observations made by the studies on African famine of 1984-85 (Wall, 1989; Corbett, 1988; Frankenberger and Goldstein, 1990; Davies, 1993). Though the conventional views of food security considered food as a fundamental need, these studies found that food, especially short term nutritional intake is only one objective people peruse. Wall (1989) found that in Durfar, Sudan, during 1984-85 famine, people chose to go hungry to protect assets and future livelihood. It was observed that avoiding hunger does not seem to be a priority of rural households faced with famine. Other studies also have similar set of findings which reveal that objectives other than nutritional intake such as preserving seeds for planting in future and avoiding sale of animals were given preferences. Thus people were ready to tolerate hunger to have a secure and sustainable livelihood. Thus livelihood security has become necessary and often sufficient condition for food security (Maxwell, 1991).

The shift in perspective from food intake to sustainable livelihood made the studies focusing more on issues related to livelihood such as diversification of income sources, coping strategies during vulnerabilities, impact of off farm activities etc…Livelihood diversification has been proposed as a strategy to reduce vulnerability and improved level of consumption (Block and Web, 2001). Thus households generally diversify their assets, income, and activities. Further, several studies have established the role of off-farm work in helping the poor to escape from poverty and food insecurity. Off-farm income has a positive net effect on food security and nutrition (Babatunde and Qaim, 2010; Owusu et al., 2011). It is also held that off-farm income contributes to higher food production and farm income by easing capital constraints.

1.2.3 From Objective Indicators to Subjective Perception

The measurement of food security, using direct and indirect indicators related to food or calorie intake, economic access and so on, is largely based on the concept of 'enough food' or 'adequate food'. This implies that food intake must be adequate to meet nutritional needs or enough for an active and healthy life. This conventional approach has been using objective measurement by setting target levels for consumption. It is now common practice to estimate the number of food insecure households by comparing their actual calorie intake with required norms (Radhakrishna, 2005). The practice is that those who fall below this norm are considered as food insecure. There are two fundamental problems with this approach. First, the notion of common norm for energy or calorie adequacy itself is problematic because for any individual calorie requirement is a function of age, health, size, workload, environment and behaviour (Payne et al., 1994). Further the calorie requirements of individuals vary with season, year, activity pattern and adaptation strategy (Payne et al., 1994). Thus fixing a precise calorie requirement for different groups is a difficult task.

The second issue is the neglect of qualitative factors from quantitative measurements. While the technical quality of food with an emphasis on consistency with local food habits and cultural acceptability is important, the quantitative approach does not take these factors into consideration. Oshaug (1985) remarked that food is culturally important as a vehicle for self realization, communication, and maintenance of social relations. He pointed out further that dimension human dignity is a necessary condition for food security, suggesting that it depends on self respect, freedom of choice and action, mutually beneficial exchange etc…Thus the perception of people about the access to food they need, which in turn depends on the qualitative factors such as local food habits and cultural acceptability, assumes greater importance.

Now the methodological issue is that how such kind of qualitative factors can be measured?. The initiative towards developing qualitative measures begun in United States, when U.S Department of Agriculture organised a food security measurement conference in 1994, the participants of which included researchers, policy makers and advocates with experience in measurement food insecurity and hunger. In the conference the initial consensus on the most appropriate measurement of food security was reached and on the basis of this a questionnaire was developed. The questionnaire was tested and refined over next year. The final approved questionnaire consists of 18 questions intended to measure four underlying conditions or behaviour in the household: (1) anxiety about the food budget or food supply, (2) perceptions that food is inadequate either in quantity or quality, (3) reduced food intake in adults and (4) reduced food intake in children (Kennedy, 2003). The 18 questions, taken together, provide a good measure of severity and extent of food insecurity and hunger and have strong statistical properties (Hamilton, et al., 1997).

The questionnaire was first administered in April 1995 among 45,000 households. As per the results of this survey, the households were classified into four categories, namely (a) food secure, (b) food insecure without hunger, (c) food insecure with moderate hunger, and (d) food insecure with sever hunger[4]. Similar type of methodology was later followed by the developing countries like Brazil, Bangladesh and Yemen. In the recent past, many national household surveys used slightly reduced variant of these subjective questionnaire. Further, the World Bank's Living Standards Measurement Surveys (LSMS) estimates respondent's perceived assessment of individual or household food security situation. Recently, some studies employed perception approach for measuring food insecurity. For instance, Migotto et al. (2005) compared informations on self perceived food consumption adequacy from the subjective modules of four select household surveys with standard quantitative indicators.[5] The study concluded that the subjective food adequacy indicators may provide insights on the vulnerability dimension of food insecurity. Therefore presently many studies use qualitative informations along with quantitative data to examine the problem of food insecurity in detail.

1.3 Food Security: Meaning and Components

1.3.1 Meaning

As we have already discussed food security is now a complex and multidimensional phenomenon, encompassing the factors and polices

[4] The methodology used for scaling and classification is elaborated in Kennedy (2003).

[5] The surveys are Nepal 1995-96 Living Standard Measurement Survey (NLSMS); The 2000 Indonesia Family Life Survey (IFLS3); The Albenia 2002 Living Standard Measurement Survey (ALSMS) and the Madagascar Household Survey (MHS).

influencing food supply at global and national level to entitlement and sustainable livelihood experienced by individual at the household level. Given the complex nature and wide range of interrelated factors affecting food security, no single definition can capture all the dimensions of food security. Smith et al. (1992) present nearly two hundred definitions of the term food security. However, in simple terms food security is a situation where everyone has sufficient and affordable food. The World Bank (1986, p. 1) defined food security as "Access by all people at all times to enough food for an active and healthy life". To Food and Agriculture Organization food security means ensuring that all people at all times have both physical and economic access to basic food they need. Eicher and Staatz (1986, p. 216) defined food security as "The ability of a country or region to assure, on a long term basis, that its food system provides the total population access to a timely, reliable and nutritionally adequate supply of food". Therefore, the available food should be adequate in quantity as well as quality to meet nutritional requirement.

1.3.2 Components

There are four major components of food security, availability of food, economic access, physical utilisation of food and vulnerability.[6]

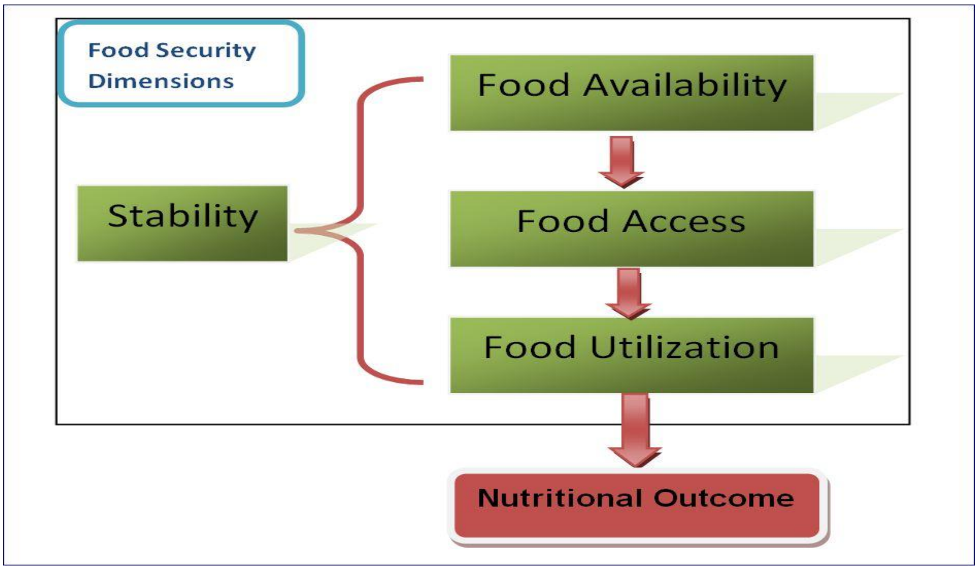
a) **Food Availability** refers to the availability of sufficient quantities of food supplied through either domestic production or imports.

b) **Economic Access** refers to the purchasing power of an individual relative to market price of food. Economic access refers to adequate resources that enable a person to secure food.

[6]See Broca (2002) and Tagade (2012) for references.

c) **Food Utilisation** refers to domestic absorption of food through adequate diet, clean water, sanitation and health care. Food utilization brings out the importance of non-food factors like nutrition practices, metabolic absorption and intra household distribution in food security. Nutrition practices include dietary practices, childcare and nutrition knowledge which depends on female literacy. Metabolic absorption requires safe drinking water, sanitation and adequate health services. Equitable intra household distribution is necessary to prevent gender discrimination. Nutritional status is often used as an outcome indicator to analyse the utilisation component, as it is influenced by all these factors.

Figure 1.1 Dimensions of Food Security



Source: Bajagai, (2015).

d) **Stability of Access** refers to the absence of risk of losing the access to food. There are risks involved with fall in income, decline in food production and rise in food prices. Thus the stability of access is regarded as the stability in food grain production and availability, stable prices, stable income and command over resources to access food.

1.4 Pathways between Agriculture and Nutrition

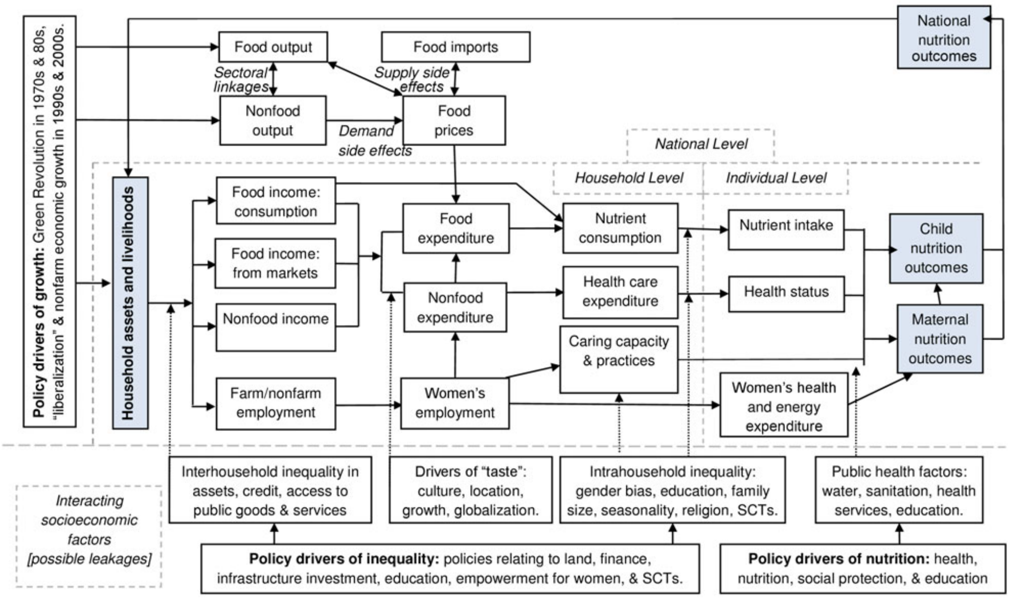
Two perspectives have dominated the literature on the pathways from agriculture to nutrition. The first one is the role of agriculture in supplying food and nutrition intake to rural households (Dev, 2012; Parasuraman and Rajaretnam, 2011). The second one is the argument that agricultural initiatives alone cannot solve the nutrition crisis in India since nutrition outcomes are determined by a complex interaction of individual and household level factors, which are in turn influenced by social, economic and institutional factors (Gillespie and Kadiyala, 2011). Even though the latter highlights the complementary roles of nonfood factors such as sanitation, health services, care practices, education, intrahousehold distribution of food etc.., it does not undermine the potential role of agriculture in controlling undernutrition.

The theoretically conceived pathways from agriculture to nutrition are many. Gillespie and Kadiyala (2011) present a detailed explanation of the pathways between agriculture and nutrition[7]. The first one they identified was the role of agriculture as a source of food for own consumption. Secondly agriculture is regarded as the source of income in the form wage for labourers and revenue from the sales of marketed surplus for cultivators. The third one is the public policy related to agriculture. Agriculture price policy and minimum support price ensure a stable income for net sellers of agricultural produces and procurement and redistribution through PDS networks by the government ensures access to food for the net buyers. Fourth, income from agriculture can be allocated to nutrition relevant activities like expenditure on health, education, sanitation etc..Fifth, involvement of women in cultivation process

[7] The same kind of discussion can also be found in Parasuraman and Rajaretnam (2011) and Headey et al., (2011).

enhances their earning capacity and decision making power and ensures equitable intrahousehold distribution of food towards them and children.

Figure 1.2 Mapping the Agriculture-Nutrition Pathways in India



Source: Kadiyala et al., (2014).

However, the impact of agriculture on nutritional status of women and children need not always be positive. Negative impacts may arise from inappropriate time allocation between care practices and farm activities especially by women and physical works and exposure of health to risks. These factors can affect nutritional status of women and their children. It is proved without any ambiguity that nutritional status of the children is influenced by nutritional status of the mother. Mothers' ability to feed and take care of health of children will be weakened if they are employed. Further, energy spent on farm work, if not substantiated by adequate food intake, will worsen their nutritional status. Their health will be exposed to hazardous agricultural practices such as application of harmful pesticides.

1.5 Statement of the Problem

Food insecurity, exposed by abnormally high rates of undernutrition, continues to remain as a major policy challenge in India. India's failure to reduce undernutrition considerably during the periods of rapid economic growth is often regarded as the best example of 'Asian Enigma'. A Recent hunger and malnutrition survey (2011) by Nandhi foundation reports that 42 per cent of children under five are underweight and 59 per cent are stunted. This alarming situation of undernutrition was referred as 'national shame' by the erstwhile prime minister of India. Despite the achievements of sustained economic growth and self sufficiency in food production at the national level, there are yet concerns about the food security at the household level. By now it is widely recognized that achieving self sufficiency in food production at the national level alone is not adequate to ensure food and nutritional security at the household level.

The multidimensional nature of causes of food insecurity makes it more complicated to be addressed. However, recent debates emphasize the need to focus on agriculture based strategies due to the potential of agriculture to influence nutrition. Agriculture is considered as nutrition-sensitive sector, especially in India, since it employs majority of population. Subsistence-oriented production, i.e. household level food production for own consumption assumes greater relevance in this context, because it would to help in mitigating the vulnerabilities arising from decline in food availability and real income in the aftermath of shortfalls in production at national level and the resultant inflationary pressure. Further, the inefficiency of the transfer mechanisms like Public Distribution System to provide sufficient amount of quality food on the one hand, and unprecedented rise of food prices due to production shortfalls and market imperfections in the form of artificial scarcity created by hoarding on the other hand influenced policy makers and scholars to argue for sustenance oriented production strategy for food security. The sustenance oriented production by each household would help to reduce the market dependency and also put a check on sky rocketing food prices. Further, the link between food production, consumption and nutrition has been proved without any ambiguity by many studies in the developing countries.

However, India remains as a paradox in this context, where there is disconnect between agriculture and nutrition (Gillespie and Kadiyala, 2011; Headey et al., 2011). While agriculture still provides employment to majority of India's rural population, it has failed to earn them adequate amount of income for their livelihood. Thus, the rural populations of India still suffer from significant level poverty and under nutrition. Earlier studies, without any ambiguity, have proved that Indian agriculture has experienced a complete stagnation during the period of economic liberalization and consequently the welfare of farmers is significantly deteriorated (Vakulabharanam, 2005; Mohankumar and Sharma, 2006; Mishra, 2007). The recurring farmer suicides in different parts of the country unfold the agrarian crisis and farmers' distress during the reform period, which to a greater extent is attributed to the neoliberal policies adopted by the central government since 1990s. This distress situation poses a relevant research question, whether agriculture is capable of enhancing food security and nutrition among rural households.

On the backdrop of this larger research issue, the present study attempts to examine the linkages between agriculture and household level food security among select household in Kuttanad. Kuttanad, the rice bowl of Kerala, occupies a central position in Kerala's economy in terms of rice production. It shared about 25 percent of total rice area and contributed about 37 percent of total rice production in Kerala (MSSRF, 2007). Further, Kuttanad happened to be the center for many agrarian and radical socio-political reform movements in Kerala. With reference to the occupational pattern, Kuttanad is yet largely an agrarian economy, as most of the families are associated with agriculture either as cultivators or as labourers. In addition to the problems brought in by neo-liberal policies, farmers in Kuttanad face lot of other challenges such as flood, crop failure due to diseases and pests, high cost for the preparation of field etc… As a result, agriculture in Kuttanad has been experiencing lower profitability, increasing indebtedness and employment crisis, ultimately leading to an agrarian distress.

Further, mechanisation of cultivation process has been taking place in Kuttanad. Mechanisation enabled farmers to carry out cultivation with less units of labour, or even without employing labourers and performing certain activities by themselves. Resultantly, the labour hours required for cultivation has significantly come down, replacing labour from many activities related to cultivation of rice. Hence, Kuttanad is now experiencing high level of unemployment and under employment, worsening the livelihood of agricultural labourers. Now it can be observed that neither the farmers nor the labourers are benefited from the economic reforms and mechanisation. On this backdrop there are two specific issues that the study tries to address. First, to what extent agriculture contribute to the level food consumption and income of the households. Second, what is the role of public distribution system in supporting the food security of the households?

1.6 Food Security in Kerala: Review of Literature and the Research Gap

Kerala, a major food deficit state in India, has gained a great deal of attention of economists all over the world because of its peculiar development experience. The much celebrated study carried out by Centre for Development Studies (1975) in the auspices of United Nations highlighted the development achievements of Kerala in the areas like health, education and demographic transition in spite of its low level of per capita income. This study was the first one to examine the food security problem in Kerala systematically. The study showed that per capita consumption food as reported by NSSO round of 1961/62 is lower in Kerala than in any other state and mass poverty was also found to be higher in Kerala in terms of the criterion of food intake and nutritional levels. However, the diet survey and food balance sheet prepared for the survey by CDS reveal that expenditure survey of NSSO have underestimated the intake of certain food items, especially regional items like Tapoica, Banana, coconut oil etc.. Another base for this argument was that the rapid growth of tapioca, a major cereal substitute in Kerala, since mid 1960s has helped in raising per capita availability of food. However, even after we adjust for these errors, the food intake of not less than one third of population must have fallen short of minimum requirement. The study described that Public Distribution System through rationing contributed 40 per cent of the total available supply of rice. The study in a nutshell illustrates the achievements of policies of distribution in the state towards equity and balanced social and economic development.

However, being a chronically food deficit state, the food security continues to remain as a predominant socio economic issue in Kerala and some earlier studies therefore examined the different aspects of food security problem in Kerala[8]. Panikkar (1978) studied the level of employment, income

[8] With an aim to establish the research gap, this section is confined to the studies undertaken in Kerala context. The review about national and international studies is given in second chapter along with a discussion on theoretical and empirical issues related to household level food security

and food intake among a few selected agriculture labour households in Kuttanad, southern Kerala. The study has collected primary data from select agricultural labour households on the level of employment, earning from farm and non-farm income activities, and pattern of food intake. To collect data on food intake the study conducted two diet surveys to avoid bias and to capture the seasonal variation. The study finds that open unemployment works out to 33 per cent of labour force. Further, there existed higher level of underemployment, as those who are employed got work for only one third of the working days in a year. Even though wage rates were high, the lower number of work days led to the low level of earnings and per capita income.

There was hardly any non-agricultural work for the labourers. Resultantly, the food intake among the labour households as reported by the diet survey is remarkably low. The average intake of energy works out to 66 per cent of the required minimum of 2,200 calories per capita per day as per the first round of the survey, it amounted to 54 per cent in the subsequent round. The study finds that a higher incidence of undernutrition and malnutrition is a reflection of the very low level of income which in turn is due to inadequate employment opportunities.

George (1979) assessed the operation of the public distribution system of food grains in Kerala. He observed that the operation of Public Distribution System (PDS) in Kerala created a dual market mechanism since farmers sell paddy in the open market after meeting the levy requirements and consumers buy grains from open market to supplement the quantity obtained from fair price shops. The analysis reveals that the sale of rice through ration shops is mainly affected by supply constraints and sale of wheat is affected by demand variables. Furthermore, ration rice accounted for a major share of the rice consumption of lower income groups. The study also found the there was sufficient income impact of public distribution system of food grains to consumers than producers. Compared to direct cash transfer, rationing of food grains provided higher operational efficiency and political feasibility.

Kumar (1979) studied the impact of access to subsidised rice on levels of food consumption and nutritional intake and status using household level data for six months in 1974. The study reveals that the rice from ration shops contributed one fifth of both calorie and protein in the household diet. If rice was not supplied through ration shops a net decline in calorie and protein supply would occur for the households since they have to purchase rice at higher prices from the open market. The impact on demand and consumption of ration rice availability is reflected in the higher marginal propensity to consume additional food from the subsidy income. In addition to this, a positive relationship between ration rice consumption and nutritional status is also identified. On the whole, The study found that there was substantial impact of subsidised rice on calorie and protein intake and nutritional status.

Kannan (1995) brings out the reasons behind the declining incidence of poverty in Kerala. He classified the poverty alleviation programmes of the government into two on the backdrop of the concepts developed by Dreze and Sen (1989). The first set of programmes aim at the creation of entitlements in the sense of access of the poor to consume commodities, while the second set of programmes are associated with building up capability of people by providing education and health facilities. The interaction of entitlement and capabilities will impact the ability of the people to perform their work efficiently.

The study points out that while there is a declining trend in incidence of rural poverty in Kerala since late 1970s, the structure of rural poverty is tilted towards labour households. The development programmes of the state government, especially Public Distribution System played a major role in reducing incidence of rural poverty. With its universal coverage and efficient functioning, the PDS in Kerala distributed essential food grains. Further, supplementary nutritional programmes for children and pregnant women and rural employment programmes also have contributed. Kerala's experience shows that the social security measures, if implemented properly, will help the people to meet basic consumption requirements.

Kannan (2000) examined the state assisted food security system in Kerala by reviewing its contribution to the food availability in the state. He finds a deficit in the food grain production in Kerala since there is wide gap between requirement and total production of cereals, pulses and vegetables. The declining trend in food production and food deficit are mainly because of the commercialisation of agricultural production. The State could resolve this food deficit through the effective and egalitarian functioning of Public Distribution System in the state, which is characterized by universal access, and lack of urban bias. Analysing the outcome of the food security measures, he reveals that the state performs best in case of indicators like life expectancy, infant mortality, nutritional status of children, and incidence of poverty. However, the policy shifts of central government during 1990s seem to threaten the well established Public Distribution System in Kerala. The restrained availability of subsidized food along with the altered definition of "Below poverty line" will exclude number of households from the Public Distribution System beneficiaries. Moreover, the recent hike in issue prices was another threat to the survival of Public Distribution System in Kerala.

Suryanarayana (2001) examined the implications of structural adjustment programme of central government for the food security and social development in Kerala. He observes that the state sponsored Public

Distribution System (PDS) played a vital role in promoting food security in Kerala by providing food grains at subsidized prices. The scale of ration entitlement per adult exceeds the norm by more than 200 g. But it not fully utilised; the average utilisation rate is about 50 per cent only. Thus the per capita cereal consumption in both rural and urban areas falls short of the norm, which can be attributed to the variety of reasons such as inadequate economic access, better health facilities and poor quality of PDS rice.

However, the reform of central government on the distribution side, especially the introduction of Targeted Public Distribution System restricted the food entitlement to the poor households. The APL families shifted their preference towards open market due to higher APL price and poor quality of rice. This implies that the highly subsidised universal public distribution system, which improved the per capita cereal consumption in the state, is not sustainable for fiscal reasons. The social cost of this would be heavy since Kerala is a food deficit state. Moreover the state also is not in a position to distribute food at subsidized price due to its own fiscal constraints. Therefore, he concludes that the social safety nets and human development in the state is in peril.

Ibrahim and Pramod (2006) examined how the policy changes introduced as a part of New Economic Policy affected the Public distribution in Kerala. They argued that the public distribution system has played a crucial role in ensuring food availability in the state. The implementation of New Economic Policy, with a view to reduce fiscal deficit, resulted in rising issue prices of food grains and the introduction of Targeted Public Distribution System. The issue price became more or less similar to open market price. Therefore the consumers have little incentive to make use of PDS. With the subdivision of beneficiaries in to two namely, Above Poverty Line (APL) and Below Poverty Line (BPL), the government changed the entitlement from a per capita norm to family norm since only BPL families are provided food at subsidised price. As a result, there has been considerable fall in the total food grains distributed through PDS. The per capita availability through PDS also registered a declining trend. As a result during post liberalisation the contribution of PDS to total food supply in Kerala has declined consistently. This has resulted in increasing open market dependence of the state.

Isacc and Ramkumar (2010) highlighted the special efforts taken by the Kerala government to include all households in unorganised sector in BPL list. They critically examined the Tendulkar Committee and Saxena Committee Reports. They argued that the use of poverty estimates provided by Tendulkar Committee is likely to result in exclusion of many poor households from BPL list. On the other hand, Saxena Committee Report would put many of the disadvantaged group on competition with general population for a place in BPL list. Further, since the maximum size of the BPL list is fixed in line with the estimates of poverty from NSSO surveys, further expansion of criteria for automatic inclusion is limited. However, to overcome these problems the Kerala Government has adopted a Class approach, which automatically brings all households in the unorganised sector in to BPL list. With this the state expanded the welfare entitlements to some more vulnerable households. However, the impact of these efforts on the offtake of food from PDS remains unanswered.

Kannan (2011) argued that Kerala is not food insecure in spite of the shortage of food production in Kerala. This is due to the fact that food security is no longer entirely dependent on production, but more importantly, on the ability of all sections of the people to access food and consume an adequate amount, as shown by nutritional and related health outcomes. In this context Kerala has not only very high purchasing power among the Indian states but also relatively well functioning Public distribution system and other supplementary nutrition programmes for children and pregnant women. Thus these safety networks ensure availability of food to the rural poor.

It is further argued that the popular perception regarding agriculture is not viable in Kerala is a myth since Kerala stands second highest in terms of value generated per hectare of land and third highest in terms of value net income. Some favourable factors for agricultural development in Kerala are economic growth and strong position of the economy, educated farmers, farmers' organisations and credit societies. Unfavorable factors are failure of public irrigation system high cost of labour, lack of skill and small size of holding. It is held that rice cultivation is not sustainable in Kerala is due to high cost of labour.

Tharamangalam (2011) disputed the argument of Kannan that 'food insecurity in Kerala is a myth'. Three reasons are forwarded to reject the argument that there is no food insecurity in Kerala. First, statistical measures of very high purchasing power and consumption hide social exclusion and unequal distribution. Furthermore, growth in income and consumption in many parts of the world during the neo-liberal period have been accompanied by increasing food insecurity. The second argument is related to the concern of declining social safety nets, including access to subsidised food. There are evidences for increasingly unequal access to education, health and other forms of social goods and services owing to extensive privatisation.

In case of access to food, it is noted that 12 per cent of rural and 20 per cent of urban people in Kerala fell below the official 2004-05 poverty lines. There are indications of increasing malnutrition among children and an increase in the infant mortality rate. A National Family Health Survey showed that the number of the state's underweight children had increased from 27 per cent in 1998-99 to 29 per cent in 2005-06. Further heavy dependence on imports from other states has resulted in higher prices of essential food grains, which in turn has reduced the real income of people in state. Third, the multidimensional food crisis at global and national level has increased the vulnerability in terms of availability.

Nair (2011) examined the policy changes after the introduction of Targeted Public Distribution System (TPDS) in Kerala and their implications for the utilisation of entitlements under TPDS. The study also attempted to analyse the drastic decline in offtake in Kerala. To analyse the objectives the study has collected secondary data from civil supplies department, Food Corporation of India, and National Sample Survey Organisation and Primary data from the Kottayam and Thiruvananthapuram districts of Kerala. It is shown that state government included additional 4.85 lakh beneficiaries in BPL list than the estimates of planning commission. It was also decided to provide some subsidy to APL households on the issue price of food grains.

In spite of these special efforts of state government, implementing TPDS resulted in a drastic decline in the offtake of food grains from the system. The foremost reason for this decline is complete withdrawal of APL households from the system due to the rise in issue price of food grains. Hike in prices resulted in the transfer of purchases from TPDS to the open market due to the poor quality of TPDS food grains. In addition, higher APL prices have significantly reduced the purchasing power of consumers who are now not able to maintain previous levels of consumption. It is argued that the food grain distribution through TPDS is not properly targeted owing to the arbitrary identification BPL households by local bodies without any objective measurement. However a major proportion of consumption of poor households is met through the system and indicating that the genuinely poor are still dependent on the PDS.

It is clear from the above discussion that, despite the shift in analytical thinking about food security from macro to micro level, most of the earlier studies on food security in Kerala focused their analysis on the availability pattern and issues related to supply. These studies analysed the role played by public distribution system in total food availability in Kerala, and how the policy changes and introduction of TPDS has affected the offtake from PDS (Kannan, 1995; Kannan, 2000; Suryanarayana, 2001; Ibrahim and Pramod, 2006). Some studies evaluated the errors in identifying poor households under TPDS, and highlighted the special efforts of state government to expand welfare entitlement to some more vulnerable sections of the society and their implications for the food security of the poor (Isacc and Ramkumar, 2010; Nair, 2011).

Some micro level studies examined the impact of subsidized food on the levels of household food consumption and nutritional status, factors influencing offtake from PDS and the income gains to farmers from PDS consumption (Kumar, 1979; George, 1979; Nair, 2011). A study by Panikkar (1978) in the context of Kuttanad examined the impact of employment and lively hood crisis on the levels of food and calorie intake. There is no comprehensive study on the linkages between agriculture and household level food security in the context of Kerala, that analyses the impact of own agricultural production and net farm income on household level food security and nutritional status. More importantly no study has yet empirically analysed the determinants of food security status of households in Kerala. Thus a household level study in the context of Kerala on the linkages between agriculture and food security with a special focus on the people who depend on agriculture is much required.

1.7 Scope and Relevance of the Study

Much less is known about the linkages between agriculture and household level food security in India. This is because studies analysing malnutrition usually center their analysis on consumption of calories, micro- and macronutrient intakes and anthropometric measures without linking them to agricultural production. On the other hand studies on agriculture tend to examine agricultural productivity, incomes, and price trends. Thus there is paucity of micro level study that brings together the informations on both nutrition and agriculture, which would help in understanding their linkages.

Coming to Kerala context, the linkages between agriculture and food security at the household level still remain unexplored. Further, a micro level study about the role of PDS in the context of agrarian distress and employment crisis during the neoliberal regime will provide insights into the question, how public supported social security schemes can ensure food security of the deprived.

Kuttanad is selected as the study area due to its agrarian nature and it's importance in food production in Kerala. Another issue, which is specifically important in the context of Kuttanad, is the impact of land reforms on livelihood of labourers. Though Kerala prides itself to have implemented land reforms measures, many studies have been criticizing these measures on several grounds. It is now a well established fact that the land reforms in Kerala distributed lands not to the actual tillers of the soil but to the so called intermediaries. Therefore, the labourers who belong to the lower strata of the social hierarchy, either have to lease in land for cultivation at higher rent, or have to sell their labour for earning the means of livelihood. The crisis in agriculture in the form lower return or loss and few days of employment drastically cut short their income, the impact of which on food intake need to be examined in detail.

Therefore this study is an attempt to revisit the role of agriculture in household food security in the context of the agrarian crisis experienced by the farmers and the employment crisis by the labourers in Kuttanad. Further, the study also looks into the question, how public supported institutions like PDS can contribute to food intake at the household level during the crisis period.

1.8 Objectives of the Study

The general objective of the study is to examine the linkages between agriculture and food security at the household level in the context of agrarian distress experienced by farmers and labourers in Kuttanad. The specific objectives of the study are following.

1. To examine the present status of agriculture in Kuttanad by analysing the structure of land holding, cultivation pattern, and the levels of agricultural production and farm income.
2. To analyse the employment situation and livelihood outcomes of households in Kuttanad with a focus on agricultural labourers.
3. To examine the level and sources of cereal consumption and also to understand the levels of food, calorie and nutrient intakes among various groups of households.
4. To empirically investigate the food security status of the households and its determining factors.
5. To estimate the nutritional status of adults and children in the sample population.

1.9 Analytical Framework.

The analytical Framework of the study is broadly divided into two parts. The first part is the analysis of physical and economic access to food at household level. For this the study has adopted the famous 'Entitlement' approach of Amartya Sen (1981). The entitlement approach provides a framework for analysing the various factors influencing food security status of households. The second part is related to the measurement of food security status of households using standard indicators.

1.9.1 Sen's Entitlement approach.

Sen (1981) introduced the concept of food entitlement as a key element in the study of food insecurity and famine. The entitlement approach stresses the significance of adequate resources which enable a person to acquire food. Entitlements are defined as the set of all those commodity bundles over which a person can establish command given the legal, political, and economic arrangements in the society. Entitlement in this context is considered as ownership rights of a person over a commodity or a group of commodities. The ability of the person to consume food is therefore directly determined by the nature and size of commodity bundle that he owns. A person's entitlement usually depends on endowment and exchange. While endowment refers to the initial ownership of assets and capabilities, exchange refers to commodity bundle that a person can acquire in exchange of what he really owns.

According to Sen in a private ownership market economy, food entitlement depends on four elements

a. Production based entitlement which depends on ownership of productive asset. Land is an important productive asset that enables a person to produce for own consumption.

b. Trade based entitlement which depends on the market prices of produce or food.
c. Household based entitlement which depends on the productivity and the opportunity cost of labour power owned by an individual or household. Usually wage is considered as a proxy for this.
d. Inheritance and transfer based entitlements which include social security schemes, relief and subsidies obtained from the government.

All these four set of entitlements are examined in detail in various chapters to analyse both physical and economic access to food.[9] The production based entitlement is examined by analysing land holding pattern, cultivation pattern, agricultural production and the level of consumption from own production. Then the trade based entitlements are examined by analysing the quantity of commercial sale of agricultural produces, price of produces and total earnings of households. To study the Household based entitlement, a detailed investigation of employment conditions, wage status and earnings level of agricultural labourers is attempted. Various modes of transfer payments such as fertilizer and credit subsidies, food subsidies through public distribution system, and employment programmes are also examined to study the transfer based entitlements.

1.9.2 Measurement of Food Security Status.

The second part is concerned with the measurement of food security status. This is accomplished by examining the direct outcome indicator of household food security. Per capita household energy consumption is used as the direct outcome indicator of food security. For estimating this, data on the quantity of food items consumed by the households are collected through a

[9] Structure of the analysis of these entitlements is provided in the organisation of the study.

diet survey. Then these quantities of food items are converted into equivalent amount of energy and nutrient intakes with the help of conversion table provided by Indian Council of Medical Research (ICMR). After this, the amount of food, energy and nutrient intakes are compared with Recommended Dietary Allowance (RDA) suggested by ICMR.

The study defined food security in terms of calorie adequacy. A household is considered as food secure when it provides adequate amount of nutritious food that ensures sufficient energy and nutrient intake for its members to live an active and healthy life. A minimum per consumer unit calorie intake is considered as the cut-off point to determine the adequacy of energy intake. The study has considered the minimum calorie norm of 1800 kcal suggested by the Food and Agricultural Organisation (FAO) for India.[10] Therefore a household is considered as food secure if its daily calorie intake per consumer unit is greater than or equal to the 1800 kcal suggested by FAO, otherwise household is considered food insecure.

1.10 Data Sources and Methodology.

1.10.1 Data Sources

The study makes use of both primary and secondary data. To understand the growth of population and workforce in the state and the districts under study data from District Census Hand Books (DCHB) published by Directorate of Census Operations in Kerala and data from various issues of Economic Review, published by State Planning Board are used. The data on the background characteristics of sample Panchayats are collected from the reports on Panchayat Level Statistics for respective districts published by the Department of Economics and Statistics,

[10] The rationale for choosing this norm is explained in detail in sixth chapter.

Government of Kerala. Data on the food, energy and nutrient intake in Kerala are collected from various reports of Consumer Expenditure published by National Sample Survey Organisation (NSSO) and also from the report on the Diet and Nutritional Status published by National Nutritional Monitoring Bureau (NNMB). Data on the employment indicators for Kerala are collected from various reports of Employment Surveys of NSSO. Details about the incidence of undernutrition in the state are obtained from reports on National family Health Survey (NFHS) published by International Institute for Population Sciences Mumbai. Informations on land holding, cultivation pattern, production and cost of cultivation are obtained from reports on Agricultural Statistics published by the Department of Economics and Statistics, Government of Kerala. Some other information are collected from the Agricultural Statistics of the Ministry of Agriculture, Government of India, reports of Food and Agricultural Organisation (FAO) of United Nations, reports of International Food Policy Research Institute (IFPRI) and reports of WHO and published articles.

The analysis of agricultural production, employment situation, household income, and food security status of the households in Kuttanad is based on the primary data collected through the sample survey. For this purpose the informations on the household characteristics, demographic and employment details of members, land holding and agricultural production, food consumption and anthropometric features of members were obtained by administering a structured interview schedule.

1.10.2 Sampling Design

The study has collected required primary data through a sample survey carried out among the selected households in Kuttanad. Since the primary objective of the study is to analyse the linkages between agriculture and household level food security, the population for the study consists of households associated with agriculture in Kuttanad. The households associated with agriculture are of two types, cultivator and labour households. Therefore the main criteria for a household to be an item of the population under study is that it's major earning member, either household head or elder earning member, must be engaged in agriculture either as cultivator or as labourer. Thus the population of the study can be conveniently divided into two strata, namely cultivator households and labour households.

A multi-stage stratified random sampling is employed to select the sample households. The study area Kuttanad is a wetland region situating below mean sea level. It spreads over three districts, Alappuzha, Kottayam and Pathanamthitta districts. Among these three districts Alappuzha district was selected on judgment basis as it constitutes 57 per cent of Kuttanad. Then from Alappuzha district two community development blocks, namely Chambakkulam and Veliyanad were selected on random basis and these two blocks come under Kuttanad taluk. Then from each block, two panchayats were randomly selected. Chambakkulam and Edathua panchayats were selected from Chambakkulam block, similarly Kavalam and Muttar panchayats were selected from Veliyanad block. After this the Panchayat level data on the occupational classification of main workers from 2011 census was considered to fix the total number of workers employed in agriculture in these four sample panchayats. An individual employed in agriculture can be cultivator or labourer. A five per cent of the total number of cultivators and labourers is fixed as the total sample size within each panchayat, then as per their respective shares in total, the final sample size of cultivators and labourers is determined for each panchayat. The final sample size is given in table 1.1. Total sample size is 273 households, of them 71 are cultivator households and 202 are labour households.

Table 1.1 Sample Size

Panchayath	Cultivator Households	Labour Households	All
Chambakulam	24	57	81
	(29.0)	(71.0)	(100)
Edathua	16	44	60
	(26.0)	(74.0)	(100)
Kavalam	20	57	77
	(26.0)	(74.0)	(100)
Muttar	11	44	55
	(20.0)	(80.0)	(100)
Total	71	202	273
	(26.0)	(73.9)	(100)

Source: Author's own calculations

Note: Figures in parentheses show percentages to row total.

1.10.3 Survey Method

From the selected sample households, data on socio-economic characteristics, land holding, details of cultivation, details of members, employment status of members, household income, food intake and height and weight of adults and children were collected using structured interview schedule. Data were collected during the months of April and May 2014. The study has prepared interview schedule on the basis of schedules of National Sample Survey Organisation (NSSO) for employment and consumer expenditure surveys. The informations on employment details are collected for the last one year preceding the survey using one year recall period. The informations on household characteristics, demographic and employment details of members, land holding and agricultural production are obtained from the household head.

Diet survey was conducted to collect data on the food intake. The data on the quantities of food items prepared and consumed were collected from the housewife or the female member involved in the preparation of food. The 30 day recall period is used for collecting the data on the consumption of all food items following the methodology of NSSO. At most care was taken to record the intake of all food item by the members of households both within the home and outside home. The data on heights and weights of adults and children was collected on the basis of the instructions provided by the World Food Programme (WFP, 2005) in its 'Manual for Measuring and Interpreting Malnutrition and Mortality'.

1.10.4 Methods of Data Analysis

The study has employed statistical and econometric methods to analyse the data. Frequencies, percentages and descriptive statistics are used to summarise the primary data. To examine the differences in the mean values of variables such as land holding, income and per capita calorie intake among various categories of households, t- test and ANOVA tests are carried out. With an aim to assess the extent of land and income inequality Gini coefficients are estimated for the respective variables. To analyse the determinants food security status, the study has estimated a Binary Probit model using the Maximum Likelihood Estimation (MLE) method since the dependent variable is a binary response variable. Further to understand the determinants of dietary diversity, a multiple regression model is estimated using Ordinary Least Square (OLS) method[11].

[11] See chapter 6 for the specification of the econometric models.

1.11 Organisation of the Study

This study is organised into eight chapters. The first one is the introductory chapter which includes discussion on the context of the study, research problem, objectives and data and methodology. Chapter 2 presents review of theoretical and empirical literature on household level food security. Chapter 3 introduces the study area by providing description about the topographical characteristics, population dynamics and present status of agriculture in the region. Chapter 4 is devoted to the analysis of production based entitlement of the households such as land holding, agricultural production, and farm income. In chapter 5 household based entitlements such as employment status and earnings from employment are examined. Chapter 6 provides the empirical findings related to the level of food, energy and nutrient intakes of sample households and also the incidence of food insecurity. Chapter 7 gives the estimates of the nutritional status of adults and children of sample households. Chapter 8 summarises the findings of the study and also forwards some policy implications drawn on the basis of findings.

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Chapter 2

HOUSEHOLD FOOD SECURITY: REVIEW OF THEORETICAL AND EMPIRICAL LITERATURE

Contents

2.1 Introduction

How the incidence of food insecurity and undernutrition can be brought down? By triggering a good number of empirical studies, the question generated a large amount of academic literature and served as a cause for many conceptual and organisational innovations by aid agencies (Maxwell and Smith, 1992), which would later become integral part of food security programmes in developing countries. The attempts to address the issue have resulted in progressive development of definitions as well as enrichment of analytical apparatus. These developments, documented in studies undertaken since 1980s, reflect international shift in thinking about food security, and indicate some of the difficulties in describing and measuring factors causing hunger and malnutrition (Hendriks, 2005).

Although the discussions about food security began to intensify only after 1980s, general awareness in the policy regime can be traced back to 1940s. The 1940s witnessed several developments towards acknowledging the food security as a major development agenda, which ultimately led to the formal establishment of Food and Agricultural Organisation (FAO) by United Nations (UN) in Canada on 16th October 1945 with head quarters in Rome[1]. FAO aims towards achieving food security for all. Further, United Nations Children's Emergency Fund (UNICEF) was formed in December 1946 with an aim to provide emergency food and healthcare to children in countries that had been devastated by Second World War. In addition to all these, a remarkable step was the recognition of 'right to food' as core component of adequate standard of living embodied in the Universal Declaration of Human Rights in 1948. Following these, there were some developments in 1960s like implementation of world food programme and first food aid convention.

However, the predominance of food security in the development discourse of 1980s was mainly rooted in the world food crisis of 1972-74 and the consequent first world food conference in 1974. The deliberations further strengthened in the aftermath of African famine of 1984-85 primarily because of new insights brought in by studies analysing household level food security using entitlement approach. Here after Individual's entitlement bundle or entitlement failure received particular attention. More recently experiential-based measures estimated with the help of qualitative surveys have been used

[1] First initiative towards this was taken by then US President F.D Roosevelt by calling a United Nations conference on Food and Agriculture in Hot Spring, Virginia from 18 May to 3 June 1943. This meeting decided to set up UN interim commission on food and agriculture to make necessary recommendations for FAO's establishment. Based on recommendation and constitutions prepared by the commission, the first session of FAO was held in Quebec, Canada from 16 the October to 1 November.

as indicators of self-perceived food security among households (Rose and Charlton, 2002).

The main objective of this chapter is twofold. First is to discuss the conceptual and empirical framework of household food security. Second is to present the review of existing literature on some important domains of empirical enquiry with respect to household food security. This chapter is divided into nine sections. Section 2.2 deals with the conceptual framework of household food security, where conceptual evolution, various components and their inter linkages are discussed. This would help us to understand the dynamics of relationship between food security and its determining factors. Section 2.3 provides a description of various indicators used to measure food security along with the relative merits and demerits of major indicators, so that appropriate indicators can be selected for the study. Section 2.4 presents a review of empirical studies on the determinants of food security in order to bring some idea about the dependent and independent variables to be used for econometric analysis and also about nature of their relationship. A discussion on the linkages between agriculture and food security is given in section 2.5 since it is the focus of the study. Section 2.6 discusses the sustainable livelihood approach of household food security by highlighting the importance of livelihood diversification and non-farm income activities for food security. Section 2.7 explains various issues related to role of public distribution system in providing access to food in India highlighted in previous studies. The relationship between trade and food security is elaborated in section 2.8. Section 2.9 concludes the chapter.

2.2 Household Food Security: The Conceptual Framework

2.2.1 Conceptual Evolution

The conceptual framework of household food security has been undergoing considerable modifications. Extensive research in this area since 1980s has brought in new elements towards understanding the nature and causes of food insecurity. During world food conference of 1974 the emphasis was on increasing food production and creating a coordinated system of national and international grains reserves (Adebayo, 1989). Thus earlier time household food security was viewed a measure to link national, regional, and community level food supply to household food consumption and individual nutritional status and relate agricultural policy to issues of nutrition (Gittelsohn, et al., 1998). [2]

It was the pioneering work of Amartya Sen (1981) on food 'entitlements' which shifted the focus from production towards economic access. However, even before this, a similar set of ideas pointing towards the relevance of economic factors were also found in literature on food policy and nutrition. For instance, Joy (1973) developed a 'Functional classification of undernourished population as basis for food and nutrition planning'. Interestingly the classification was an integration of ecological, demographic, and economic factors. Further, he classified the deficiency pattern into three, namely chronic, seasonal and occasional and categorised nutrient deficiency into various micro and macro nutrients. A similar sort of argument was put forth by Clay (1981), who viewed food insecurity as a human problem as it is

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[2] See Maxwell and Slater (2003) for a comparison of old and new concepts of food security, they distinguish between old term 'food policy' and the new term 'food security'. Focus of food policy was on food supply, while food security is concerned with entitlement and livelihood.

primarily one of the welfare vulnerabilities of distinct categories people within the population such as the urban poor, the rural landless and small marginal farmers.

Nevertheless, at the core of theoretical framework of food security is the Sen's concept of 'Entitlement'. The entitlement approach revolutionised the analysis of food security by bringing household level factors into the focus. Entitlement refers to resources bundle over which an individual can establish command. The resources bundle consists of productive assets, inherited properties, returns on labour, and transfer payments that are critical in determining the livelihood status and purchasing power of a person. The approach also incorporates risks associated with the bundle and extent of livelihood vulnerability resulting from them (Maxwell and Slater, 2003). The sustainability of livelihood that can be attained through the mitigation of risk related to the individual's entitlement bundle assumes a decisive role in case of food security (Chambers and Conway, 1991) Therefore food insecurity is recently seen as a livelihood failure (Deverux and Maxwell, 2001). The entitlement approach as a household centered analysis had its own limitations, of which relevant are neglect of Intra-household distribution of food, cultural accessibility, and temporal dimension of vulnerability.

2.2.2 Definition and Components

As it is already argued in the first chapter, due to the multidimensional nature of interrelated factors influencing food security, no single definition can capture all the dimensions. However, individual studies have attempted to adjust these factors to suit their needs and priorities (Smith, et al., 1992). The priorities are different for different groups who undertake the studies. The national governments tended to focus on food production with the aim of achieving self sufficiency, while the international organisations and academic literature give preference to consumption and nutritional outcomes.

Nevertheless, most of the studies have made use of the definition proposed by World Food Summit of 1996 and further refined by FAO as "Food security is a situation that exists when all people, at all times have both physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2001, p. 49).[3] Many core concepts related to food security, which we shall discuss in subsequent sections in detail, are embodied in this definition. Physical access refers to the availability of food from various sources at national or household level. Economic access refers to the capacity of household to secure food using various resources at household level. The term 'all times' relates to the stability of access to food, which brings forth the temporal dimensions and risks involved in accessing food. 'Sufficiency' indicates that food also must be nutritionally adequate to meet the dietary needs of household members to live a healthy life. The term 'Safe' refers to two aspects; first one is safe food without any harmful substances that makes food injurious to health. Second is utilisation component, which means safe utilisation and consumption of available food through clean water and proper sanitation facilities. Similarly 'food preferences' implies that available food items also must be in accordance with the cultural and social preferences of households.

2.2.3 Physical Access or Food Availability

Access can be of two types; physical access and economic access. At the household level physical access or food availability means maintaining

[3] This is because the definition is broad enough to cover all elements. Some of the studies that quoted this definition are Schmidhuber & Tubiello (2007), Smith and Subandoro (2007), Owusu et al. (2010), Haen et al. (2011), , Ecker and Breisinger (2012), Kavikumar et al. (2012), and Maxwell et al. (2013).

adequate stock of appropriate food within the reach of individuals, through household's own farm production or commercial imports from other domestic or international markets or through government transfer mechanisms (United States Agency for International Development, [USAID], 2011). In another words food availability is described as the physical presence of food, sufficient in terms of quantity and quality, within the reach of household. Food availability at household level is influenced by supply side factors like overall availability, food policies of the government or aid agencies and the smooth functioning of supply networks. Overall availability is determined by domestic food production and food imports, which are in turn influenced by government policies regarding food production, such as policy makers' focus on food self sufficiency or self reliance (Pieters et al., 2013). Moreover, food subsidy policies, food procurement and distribution programmes, policies affecting import and export of food items also can influence over all food availability.[4] The presence of well functioning supply network, integrated with the market systems with the support of good transport and communication infrastructure, can facilitate the delivery of adequate food grains to an area on consistent basis (Action Contre La Faim [ACF], 2010).

Several studies have highlighted the role of own food production by households in enhancing food availability (Rezai et al., 2016; Zezza and Tarciotti, 2010; Barthel and Isendahl, 2013; Warren et al., 2015). Own food production or subsistence- oriented agriculture includes not only agricultural produces but also livestock, fisheries and collected food items. Warren et al. (2015) remarked that own food production by households would result in increased food availability, easy access, high income, and low price of food

[4] This is true in case of India as Chand (2005) noted public procurement and accumulation of grain stock have reduced availability in open market.

items. Further, this may also help people to survive the distress resulting from food shortage, economic or livelihood crisis, political instability etc…

However, agricultural production need not always be subsistence-oriented or for households' own consumption. Indian Agriculture became largely commercialised under British rule by the middle of the nineteenth century. Industrial revolution took place in Britain brought about higher demand and price for raw materials, consequently Indian farmers shifted to commercial crops (Roy, 2011). Most of the commercial crops were export oriented. The commercialisation and market orientation further strengthened with the development of railways and other infrastructure.[5] Thus the area under these crops increased after independence. However, some states still preferably produce food crops especially cereals like rice and wheat. Even these productions are also market oriented because these produces were sold to either government procurement or private traders. Thus, typical subsistence agriculture is no longer seen in India, though some farmers cultivate some food items like pulses and vegetables or keep apart some food crops for consumption.

In India self-sufficiency in food production was a major goal of planning. Right from the first five-year plan government initiated many programmes to achieve food self-sufficiency. After the two droughts in 1965 and 1966 and the consequent cut off of food aid from America, government the under the leadership of Indhira Gandhi launched seed- fertiliser- water-policy what we celebrated it as 'Green revolution'. Since 1960s, government initiated new agricultural policy with the application of modern agricultural technology, seed-firtilisers and high yield variety seeds. As result of this, there has been phenomenal increase in food production in India. For instance,

[5] Commercialisation led to decline in food production and rising food prices, ultimately resulting in several famines. Some famines occurred after 1850s was not due to non-availability of food but due to the insufficient purchasing power of people due to higher food prices.

between 1950-51 and 2001-2002, food grain production had increased from 51 million tonnes to 212 million tonnes, more than fourfold increase. However, this increase was uneven across states since North and North West India were deemed by public policies to become the granaries of India. India achieved self-sufficiency in food production in 1970s and has sustained since then. Increase in food production improved the food availability in India. Net availability of total food grains (per annum) increased from 144.1 Kgs Per capita per year in 1951 to 180.4 Kgs Per capita per year in 2002.

2.2.4 Economic Access

Economic access refers to the ability of households to obtain appropriate and nutritionally adequate food for all its members by making use of various assets at its disposal (Lovendal et al., 2006). Economic access to a greater extent depends on various types of assets and market price. Assets enable households to generate income to secure food. A larger asset base generally translates into greater livelihood opportunities and food security (USAID, 2011). There are various types of assets such as natural resources, human assets, physical assets, financial assets etc…The idea of economic resources is largely based on Amartya Sen's Entitlement Theory. Entitlement generally refers to resources under the possession of household that help to gain some purchasing power. Maxwell and Smith (1992) showed various types of entitlement, which households can utilise to access food (Table 2.1).

Table 2.1 Sources of Entitlement

Productive Capital	Non-Productive Capital	Human Capital	Income	Claims
Land, machinery, tools, animals, farm buildings, tress, well etc…	Jewellery, dwellings, granaries, some animals, cash savings	Labour Power, Education, Health	Crops, Livestock, non-farm and non-agricultural activity	Loans, gifts, social contracts, social security

Source: Maxwell and Smith (1992)

To Sen (1981) lack of resources is the primary cause for food insecurity, which he termed as entitlement failure. If the entitlement bundle of a person does not include adequate resources to obtain food, he will go hungry. Thus the access to income generating resources is really critical in case of food security. These resources can be allocated to food production, wage labour or other business activities that allows household to secure food either directly through food production or indirectly through income generation. (Hoddinott 2012 cited in Pieters et al., 2013, p. 8).

Some earlier studies have proved the importance of income in achieving adequate calorie intake (Iram and Butt, 2004; Sahn, 1988). Several factors that contribute to household income starting from productive asset like land to the socio-political relations influence the food intake of households. Land, live stock and other productive assets enable households not only to produce food for own consumption but also to generate some amount of farm income by selling the produces in the market. However it was observed that income from farm activities and agriculture has not been sufficient to meet nutritional requirements at household level (Owusu et al., 2011). Therefore many studies (Barrett et al., 2001; Diao et al., 2007; Babatunde and Qaim, 2010)) have highlighted the potential role of off-farm income in enhancing food security and nutrition.

Households members also supply their wage labour to both farm and non-farm activities. But the total earnings from this wage labour depend not only on wage offered but also on the level of employment (Panikkar, 1978).[6] The level of employment in many countries has declined over last some

[6] Same sort of argument can also be found in Report of MS Swamininathan Research Foundation [MSSRF] (2010) on the state of food security in urban India. The report showed that the pattern of employment seriously affected the economic access to food.

decades because of farm mechanization and risks arising from adverse agro-climatic conditions. The vulnerabilities arising from risks associated with the rural farm and non-farm activities to a greater extent can be mitigated through financial and other supports from government, aid institutions and social networks. Thus Broca (2002) stated that socio-institutional arrangements are also important. Being the members of various networks, people can utilise them to raise resource if there is a short term crisis.

2.2.5 Food Utilisation

Food availability and access are necessary but not sufficient conditions to ensure food and nutritional security (Barrett and Lentz, 2009; Broca, 2002). Proper utilisation of available food that creates a balanced dietary intake is also essential to achieve better food and nutritional status. Food utilisation refers to the domestic preparation and metabolic absorption of adequate food with clean water, sanitation facilities and good health practices to take in sufficient amount of nutrients contained in the food items. It includes the allocation of food within households to each member, the nutritional quality of that food, and the bioavailability of nutrients in those foods (Jones et al., 2013). For a better utilisation, facilities for storage, processing, preparation, and intra-household distribution of food are important. The UN World Food Program (2007) stated that the food consumed must be sufficient in quantity as well as quality to meet the energy requirements of its members, especially for income generating activities. Utilisation of available food is affected by non-food factors like medical attention, health services, basic education, sanitary arrangements, and provision of clean water and eradication of infectious epidemics.

It is now realised that even if food is available within close proximity of households, and individuals have access to it, they may necessarily not consume it. For Instance, Pieters et al. (2013) argued that even though the members of household have access to a balanced diet, they may still prefer to buy hyper-caloric food. Further it is noted that increase in income will not lead to improvements in nutrient intake because increased expenditure will not be made more on nutrients (Behrman and Deolalikar, 1987) but sometimes spent on items such as alcohol or fast food (Banarji and Duflo, 2006).

Therefore to ensure better utilisation of food adequate knowledge about nutrition and health practices and adequate health and sanitation services must exist (USAID, 2011). It is believed that undernutrition is the outcome of not only inadequate food intake but also poor health and sanitation conditions that may prevent individuals from deriving full nutritional benefit from what they eat (FAO, 2000). This necessitates an all around intervention from the part of government or aid agencies in the socio-economic spheres of life of people.

The words sufficiency or enough can be found in the studies analysing food security. Sufficient food or enough food in essence means adequate amount of nutritious food that ensures sufficient energy and nutrient intake for the individuals to live an active and healthy life. In general, adequacy of calorie intake of household is accepted as a benchmark measure of food insecurity (Chung et al., 1997). Adequate caloric intake is determined as a minimum required caloric norm by national and international institutions. It has been a common practice to convert different food items consumed into calories and if people's caloric availability fall below the minimum level identified by the institutions, they are considered to be food insecure (Burchi and Muro, 2016). [7]

[7] This approach is similar to the concept of 'poverty line' used for poverty estimation.

2.2.6 Food Stability

Food stability is closely associated with food insecurity reflecting the importance of secure access to food at all time without any vulnerability or risk. Food insecurity resulting from negative shocks to availability, access and utilisation endangers the stability condition. The stability component considers stability of the other three components such as availability, access and utilisation over time. Household is considered as food secure only when they feel security and stability of availability and accessibility and proper utilisation conditions (Bajagai, 2015). Therefore stability can be regarded as secure access to appropriate level of nutritious food over time without any risk or vulnerability. Stability addresses the issues of vulnerability or risk involved in availability and access. There are risks involved in food availability in the form of acute food shortage resulting from crop failure or natural disasters. Risks related to entitlement bundle are in the form of variability in production and prices, risks in employment and wages, risks in health and morbidity.

According to Lovendal et al., (2006) vulnerability is negative outcome of food insecurity that refers to people's propensity to fall below the food security benchmark within a certain time frame. Thus vulnerability with regard to food insecurity is often regarded as the likelihood that an individual may experience insecure access to food required for healthy life due to risks resulting from the factors influencing availability and entitlement. Many studies have sought to define food insecurity in terms of risk. For instance, Food insecurity is defined by SCN (as cited in Maxwell and Smith, 1992, p. 13) as "undue risk of losing access to the food for healthy life". Braun (as cited in Maxwell and Smith, 1992, p. 14) described food insecurity as "the risk of an ongoing lack access by people to the food they need".

Two types of food insecurity are widely recognised, chronic and transitory food insecurity. Chronic food insecurity is long term in nature that refers to persistent failure of household to meet the food needs of its members. While transitory food insecurity refers to short term food shortage and temporary decline in entitlement. Transitory food security can further be divided into two sub categories, cyclical food insecurity and temporary food insecurity. Cyclical food insecurity or seasonal food insecurity occurs in a predictable and regular pattern, for instance, lean that comes in the period just before the harvest. On the other hand, temporary food insecurity occurs for a limited time due to unforeseen and unpredictable circumstances.[8]

2.2.7 Household Food Security Framework: Understanding the Inter Linkages among Factors.

Food security at the housed level is determined by the complex interaction of several interrelated factors. The factors are quite distinct in their nature and domain. Some are production and policy related factors operating at national or international level. Some are market related factors such as supply networks and prices and some are household specific or individual specific factors. Further there is no specific framework for the way they interact together because all factors are interrelated in multiple ways with forward and backward linkages. However, several studies have demonstrated different frameworks, which vary from each other as the purpose of the study and unit of analysis change.[9] In our discussion we use the framework proposed

[8] See Broca (2002) for household level and market level dimension of chronic and transitory food insecurity.

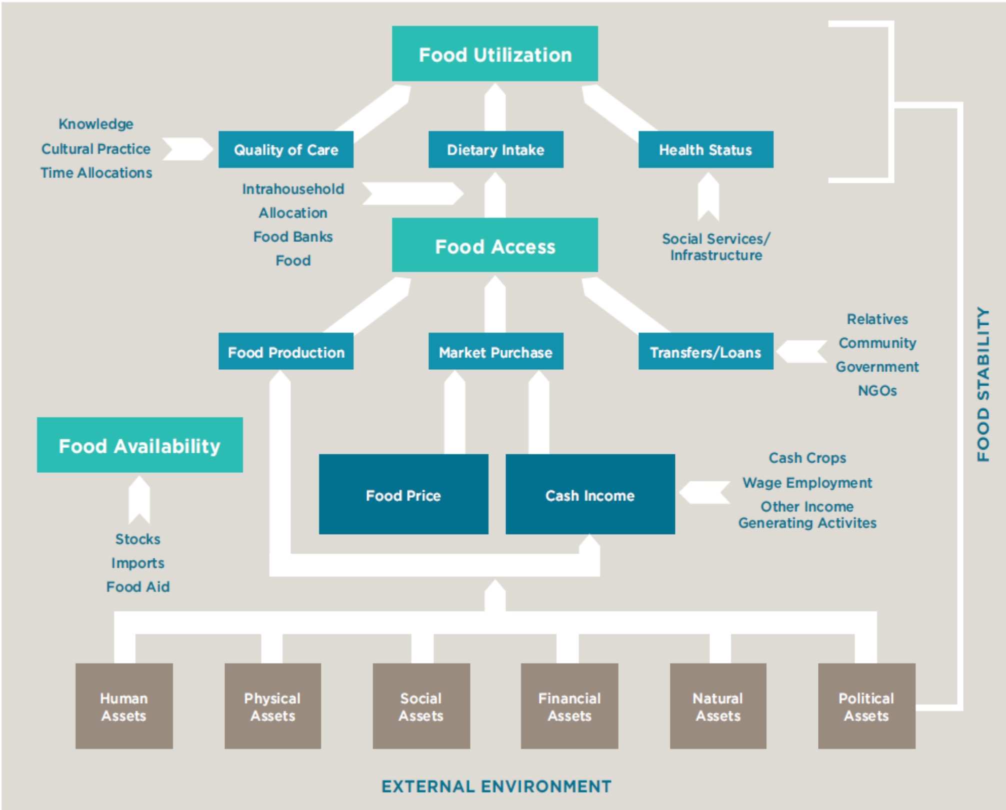
[9] For some examples see Binxin Yu et al. (2010), Ecker and Breisinger (2012), Gross et al. (2000) Pieters et al. (2013), Lovendal et al. (2006) and Smith (1998)

by United States Agency for International Development (2011), which is more household centric and covers almost all aspects of food security.

While the definitions of household food security relate to individual, empirical studies treat household as a unit of analysis, to dispense the individual specific disparities in preferences and activities. This empirical exercise has been carried out by making a series of assumptions about household structure and organisation. Towards this end, Maxwell and Smith (1992, p. 19) advanced some assumptions, of which first one is that household members share common set of preferences in resources allocation. Second, household income and food resources are pooled and allocated to maximize collective welfare. Third, households with similar endowments respond similarly but independently to price, income, and other exogenous changes.

As it is depicted in figure 2.1 household food security framework starts from various types of assets. Assets enable households to produce food crops for own consumption or cash crop for selling in market. Further, they also help to generate some income from various income generating activities. Parallel to this at the national level, food availability is created through stocks formed by procuring from domestic production, imports and food aid from other countries or international organisation. In the next stage access to food is attained by three ways. Households can use own food produces for consumption. Or they can use cash income to purchase food from market. Here the purchase of food items from market to a greater extent is influenced by level of prices. Even if they do not produce themselves or do not have sufficient income to purchase from market, they can make use of food transfers or loans. The transfer mechanisms run by government or NGOs at free of cost or subsidised price provide food to the needy. Another possibility is to make use of social relations to raise some loans which can be used for purchasing food.

Figure 2.1 Framework of Household Food Security: Understanding the Inter Linkages among Factors



Source: Adapted from USAID (2011)

Once households have access to food, the next task is to ensure proper utilisation of food. Three aspects such as quality of care, dietary intake and health status are important for utilisation. Quality of care depends on knowledge about health care and feeding practices, cultural habits and time allocated for care. Dietary intake depends on quantity and quality of food and intrahousehold allocation of food. Health status is determined by the health services and infrastructure. In case of utilisation component government agencies (Political Asset) has a decisive role to play by providing education and awareness about feeding practices and health care and also by providing good health service and infrastructure. Finally stability has to be ensured with regard to all factors influencing food availability, food access, and food utilisation.

2.3 Measurement of Household Food Security

Despite the achievements of impressive growth and self sufficiency in production by various countries, the incidence of food insecurity and undernutrition is widespread among millions of people throughout the world. Hence, food security continues be main priority of development policies and central topic in development research (Conceicao et al., 2016). Any policy for reducing food insecurity necessitates answering some questions such as who are food insecure, why and how they became vulnerable, and where they reside (Maxwell and Frankenberger, 1992). To address these questions a sound information base is required. The information base is also a prerequisite for proper monitoring and evaluation of various programmes implemented. As a result, most of the governments and organisations have set up and attempted to update the information base on various indicators of food security. Setting up this information base involves identifying policy variables, deriving appropriate measures or indicators, and finally collecting and processing the data.

Thus, by now it is realised that selection of appropriate indicators of household food security is crucial for developing food policies as well as for the effective implementation of programmes. Nonetheless, given the multifaceted nature of food security and array of indicators, it is a challenging task to choose indicators required for the assessment of food security. There are many indicators associated with various factors influencing each components of food security at different levels, such as national, market, household and individual.[10] Further, there have been confusions about the ultimate meaning of the term food security. It is often used interchangeably with other terms such as hunger, food deprivation, undernutrition and undernourishment, despite the fact that these are all various aspects of a broad concept food security (Aurino, 2014). The confusion gets accentuated when it comes to analytical concept of food security because studies have been employing various input indicators and outcome measures without understanding whether it serves the purpose of investigation. Such sort of empirical exercises, without understanding the methodological distinctions, tend to use a list of input and outcomes indicators together, what is later known as 'shopping list of indicators' (Sen, 1999). This tendency ultimately resulted in analytical difficulties and ambiguity in conclusions.

Because of the reasons discussed so far, there has been continuous interest among researchers in the indicators used to measure household food and nutrition security.[11] The indicators can broadly be classified into two, process indicators and outcome indicators. While process indicators are related to both food supply and access, outcome indicators serve as proxy for food consumption (Frankenberger, 1992). Outcome indicator can further be classified into direct or experienced-based measures and indirect or derived measures. Direct indicator is a qualitative assessment using a scale based measure on the perception and experience of food insecurity and hunger. It is

[10] See FAO (2013) or Food Security Information Network [FSIN], (2016) for an exhaustive list of indicators related to various components.

[11] This long standing interest produced a number studies about indicators such as Frankenberger (1992), Jones et al. (2013), Leroy et al. (2015), Hoddinot (1999), Smith (1998), and FAO (2013), and some technical guides such as ACFI (2010), FAO (2013), Napoli et al. (2010), FSIN (2016), USDA (2000), and Wiesmann (2009) explaining the methods of measurement and styles of questionnaire.

measured with the help of Household Food Security Survey Module (HFSSM), consisting of 18 questions on various aspects, developed by US department of agriculture. Indirect indicators or derived indicators of food security are based on various estimates indirectly derived from total calories of available food, consumer expenditure surveys, dietary intake surveys, and anthropometric measures of an Individual.

In the following sections we shall discuss all these measures and their relative advantages and disadvantages in detail. The classification of process and outcome indicators is based on Frankenberger (1992). However recent literature such as Jones et al. (2003) and Escamilla and Correa (2008) follow direct and indirect classification. This is quite distinct from the classification of Frankenberger (1992) who viewed consumer expenditure survey as direct measure, while Jones et al. (2003) and Escamilla and Correa (2008) considered it as indirect measure. Therefore, in our discussion on indicators, our aim is to present relevant indicators related to the components of food security without making strict classification of the direct and indirect indicators. Moreover, sometimes it is often difficult to distinguish between indicators of components, because a single factor may contribute to two or three components. For instance, some factors such as land contribute to both physical access and economic access. Thus, an indicator that shows the status of physical access may also reflect the impact of economic access, or other way around. Therefore more focus is given on the elaborations of indicators, while a moderate attention is paid on relating them to respective components.

2.3.1 Process Indicators of Availability

As we have already discussed, process indicators represent availability of food in the area of household. This availability to a greater extent depends on domestic food production, commercial imports, food aid, and access to natural resources, institutional development and market infrastructure. Most commonly used process indicators are availability of food, prevalence of undernourishment, average value of food production, and availability of physical infrastructure.

a) National Availability of Food

This is a more straight forward indicator of total food supply met through domestic food production, private food import, food aid from foreign countries or international organisations and food supply though the government agencies. Generally Total food production and per capita food production are used to analyse the availability of food.

b) Prevalence of Undernourishment (Per capita Dietary Energy Supply)

This is a national level estimate proposed by FAO to analyse availability or physical access. This method calculates daily per capita dietary energy supply adequacy, to show that what share of national population is not meeting the minimum food energy requirements. Calculation is based on three parameters, the mean quantities of calories available for human consumption, the inequality in access to those calories among the country's population, and the mean minimum amount of calories required by that population. The first step is to calculate quantity of food available for human consumption each year from national food balance sheets. The food balance sheet is estimated as balancing item after considering opening stocks, production, imports, exports, domestic utilisation (both food and non food uses), wastes of food, fed to live stocks, lost in warehouses and transportations, and closing stocks.

Then this estimate of quantity of food available is converted into calories and then divided by the population to derive the per capita dietary energy supply (DES), expressed as kilo calories per day. Off course, DES is an estimate of food availability and not intake, but it is used as an approximation of mean calorie consumption (Haen et al., 2011). Coefficient of Variation (CV) is used as a measure of inequality in the distribution of dietary energy supply (DES) with in a country. CV is estimated as the standard deviation of DES divided by its mean using data from available household food consumption or expenditure surveys. Then cut off point of minimum daily per capita dietary energy requirements (DER) for individuals are fixed based on their demographic features.[12] Finally the proportion of population falling below minimum cut off point is considered as undernourished. This measure is often used by FAO for evaluating the progress towards millennium development goals. This helps to have a cross country comparison of food security and also facilitate global and regional governance of food security. Moreover, this method is inexpensive since almost all countries on annual basis generate the data needed to estimate per capita dietary energy supply and these estimates are frequently updated, so that one can easily look into global, national, regional, food security trends (Escamilla and Correa, 2008).

Off course, this indicator of prevalence of undernutrition is not free from criticisms. Haen et al. (2011) criticised that the FAO approach measures only chronic food insecurity at national levels, neither it indicates actual distribution within a country of people suffering from hunger, nor it helps to provide useful information for policies at sub-national levels. Moreover, the assumption of mean of the distribution of calorie consumption equals the average dietary energy supply is proved problematic since there existed large

[12] See Smith (1998) for a detailed discussion on the steps of calculating minimum daily per-capita energy requirement and also for the mathematical formula used by FAO for estimating the prevalence of chronic undernutrion.

disparities between number of food insecure households estimated by these data and estimates made by United States Department of Agriculture (USDA). Further this does not consider dietary quality. The assumption that energy consumption above cut off points does not ensure food security because malnourishments like obesity is a now common phenomenon. There are also chances for high degree of measurement errors in food balance sheet and in determining minimum cut off points (Jones et al., 2013).

Due to these criticisms in order to have comparative analysis, FAO also releases similar set of additional estimates such as Share of dietary energy supply derived from cereals, roots & tubers, Average protein supply and Average supply of protein of animal origin. Further Relative Dietary Supply Index is constructed using the same methodology of dietary energy supply indicator. This is calculated as the ratio of the per capita dietary energy supply in the country, normalized by the country's average dietary energy requirement based on age, sex, and height distributions.

c) Individual Dietary Intake

This perhaps is the most effective indicator that measures the amount of calories and other nutrients consumed by an individual for a 24 hours reference period. There are two approaches for collecting this data (Hoddinott, 1999). The first is observational, where an enumerator resides in the household throughout the entire day and measures the amount of food served to each person. In addition, the enumerator notes the type and quantity of food eaten as snacks between meals as well as food consumed outside the household. The second method is recall. The enumerator interviews each household member regarding the food they consumed over the previous 24-hour period. This covers the type of food consumed, the amount consumed, food eaten as snacks and meals outside the household.

This collected data on the quantities of food will be converted into calories using a standard conversion table. Then this calorie is compared with the minimum required calorie intake data for each person. The individual calorie requirement changes with the characteristics of a person such as gender, age, body composition, activity levels, disease state etc…However, to standardize, normally we start with a reference person with body weight of 60 kilograms, aged somewhere between 30 and 60 years undertaking moderate activity. This yielded a caloric requirement of approximately 2,700 kilocalories per day. Requirements for children also can be worked out based on their age sex.[13] There are controversies that this minimum calories requirement is not real representation of minimum food needs. Although there is no consensus on these figures, estimates of "basic requirements to meet food needs" range from 1,885 to 2,500 kilocalories (James and Schofield 1990; Smil, 1994).

Being more intensive method, dietary intake measure has certain advantages over other methods. It gives more accurate measures of individual calorie and nutrient intakes, so that food security status of individuals can be determined. It gives clear idea about actual consumption rather than availability. Inequality in Intrahousehold distribution of can be studied. It throws lights on not only quantity but also quality of the dietary intake. Determinants and consequences of food insecurity at the household level can be examined.

Nevertheless, the intensity and care required for data collection raises some serious disadvantages for this method. The method is very costly, time

[13] Hoddinott (1999) reports the table for recommended daily caloric intakes by WHO (1985) for children and adults for various activity level distinguished by gender.

consuming, requires highly skilled and trained enumerators, and there is higher chance for measurement errors. Spending 24 hour in one household means it may require more time or more enumerators to have a significantly large sample. Further, to account for with in person or within household day to day variations in dietary intake, data need to be collected repeatedly, ideally for seven non consecutive days. This necessitates highly skilled enumerators and good memory of the respondents. Specialized skills are required for observing and recording food consumed quickly and accurately in case of observation method. Accuracy of recall method depends on the memory of respondents because they are required to recall not only types and quantity of food items but also the method of preparation. If interviewers are not fully trained and standardised against each other under a lead supervisor, all these methodological challenges can lead to unacceptably higher level of measure error. Moreover, the method generates a large amount of data necessitating huge efforts to enter, check, and aggregate to make it usable. Therefore the feasibility of implementation of this method is still questionable.[14]

d) Global Hunger Index (GHI).

This index is widely used to understand the positions of various countries in terms of sever food insecurity. The index is developed by IFPRI with an aim to measure taking three equally weighted indicators, undernourishment, child underweight and child mortality.[15] After this

[14] The experiences of Western Honduras, Northern Mali, and Central Malawi suggested that even under relatively straightforward survey conditions implementation of this dietary intake survey is infeasible.

[15] Undernourishment is estimated as the proportion of undernourished people as a percentage of the population. The proportion of children younger than 5 y who have a low weight for their age represents child underweight. The mortality rate for children younger than age 5 years is considered.

countries are ranked on a 100 point scale and categorised as having “low” to “extremely alarming” hunger.

e) Global Food Security Index (GFSI)

The Global Food Security Index (GFSI) is another index for assessing country-level trends in food security. It was constructed by the Economist Intelligence Unit of the Economist Group. The index employs a 30 indicators related to three main components of food security, affordability (6 indicators), availability (10), and quality and safety (14), to provide a standard against which country-level food security can be measured.

2.3.2 Indicators of Access to Food

The indicators of access to food comprise of various measures that reflect economic capability of households or individual to secure sufficient food. Here the focus is on purchasing power which in turn will be influenced by income and market price. Economic access presently is analysed through the lenses of a livelihood approach. The term livelihood in the context of food security means economic empowerment by generating sufficient and stable income through production activities using assets and employment activities using capabilities (labour). To Frankenberger (1996) sustainable livelihood means adequate and sustainable access to income and other resources to enable households to meet basic needs. In this section what various indicators that can be used to assess the level of income and resources.

a) Economic Growth and Per capita Income

The economic position of a country can be assessed by analysing the level of economic growth. For this two indicators are generally used, growth rate and per capita income. Higher growth rate and per capita income indicate over all better economic access in the country. Nonetheless, being macro indicators these two estimates do not consider the inequalities in income and wealth, thereby neglecting the economic status of people in the low income strata. Obviously, even if higher economic growth is achieved at national level, this will not necessarily improve food and nutrition security at the household level. This is more evident in the case of India where even after achieving higher level of economic growth for consecutive years, incidence food insecurity and undernutrition prevail at a disquieting rate.

b) Share of food Expenditure by Poor

This is an indirect measure of access to food. Expenditure is commonly used as a proxy for income when reliable income estimates are not available. Household consumption expenditure survey data provides information required for calculating this measure. This indicator is defined as an average share of total expenditures spent on food by households belonging to the lowest income quintile. This will point towards the importance of food in consumption of poor.

c) Domestic Food Price Index

This is an indicator that can be used to examine the level of food prices relative to the prices of other non-food items. This helps us to make a comparative analysis about relative increase in prices of food items and non-food items. Higher food price inflation deteriorates the food security situation in the country by reducing the real income and purchasing power of people. Food inflation usually result from production shortfalls and subsequent supply shocks or rise in aggregate demand.

d) Household Consumption and Expenditure Surveys (HCESs) and Income Poverty

Household consumption and expenditure survey has been the most employed method for assessing the food insecurity situation by analysing income poverty and monthly per capita consumption expenditure, especially by studies carried out in Indian context.[16] These surveys provide data on consumer expenditure, which is often taken as a proxy for income. The surveys are frequently undertaken in a regular interval of five years and therefore provide a longitudinal data for households residing in various states over last some decades, enabling researchers to make analysis of cross section as well as temporal dimensions of food security. This method has certain advantage over Dietary Energy Supply (DES) method of FAO because it does not make any assumptions used by DES about the missing data on agricultural production, trade, post harvest losses and non food uses (Haen, 2011) and also about the distribution of energy supply within the country, and demographic composition of households (Jones et al., 2013).

HCESs collect informations on quantities of food and non-food items consumed, food and non-food expenditure, socioeconomic status of household, and demographic features of members. Data on the quantity food items and non-food items consumed are collected using 14 day or 30 days recall period, where the persons involved in the preparation of food (mostly mother) is asked questions regarding food prepared and consumed and other non-food items consumed over the reference period. What is most important

[16] Although HCESs is presented in the section of economic access, it also provides data on food consumption and caloric acquisition of household. The reason for including this method in this section is that previous studies have made use of it mostly for analysing economic access.

here is that the questionnaire must include all the food items obtained from various sources and consumed locally, otherwise this may result in underestimation of consumption. After collecting the quantity of consumption the next task is to convert them into calories. This involves three steps. First, convert all quantities into common unit such as kilograms. Second, converting these figure into edible portions by adjusting for processing. Third step involves in converting these quantities into kilocalories using the standard caloric conversion table provided by any agency.[17]

HCESs provide two indicators to assess economic access to food. Simple measure is monthly per capita consumption expenditure that directly indicates the purchasing power. Other one is incidence of income poverty that is estimated using per capita consumption expenditure, which if falls below the monthly or daily required norms, household is considered as poor.[18] Thus, income poverty would reflect the lack of sufficient income of household to access food and is the immediate manifestation of food insecurity, directly indicating insufficient resources at the disposal of household. As result, vulnerable households can easily be identified and they can be provided assistances. Moreover, HCESs are used for evaluating the performance of national anti poverty programmes and other social security schemes. Data from HCESs can also be used for understanding the level and changes in consumption pattern and dietary quality. The calorie and micronutrient deficiencies can be analysed. Availability of data on socioeconomic and demographic features facilitates the analysis of determinants of food insecurity and undernutrion. Beside these, the HCESs have certain merits over individual

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17 In India the conversion table provided by ICMR is generally used.

18 Head count ratio is applied in this context, if the per capita expenditure falls below the poverty line, they are considered are poor.

dietary intake method. HCESs are less costly and time consuming and require only less skill and efforts unlike the observation method. Because the questionnaires are predesigned and standardised therefore only less skilled enumerators are required and by and large it takes only 30 minutes per household to collect the data.

Nonetheless, the method is criticised on several grounds. First it was argued that the method measures only food availability but not necessarily consumed during the reference period (Escamilla and Correa, 2008). The surveys are undertaken under the assumption that household food consumption equals household food purchase. Unlike the population level estimates, the assumption of acquisition and consumption equality may not hold for households because food acquired may be wasted, lost, fed to animals, or gifted and on the other hand members also may consume self produced, food from outside or gifted food. Such sort of situations would probably lead to over estimation and under estimation of food intake. Moreover, the use of recall period, as we have seen, relies considerably on the memory of the respondents, their failure to remember food used over the reference period may lead to measurement errors (Hoddinott, 1999). Similarly, HCESs data do not account for individual consumption, especially among vulnerable groups such as infants, young children, and pregnant and lactating women, and therefore the issue of inequality in the intrahousehold distribution of food is largely neglected (Jones et al., 2013). Since the method requires collection, recording and processing and conversion of huge amount of data into calories and other nutrients, non-sampling errors are likely arise (Haen, 2011).

e) Household Entitlement Bundle or Assets

Economic access to food largely depends on the entitlement or assets. Entitlement refers the bundle of resources which the individual can use to access resources. Entitlement broadly can be divided into two, personnel entitlements and exchange entitlements. While personnel entitlement refers to resources a person legally own such as house, land, live stock etc.., exchange entitlements refers to a group of commodities that the person can access through trade and production (Sen, 1981). Asset is also similar but somewhat wider concept, that in addition to resources, includes stores, claims and access (Chambers and Conway, 1981). Both the concepts are widely used in livelihood studies of food security to highlight the importance of assets. USAID (2011) has explained six types of assets.

1. Human assets: These assets consist of knowledge, capability and health status possessed by individuals which help them to earn livelihood. Human asset depend on individuals' access to education and training, health services, sanitation, clean water, and adequate amounts of nutritious food.

2. Physical assets: This kind of assets include both productive and non-productive assets of household together with physical economic infrastructure of the region such as road, rail, communication etc.. While productive assets consist of land, machinery, tools, and animals, non-productive assets include jewelry, furniture, electronics, appliances, or animals.

3. Social assets: These assets are otherwise known as social capital that emerges from the social network or relationship of an individual within the society. The importance of such relationship is that individuals can make use of them whenever any livelihood crisis emerges, by borrowing either money or food items. They also can be utilised for organizing collective action against food insecurity.

4. Financial assets: These assets include financial resources such as savings, credit, insurance, remittances, pensions, cash transfers from social welfare programs, and also the assets possessed as a store of value, such as livestock or jewelry.

5. Natural assets: These assets usually take the form of the physical environment and the natural resources stocks that can be utilised to enhance livelihoods. Natural assets include land, water, wildlife, biodiversity, and forests.

6. Political assets: These assets refer to political and legal system. Political system means governance system in the country that helps through the provision of basic services such health and education, public support and safety net programmes. Legal system helps to protect the right of individual over their assets thereby facilitating their effective use.

2.3.3 Indicators of Utilisation of Food.

Measuring food utilisation is crucial to the understanding of quality of food preparation, nutritional quality of the food consumed and most importantly the intrahousehold distribution of food. Inefficiencies in these three aspects would clearly reflect in nutritional status of household members. Thus, measures of nutritional status have conventionally been used as a benchmark measure of food utilisation. Anthropometric measurements are commonly viewed as a gold standard measure of nutritional status and they are influenced not only by food intake but also by many nonfood factors like education, sanitation, health care services, access to drinking water, individual activity level etc.. (Pelletier et al., 1995).

a) Anthropometric Measurements

Anthropometric measurements are generally measurements of body dimensions such as height and weight and indicate the composition of the human body. They are calculated for both adults and children using separate measurements to indicate their nutritional status. The main advantage of these measures is that they are based on well established cut-off points. For children three anthropometric measures of nutritional status have been commonly used. They are stunting (Height for age) wasting (weight for height) and under weight (weight for age). Children with low weight relative to their age are said to be under weight. If they are underweight relative to their height, they are said to be wasted. Children they are too short for their age are said to be stunted. Three indicators signal different dimensions of nutritional problems, wasting indicates acute undernutrition, stunting indicates chronic undernutrion, whereas underweight indicates both facets (Haen, 2011). These indicators are usually determined with the help of a 'Z-score', which is calculated by taking the difference between the age-and sex-specific anthropometric indicator of an individual child (e.g., height of a girl aged 38 months) and the median of the same indicator from a reference population and dividing it by the standard deviation of that indicator in the reference population. Thus, the Z-score measures the distance (expressed in standard deviations) between the anthropometric performance of a particular child and the median of the reference population. Values of less than -2 indicate moderate undernutrition, whereas values of less than -3 reflect severe undernutrition (UNICEF, 1998).

Body Mass Index (BMI) is the widely used measure of nutritional status of adults. BMI is usually defined as weight in Kilograms divided height in meters squired (kg/m2). A cut off point of 18.5 is used to define thinness or acute under nutrition and BMI of 25 or above indicates over weight or obesity. An adult with BMI below 18.5 is considered as under nourished and an adult with BMI of 25 or above is considered as overweight or obese.

The anthropometric measures have certain advantages. They address the basic issue, how undernourishment affects the health and well being of individual. Three measures of children's undernutrion give us some idea about both chronic and acute undernutrition. Since these data come from household surveys it is easy to have a disaggregate analysis and relate them to socio-economic features. One issue with these indicators is that undernutrion can also result from poor health status due to diseases. The recent tendency to focus on the nutritional status of children neglected the nutritional problems of adults who are working age population and contribute to demographic dividend.

2.3.4 Indicators of Stability to Access

In case of stability, all indicators try to address the issue whether the household is facing any type of vulnerability (insecurity) in relation to any components of food security. Analysis of stability has recently become important after studies started analysing food insecurity in a livelihood perspective. These studies examined the various types of risks that endangered the food security status of an individual. Risks may arise from the unexpected negative shocks occurring to production, price, resources and health status. Such sort of shocks creates insecurity in case of access to food of an individual. By and large, qualitative measures generated from household experience based surveys are used to analyse stability of access to food.

2.3.5 Indicators Related to Food Supply and Food Price

There are some simple indicators used to assess the stability of access to food. This indicators measure the variability in the factors influencing access to food. Domestic food price volatility is often used to indicate the stability of food prices. The variability in food prices can be assessed with help of standard deviation or variance. Similarly per capita food production variability and per capita food supply variability can also be analysed using the measures of variance.

2.3.6 Food Insecurity Experience-Based Measurement Scales

a) Household Food Security Survey Module (HFSSM)

This is a direct qualitative measure calculated using scales based on the experience reported by the individuals. The data is collected using Household Food Security Survey Module (HFSSM) developed by US Department of Agriculture. The module consists of 18 questions on the anxiety of households about 4 domains of food security of household 1) anxiety about household food supplies; 2) perceptions that the quality or quantity of accessible food is not adequate; 3) reduced adult food intake; and 4) reduced food intake by children (Kennedy, 2002). A twelve month recall period was employed. From the responses, both continuous household food insecurity scale and categorical food security indicator can be calculated. A score ranging from 0 to 9.3 will be estimated from responses. On the basis of their score, households will be classified as either food secure (0-2.2); food insecure without hunger (2.4-4.4); food insecure with hunger, moderate (4.7-6.4); food insecure with hunger, severe (6.6-9.3).

HFSSM was highly effective in measuring the food insecurity of different sections of population. Therefore, this direct questionnaire based approach was later adopted by many studies carried out in low income countries in Africa, Latin America and South Asia. The HFSSM measure of food insecurity is considered as fundamental measure food insecurity. The results of HFSSM were found to be more valid among various socioeconomic groups. The main advantage of this is that it captures both physical and psychological aspects of food insecurity. Due to less data processing requirements and low cost it is easy to administer at more decentralied level. However, there are problems associated with it. It does not capture food safety dimension. It is difficult to standardise cut-off points across regions because several sub domains of insecurity reported by households such as feeling of shame and helplessness were missing from the measure. Besides, considerable variations were detected in strategies used by household to manage food insecurity. There can also be benefit bias in responses, if a food insecure household is supposed to get food freely from food distribution programmes.

b) Household Food Insecurity Access Scale (HFIAS)

This is a variant of HFSSM consisting set of 9 generic questions specifically related to access component of household food security. A four weeks recall period was used. The responses of HFIAS questions generate a score from 0 to 27. Based on their score households are classified into food secure, mildly food insecure, moderately food insecure, and severely food insecure. The aim of this measure was to provide a simple tool for targeting, monitoring, and evaluation processes of various programmes.

c) Household Hunger Scale (HHS)

This is more refined version of HFIAS consisting only three questions pertaining to the experience of facing severe food insecurity. It aims to concentrate on the quantity dimension of food security. Questions were asked about the occurrence of increasingly severe experiences of food shortage. A four weeks recall period was used for data collection. The final score ranges from 0 to 6. Households are categorized as households with little to no hunger (0–1); moderate hunger (2–3); and severe hunger (4–6).

d) Coping Strategy Index (CSI)

This is an index used to analyse how households adapt to the threat of a shortfall in food availability. This participatory index to assess food insecurity was developed by humanitarian organization CARE and the World Food Programme. A number of questions with respect to how households cope with shortfalls in food availability were asked to construct an index. CSI is estimated from a number of strategies that the household pursue to overcome a negative shock to access food. The index assesses the frequency of occurrence of severe coping strategies, which people pursue when they cannot access enough food (Leroy, 2015). There is no standardized set of question; therefore questions are developed on the basis strategies followed locally. For this, the first step is to identify the locally relevant coping strategies with the help of focus group discussion. By and large, strategies were placed into four categories, 1-dietary change, 2-short-term measures to increase household food availability, 3-short-term measures to decrease number of people to feed, and 4-Rationing, or managing the shortfall. After identifying the coping strategy a new series of focus groups is held to assign a weight (1 to 4) to each strategy based on its severity. The weight is assigned to incorporate the differences in the severity of strategies in various contexts. Normally a 7 day recall period has been used for collecting the data. Finally the index is calculated as the sum of the frequency of each coping strategy multiplied by its severity weight.[19] A higher index score reveals that more coping strategies reported, indicating higher incidence of food insecurity among the households. There is neither range defined for the index nor any cut-off point. Absolute value of index itself is considered as the direct indicator of severity of food insecurity.

The main advantages of this method are, it is easy to implement, highly cost effective and less time consuming, as it takes hardly three minutes per household to collect the data. Second, it effectively captures the level of adequacy and vulnerability, because large number of coping strategies or more severe strategies reported point towards the higher level of vulnerability and food insecurity. Third, the questions are very simple to understand for the respondents and analysts that make data collection easier. The disadvantage is that, being a subjective measure different people may have different ideas on the questions asked. Therefore comparison across households and regions may not be meaningful. Furthermore, as a response to the question what constituted a food secure diet? poor households tend to report smaller quantities of food than richer household. This tendency makes indicator a misleading one because both poor and rich house may be reported as eating enough food, irrespective of differences in food consumption.

2.4 Determinants of Food security and Nutritional Status: A Survey of Empirical Studies

A number of empirical studies have been carried out to examine the determinants of food security and nutritional status. The factors that determine food security and nutritional status can be broadly divided into two, supply side factors and demand side factors. While Supply factors are associated with

[19] Hoddinott (1999) offers an illustration of calculating this index.

the production and farming systems, the demand side factors are related to household income and other characteristics. There has been a general tendency in the literature to use the standard household utility model proposed by Behrman and Deolalikar (1988) to analyse the determinants of food security and nutritional status.[20] The model is a structural model which, in addition to the household preference function, includes other six functional forms. In a Neoclassical utility framework, household is assumed to maximize a joint utility function subject to certain constraints. Utility (U) is specified as a function of health of household member *i* (H^i), consumption of household member *i* (C^i), consumption of public goods by members (C^p), Leisure time of household member *i* (T^i_L), education of household child *i* ($E^{i/c}$), number of surviving children (S), taste norms (ε), and number of individuals in the household (I).

$$U=U\,(H^i, C^i, C^p, T^i_{L,} E^{i/c}, S, \varepsilon), \; i=1,\ldots\ldots,I,$$

Similarly a production function for health is specified as a function of nutrient intake of *i*th individual (N^i), education of individual *i* (E^i), education of mother (E^m), time of *i*th individual devoted to health care (T^i_H), time of mother devoted to health care (T^m_H) endowment of individual (η^i) and endowment of household (Ω) (Ex. general environment).

$$H^i=H\,(N^i, C^i, C^p, I, E^i, E^m, T^i_L, T^i_{H,} T^m_{H,} \eta^i, \Omega),$$

Nutrient intake of *i*th individual is also specified as function of food intake of *i*th individual (C^i), skill (E^m), and time input (T^m_H) of food preparer, and household environment (Ω).[21]

[20] See for example Senauer and Garcia (1991), Feleke et al. (2004) and Kassouf and Senauer (1996).

[21] See Behrman and Deolalikar (1988) for the details of other functions.

$$N^i = N\,(C^i, E^m, T^m{}_{H,}\ \Omega).$$

The main empirical issue with this approach is that many independent variables are endogenous in the sense that they are determined within the system. This mainly causes two econometric problems. Firstly, the relationships among independent variables will lead to simultaneity bias, if not corrected will result in biased estimates. Another threat is that some unobserved omitted variables may be correlated with explanatory variables of the model, resulting in omitted variable bias.

To avoid these problems many studies have used reduced form equations by taking predetermined exogenous variables as independent variables. For instance, Garret and Ruel (1999) used asset as an instrumental variable for income and accordingly run two stage least square model to get rid the problem of endogeneity. Similar kind of reduced form equation was employed by Senauer and Garcia (1991) to analyse the determinants of health status and food consumption by the students by taking previously determined variables such as characteristics of child (age, gender), characteristics of parents (age and education) and household characteristics (family size and location) as explanatory variables. However, they employed weighted least method (WLS) for eliminating the impact of heteroscedasticity.

A common pattern observed in the literature after the introduction of household utility model is that the empirical estimation of equations specified previously has become an integral part of studies on food security and nutritional status.[22] Some studies included empirical analysis of both equations (Garret and Ruel, 1999; Senauer and Garcia, 1991), on the other hand some

[22] These empirical estimations were carried out on the data from household expenditure and demographic surveys conducted by national or international agencies.

studies estimated only either calorie demand equation (Feleke et al., 2005; Iram and Butt, 2004; Sahn, 1988; Subramanian and Deaton, 1996) or equation for nutritional outcome (Kassouf and Senauer, 1996; Radhakrishna, 2006; Tarozzi, 2005). In case of dependent variable, the indicators of nutritional status are found similar as most of the studies used anthropometric measures based on height and weight. Nonetheless, for calorie demand equation studies have used different dependent variable. For instance Garret and Ruel (1999) considered actual adult equivalent calorie unit, which is a continuous dependent variable. On the contrary Feleke et al. (2005) created a discrete variable by taking the difference between actual calorie intake and required calorie intake and assigning the value ‘1’ if the relative difference is greater than or equal to zero, and ‘0’ if the relative difference is less than one.

A wide range of factors, household specific or individual specific (children and parents), have been considered as explanatory variables by the studies undertaken previously. However, since calorie availability or intake is input and nutritional status is outcome, their determinants may be different. Thus, for the convenience of discussion, we firstly look into the determinants of calorie intake, and then we shall see the determinants of nutritional status. Among the various explanatory variables, mother’s characteristics and household environment have greater impact on the calorie intake at household level. Mother’s age positively influences the per capita calorie intake at the household level because experienced mothers are in a better position to understand the proper food requirements of family members with respect to age, gender and workload (Iram and Butt, 2004). Further, several studies have stressed the role of mother’s education on nutrient intake of children. It was also observed that per capita room availability, perhaps a good indicator of standard of living, has positive impact. Importance of clean and safe water and sanitation facilities is also highlighted in various studies. Access to safe water shows positive impact and on the other hand poor sanitation facilities negatively affect per capita calorie intake.

In their study, which compares the determinants of food security and nutritional status of rural and urban areas of Mozambique, Garret and Ruel (1999) found that household total expenditure, which is often viewed as a proxy for income, showed positive impact on calorie availability.[23] However, in spite of significantly higher level of expenditures, the average calorie intake per day of urban areas is slightly lower than the rural areas due to higher prices in urban areas. The paradox of higher levels of expenditure with low calorie availability is attributed higher non-food expenditure due to higher prices and also low energy requirements owing to low physical activity.[24] Seasonality is found to have negative impact in both urban and rural areas because calorie availability declines during the periods of early rain and harvest seasons. They also find a negative effect of household size on calorie intake, which was larger in rural areas. Nevertheless, this finding is in contrast with evidences put forth by Senauer and Garcia (1991) as their study conducted in Philippines suggested a significant positive impact of household size on calorie adequacy of preschool children.[25] It was also noted by them that children's gender has

[23] The results of the study suggested that determinants of household calorie availability and nutritional status of children in the age group of 0-23 months are similar for both urban and rural areas. For children in the age group of 24-60 months determinants of nutritional status show some differences due to the differences in the levels of determinants such as income and education.

[24] In Indian context Deaton and Dreze (2009) observed a decline in average calorie intake. This was a result of lower calorie requirement due to low physical activity and improvements in health environment.

[25] To calculate calorie adequacy, informations on food intake by children was collected from their mother on a 24 hour recall period and then the calorie content of child's diet was

positive impact on the calorie adequacy ratio, indicating that boys received larger share of calories.

Sahn (1988) showed that poor households in Sri Lanka are more responsive to changes in income and prices than their urban counterparts. Rice was seen as the important food item, because even if the price rises, people are reluctant to substitute rice. Price elasticity of rice is four times higher than any other commodity. Nevertheless, the rise in price has not benefited poor farmers with small land holding because they do not sell most of their produces rather they utilise them for consumption at home. Thus increase in price of rice did not improve their earnings but on the other hand reduced their purchasing power. Similar type of evidences was also found in a study by Harttgen et al. (2016). They found that rise in the price of maize, major staple in Malawi, had great impact on the food poverty of households.[26] All these evidences point towards the need for moderating food prices through technological change to enhance food consumption among poor.

Feleke et al. (2005) provided evidences for significant impact of supply side factors on food security in Ethiopia. Farmers' use of agricultural technologies, increase in farm size, and improvement of land quality tend to increase likelihood of food security.[27] Because adoption of high-yielding varieties along with improved agronomic practices increases not only food availability at the household level but also cash income. Empirical evidences

determined using Philippine food consumption table. In comparison to this actual intake, calorie adequacy ratio is estimated using the recommended dietary allowances (RDAs) for calories developed by the Philippine Food and Nutrition Research Institute for Filipinos. The RDAs are not individual-specific but are specified for age and gender categories.

26 The study has employed simulation method on household level data to analyse how the changes in prices and negative short term shocks affect food poverty in Malawi.

27 The study has employed logistic regression that addresses the question how the probability of being food secure is influenced by explanatory variables.

suggested that households in the cereals-based farming system are more likely to be food secure than those in the cereals–enset-based system. However, surprisingly aggregate production is negatively related to food security, which was explained through income effect of price decline in the aftermath of increase in production supply. Thus fall in prices reduces income of farmers and their capacity to access food. Household size exerts negative influence on food security, implying that probability of food security decreases with family size.

There also exist sufficient empirical evidences for the impact of social security programmes on food security. Food subsidy programmes significantly contribute to the calorie intake (Senauer and Garcia, 1991). Further, Miller et al. (2010) revealed that that the social cash transfer scheme in Malawi had raised food expenditure of households in Malawi, by enabling them to purchase productive assets such as live stocks, farming equipments, and fertilizer coupons, which in turn has increased agricultural output. The increased agricultural output substantially improved their level of consumption and income. Another study by Abebaw (2010) with a similar type of objective, found that Integrated Food Security Programme (IFSP) launched in Northwestern Ethiopia on an average has improved food calorie intake by 30 per cent among the beneficiary households.[28] However, the impact differs among households depending on family size, land ownership and gender of household head. Tusiime et al. (2013) proved that non conditional food aid by world food programme had significant effect on the number of meals consumed per day for adults and children between six and thirteen years old in

[28] Kernel's matching estimator approach was used to compute the average impact of the program among IFSP households.

conflict situation in northern Uganda. [29] Food aid to conflict-affected population considerably reduced household food expenditure thereby prevented households from selling assets for survival.

Some attempts were also made in Indian context to analyse the impact of public programmes on food security. For an example, Jha et al. (2011) examined the relative roles played by PDS and NREGA on nutrient intake of rural households in three Indian states.[30] Although serious deficiencies in consumption of various nutrients were identified, study brings forth evidences on the positive effects of the programmes on the nutrient intakes by the households.

Regarding the determinants of nutritional status, by and large, studies focused their analysis on children. Because children rapidly respond to changes in dietary intake, household environment and care practices and their nutritional outcomes will reflect the influence of most of the factors. Three anthropometric measures of nutritional status of children have been commonly used based on their weight, height and length. They are stunting, wasting, and under weight. As noted by Nube (2001) the anthropometric indicators are more reliable estimates for prevalence of undernutrition than calorie intake because their estimation is straight forward and they are less subject to errors in data collection.

Earlier studies recognised the important role played by parental characteristics, especially educational status of mother, in determining the nutritional status of children. The empirical analysis of Senauer and Garcia (1991) revealed that educational status of both father and mother has positive impact on children’s height for age. Studies by Garret and Ruel (1999)

[29] The civil war started in 1987 and lasted for over 22 years, displaced two million people from their homes. Production and income losses from cash crops and livestock, which were the main sources of livelihood, caused acute food insecurity.

[30] The three Indian states are Andhra Pradesh, Maharashtra and Rajasthan.

demonstrated that education of mother improved nutritional status of children by more than one third of a ‘Z’ score, implying that maternal caring practices such as child feeding, use of health services and hygiene improve as level of education improves. Kassouf and Senauer (1996) noted that parental education had both a direct impact and indirect effects via wages and full income on child health. Results of their econometric analysis suggested that primary education of at least 4 but less than 8 years influenced nutritional status of children and mother’s education was more relevant in terms of both statistical significance and magnitude of coefficients.[31]

There are two conflicting views about the effect of wage rate. First view is with regard to direct effect of time of parents, particularly mother’s time, devoted for child care. Since Parental time is an input into the household production of nutrients and health, their choice to work has an opportunity cost on child’s nutritional status, therefore the direct effect of wage is expected to be negative. Second view is about the indirect income effect in the context of a joint household utility function, where higher wages contribute more to intrahousehold distribution of food and nutritional status, implying a positive impact. Results of Senauer and Garcia (1991) from weighted least square method applied on cross data showed a mixed picture. While men’s wage had negative impact, reflecting the opportunity cost of time, women’s wage had both negative and positive impact.[32] However, in the fixed effect model with longitudinal data only men’s wage showed an impact, women’s wage had no impact, indicating that wage was capturing the impact of some unobserved factors. However, Kassouf and Senauer

[31] Primary education of less than 4 years did not have any impact.

[32] Study used two measures of nutritional status, height for age and weight for height. Regression equations were estimated separately for these two dependent variables, therefore there are two sets of coefficients for men’s wage and women’s wage.

(1996) demonstrated that mother's and father's wage had negative impact. Radhakrishna (2006) also found that working status of mother increases probability of child malnutrition. Therefore it emerges that nutritional status of children will be adversely affected if the mother works.

There is general consensus among the studies that nutritional status is positively related to income (Reis, 2011; Kassouf and Senauer, 1996; Yun Li and Wen Yu, 2010). Further, income is also interacting with other variables such as education and housing environment to enhance nutritional status (Kassouf and Senauer, 1996). Reis (2011) noted that children in households with food insecurity seem to have worse anthropometric measures, indicating that inadequate resources for food may result in poor nutritional outcomes.[33] Household size was found to exert positive impact on child's nutritional status (Senauer and Garcia, 1991). This positive effect can be due to two reasons. First, higher number of working members can generate higher level of household income. Second, larger household size creates some economies of scale in providing food. However, on other hand higher dependency ratio may create negative impact. Larger percentage of children less than five years old in household showed a negative impact on nutritional status due to increased demand for maternal care (Garret and Ruel, 1999). It was observed that mother's height and father's height had significant role in determining child's height for age and weight for age.

Senauer and Garcia (1991) and Radhakrishna (2006) expounded that long run health status of children is closely related to birth order. A higher

[33] The study used perception approach following the procedure developed by USDA using 18 questions related to adults' and children's hunger, skipped meals, reductions in the quantity and quality of food intake due to resource constraints etc…to construct food security measures.

birth order reduces child's height for age, reflecting the effects of increased burden on family resources and declining maternal care. Garret and Ruel (1999) revealed some of the vulnerabilities experienced by urban households in Mozambique with regard to nutritional status of children. In urban area nutritional status of children was adversely affected by the land holding because land holding imperils environmental conditions and access to healthcare. Because households with land in urban areas live in outskirts of the city and also raise animals, both resulted in poor quality of environment. Further, negative effect was identified with the usage of well water due to the contamination contained in the water.

2.5 Linkages between Agriculture and Food Security: A Survey of Studies

As it is argued in the first chapter, the role of agriculture in food security remains much debated due to the prevalence of two contradicting theoretical propositions. The first one is the proposition that agriculture significantly contribute to food security at the household level by enhancing own production and consumption, agricultural income and intrahousehold distribution of food. The second is related to the disconnect between agriculture and food security resulting from the negative impact such as inadequate time for care practices, health hazards, income shocks and production shortfalls. In this section an attempt is made to examine the existing empirical evidences on the linkages, if any, or otherwise the disconnect between agriculture and food security.

Agriculture is expected to contribute to food security and nutrition by acting as a source of food and income, and also as a way to attain gender equality. There exist some evidences in Indian context, though not widely established, on linkages between agriculture and food security. Bhagowalia et al. (2012) showed that agricultural production conditions considerably enhance household dietary diversity. Their analysis of Indian Human Development Survey (IHDS) revealed that irrigation coupled with crop diversity promoted dietary diversity among both marginal and small farmers. Similarly poultry ownership has raised meat consumption among farmers. These finding suggest that irrigation, livestock ownership, and crop diversification have the potential to improve dietary diversity in India. However, the impact of income on nutritional status is very weak in their study.

Nonetheless, several studies have provided substantial evidences for the effect of income on undernutrion. Analysis of NFHS-3 data by Gulati et al. (2012) suggested a strong negative relationship between agricultural income and undernutrition among adults and children, implying that improvement in agricultural productivity can be adopted as a strategy to reduce undernutrition. Some other studies (Headey, 2013; Headey et al., 2011) also identified such strong negative effect of wealth, an indicator of permanent income, on undernutrion in NFHS data.

Similarly, micro level evidences provided by Parasuraman and Rajaretnam (2011) in their study undertaken in the distress affected areas of Vidharba, indicated that higher level per capita food expenditure and food crop production reduced the incidence of undernutrion among children and married women. Further, the experience of developing countries suggests that at relatively low levels of production, growth in food production reduces stunting (Headey, 2013). Cross country evidences suggested that that agriculture is more effective in reducing poverty among poorest of poor in developing countries (Christiaenesen et al., 2011).[34] It was also observed that growth rate of average farm yields were important in reducing rural poverty in various states of India (Datt and Ravallion, 1988).

Substantial evidences for the role of subsistence agriculture in the food security of poor were brought out by Alexandri et al. (2015) in a study investigating the role of small farms in the rural economy of Romania. About 55% of the employed population in the rural area is working in agriculture. Resultantly the share of agricultural income (measured in terms of in kind income) in total income among rural households was found high because the agricultural products directly go to self consumption without reaching the market. Almost 82 per cent farms in Romania mainly produce for self consumption. There was significantly higher share of self consumption in case of cereal-based products (43%), meat (50%), eggs (83%), fresh milk (56%), cheese (53%), and vegetables (60%). Therefore more food security is realised through the interaction of agriculture and rural households[35].

Wani et al. (2012) found that crop diversification activities by the households in the temperate regions of Jammu and Kashmir have enhanced their income, employment, and food intake. For highly diversified groups, contribution of agriculture to total income was 34 per cent, while for lower income groups the share was only 25 per cent. The food intake of high diversified group indicated more nutritional intake than that of low diversified group. The growth rate of average agricultural output is also important in reducing food security.

[34] However for non-poor, non-agricultural activities are more important.

[35] The importance of self consumption is found to decline slightly with increase in income in the years of economic growth.

The right to land seems to be important in case of household food security since it promotes own agricultural production. Women's' right to land would give them economic independence and some decision making power. However, Rao (2006) argued that, due to the declining agricultural production on the backdrop of livelihood diversification, the right to land has not helped women to improve their status. Men moved to better paid non-farm work leaving the complete burden of agricultural production and food security on women. Result of this tendency was increased work burden without sufficient income and purchasing power. Valente (2009) brought out empirical evidences for confirming the existing view that South African land reform programme has not contributed to the poverty reduction. Study showed that the households who have received land are more food insecure than non-recipients.

In the context of rising urban poverty, much attention has been paid in the recent literature to the role of urban agriculture since it can provide nutritious, safe, and cheap food.[36] Analysing the household survey of 15 developing countries from various subcontinents, Zezza and Tasciotti (2010) have found considerable participation in agriculture by the urban households.[37] Even though the role of urban agriculture in income generation is limited except in case of Africa, it seems to improve dietary diversity and calorie consumption and is therefore closed related to food security. Urban poor was recognised as the most vulnerable section to rise in food prices, as they adjust consumption towards cheaper source of calories, the brunt of which ultimately fall on women and children. Such adverse effects of rise in food prices on

[36] For an extensive review, see Warren et al., (2015) and Poulsen et al., (2015).

[37] Four countries from Africa, five countries from Asia, two countries from Eastern Europe and Four countries from Latin America were selected.

urban poor can be minimised via agriculture as it provides direct access to wider variety of food items.

Validating this proposition Smart et al. (2015) revealed that urban agriculture has become major strategy to ensure food security in Zambia. Due to the downturn of copper mining and other urban industries, the participation rate in urban agriculture has been much higher than in other urban cities of Africa. About 84 per cent of households are practicing urban agriculture and 65 per cent of agricultural output used for own consumption. Only 35 per cent was sold in market. Similarly in case of Malaysia Rezai et al. (2016) noted that growing basic vegetables by urban households has improved their food security status by enhancing fresh food availability, accessibility, and nutritional intake. In addition to this, a reduction in food expenditure was attained, enabling households to spend more on non-food items. It was realised that educated younger urban households are more likely to take advantage of urban agriculture. Even though urban agriculture has fully integrated with urban life, there is a need to enlighten urban people about the importance of urban agriculture and environment (Barthel and Isendahl, 2013).

Apart from these evidences for the linkages between agriculture and food security, there also exist literature that ruled out the linkages and brought out the impediments in attaining the linkages. Dev (2012) argued that rises in food prices in India have neither benefited producer nor the consumer. Due to the constraints in agriculture and the immediate post harvest sales at lower prices, producers have not benefited from the rise in food prices. On the other hand the poor consumers, who are net buyers of staple food, purchase food when prices are high. This situation would adversely affect poor since share of food expenditure in total expenditure has been high for them. Further, examining the impact of agriculture on nutrition Parasuraman and Rajaretnam

(2011) noted that the incidence of undernutrition of children, adolescents and ever married women among agricultural households in Vidharba was high, irrespective of size of land holding and agricultural output.

Joshi (2004) pointed towards the stagnating farm income and consumption since 1990s in Punjab after many successful years of green revolution. He hinted about the urgent need of diversifying both farm and non-farm activities also investing in education. Likewise, Gillespie and Kadilya (2011) stated that insufficient investment in public health, nutrition, and education have been the main reasons for the disconnect between agriculture and nutrition in India. Less diversification was cited as another reason because lack of diversification has considerably reduced the dietary diversity and nutritional outcomes. Mukhopadhyay (2012) argued that high proportion of undernourished children in wealthier families remind us the importance of socio cultural and behavioral aspects in determining nutritional status.

An overview of existing literature by Headey et al. (2011) concludes that the relationship between economic growth and nutritional improvement has been weak from 1992 to 2005 in India. Evidences suggest that agricultural works by men and women have worsened nutritional outcomes. Most worrisome fact that a combination of laborious farm employment coupled with inadequate access to health and education resulted in substantially inferior nutritional outcomes than that of urban slum population.

2.6 The Sustainable Livelihood Approach and Livelihood Diversification

The sustainable livelihood approach has received much attention in the discourses of food security in recent time. This is due to the understanding that sustainable livelihood is crucial for achieving food security at the household level. Sustainable livelihood relates to the methods by which a household employs its resources in income generating activities to ensure livelihood security. The basic framework of sustainable livelihood approach was introduced by Chambers (1988), who since then in company of other scholars later elaborated the concept. Sustainable Livelihood as defined by Chambers and Conway (1991) has got mainly two aspects, livelihood and sustainability. Livelihood comprises the capabilities, which includes assets, both material and social resources, and activities utilised by household for means of living. Sustainability refers to capacity of the household to cope with and recover from stresses and shocks, and maintain or enhance its capabilities now and in the future.

As we have noted earlier, assets encompasses wide range of assets such as human, natural, financial, political and physical assets. These assets are further classified into productive assets and protective assets. Productive assets are assets such as land and machinery which can be used for production to raise income. Protective assets are assets such as cash on hand or jewelry which can be converted into cash or goods when need arises. Similarly activities can also be divided as income generating activities, risk reduction strategies, and loss management strategies. Income generating activities consist of various types of wage labour and self employment activities, composition of which often tend to change depending on the earning opportunities or possibility of risk. Vulnerability refers to the exposure of household to shock and stresses that affect household’s capacity to earn adequate income in order to achieve food security.

Several studies have been attempted in the context of sustainable livelihood approach with various objectives. Most of them either focus on vulnerability aspects and coping mechanism of households or on livelihood diversification and impact of off farm activities. With regard to vulnerability, climate change is the major factor endangering food security. Schmidhuber and Tubiello (2007) noted that climate change will affect all four dimensions of food security, especially availability and access. However, the overall impact may differ across the regions and over time depending on the overall socio-economic status of the country. Climate change will increase the dependence of developing countries on imports and within the developing countries impact will be more on poor. Some other studies (Corbet 1988; Ellis, 2002 and Dercon, 2002) suggested Household Economy Approach (HEA) to assess the vulnerability resulting from the climate change and its effective management. The HEA framework is based on Sen's entitlement approach, and with the help of socio-economic data, it simulates the effect of various shocks resulting from climate on income and access to food of households.

Young et al. (2001) examined how three types of vulnerability affected food security of households in different region. The first enquiry was on how the cyclone has devastated the livelihood of rural people in the state of Orissa in India. All the households were affected by the loss of assets and rise in food prices, ultimately resulting in a period of acute food insecurity. Second one was on the impact of prolonged drought on food security in Wajir, North-east Kenya. More than 80 per cent of population was affected by the drought as they completely depended on pastoralism. The households experienced severe food insecurity, prevalence of acute malnutrition was about 22 per cent. The third enquiry was the evaluation of food security of the conflict-displaced in Urba, northern Columbia. About 80 per cent of the displaced were subsistence farmers, and they had to live in camps for almost two years without any access to their lands. The displaced were completely dependent on food aids during displacement and had to rely on wage labour to earn income. Dilley and

Boudreau (2001) argued that it is important to distinguish between the hazard events such as droughts and the outcome events such as shocks. Hazards are macro level events affecting food security, effects of which are transmitted through the economic and social systems through which people obtain food. These systems define the access to food and they are different for people with different livelihood. Therefore the extent of vulnerability depends on how the shock factors affect the systems of access to food.

Maxwell (1996) has identified several coping strategies adopted by the households to manage the vulnerability. Limiting portion size, borrowing food or money, skipping meals and eating less are some of them. A cumulative food security index was estimated collecting data on a four point scale with 24 hour recall period when there was deficiency in the quantity of food among the households in Uganda. It was found that households struggling to gain access to sufficient food not only depend on short term coping methods, but also develop other means of enhancing access and security in the long run.

Livelihood diversification is often recommended by many to mitigate the impact of vulnerabilities. Non-farm activities are found positively correlated with the welfare of households. Several attempts have been made, especially in the context of African countries, to examine the impact of off-farm income on food security and nutrition.[38] For instance, Babatunde and Qaim (2010) examined the impact of off-farm income on food security and nutrition using a farm survey data from Nigeria. Econometric evidences suggested that when off-farm income increased, not only more food consumed but also higher value food is consumed. Further incidence of child undernutrition is found lower in households with off-farm income than in

[38] See Barret et al. (2001) for a detailed review on Nonfarm income diversification and livelihood strategies.

households without off-farm income. With higher off- farm income households are able to cultivate in larger areas, which in turn increased total production and net farm income of households. Therefore farm and off-farm activities are complimentary in nature and positive effect of off-farm income on food security is facilitated through food production and farm income.

Another study in the same context by Owsu et al. (2011) assessed the impact of non farm work on household income and food security in Northern Ghana. A propensity matching score model was employed, and the results indicate that non-farm work had positive effect on household income and food security status. Thus diversification of livelihood with non-farm activities was therefore recommended to improve nutritional status rather than depending solely on farm activities and subsistence agriculture. Though the participation rates of women in non-farm activity was higher, participation of male contributed to higher income and better food security status due to higher wages.

Some studies aimed at answering the question, what are the determinants of livelihood diversification? Abdulai and Delgado (1999) examined the determinants of non-farm work participation decision of married women in rural Northern Ghana by applying a bivariate probit model on a survey data. It was found that the choice of wives to participate in nonfarm activity is triggered by lack of noncash income of their husbands. The empirical results suggest that education is important in improving nonfarm work and earnings since increase in years of schooling enhances participation in nonfarm work and nonfarm wage for both men and women. Further basic infrastructure and population density also positively influenced nonfarm work participation and nonfarm wage. The combined effects of education and infrastructure on nonfarm earnings were recognised and they were found to be significantly larger in more densely settled areas.

Abdulai and CroleRees (2001) attempted to examine the determinants of diversification of income in Southern Mali by analysing household level panel data on various sources of income. It was found that poor households had fewer opportunities to engage in non-farm activities due to lack of capital, and resultantly earned less diversified incomes. Education was found to exert greater influence on livelihood diversification because households with educated heads are more likely to engage in non-farm activities than those with illiterate households. Further households residing close to local markets are more likely to participate in non-farm sector than households residing in remote areas. The study concludes that improving infrastructure for the households in remote areas to access local market is really important to promote livelihood diversification.

2.7 Public Distribution System and Access to Food in India.

Transfer mechanisms run by government and aid agencies also play vital role in both physical and economic access. Public distribution system (PDS) has been the major food distribution programme in India which ensured both physical access and economic access. Besides supplying essential commodities, it has been facilitating implicit transfer of purchasing power through subsidised price. The system has undergone several intuitional changes. While British government introduced food grain rationing in 1939, public distribution system in its present form with nationwide network of warehouses and procurement mechanisms run by Food Corporation of India (FCI) was established in 1965 (Mooji, 1998). It was the Food grains Price Committee of 1964 which recommended the establishment of Food

Corporation of India to carry out procurement operations. The committee also recommended to form Agricultural Prices Commission to determine Minimum Support Prices (MSP), a price support given to farmers while procuring food grains and other commodities.[39]

The food policy in India has been functioning at a two tier level. At the operational level, Food Corporation of India with the directions of central government procures food from farmers by providing minimum support prices, and then stores the food grains in warehouses and finally transports them to deficit states for distribution. At the distribution level, public distribution system administered by state government undertakes the distribution of food grains to consumers through its outlets. Thus food subsidy takes two forms. First one is producer subsidy provided to farmers through minimum support prices which are regularly increased by Agricultural Prices Commission. Second one is consumer subsidy provided to consumers in the form of subsidised prices of commodities distributed through public distribution system. Although initially aim of public distribution system was to stabilize the food prices and food consumption, later on it became most important poverty eradication programme in India (Jha and Srinivasan, 2001).

Thus to meet the increasing requirement of food grains for distribution through outlets of public distribution system, a need for accelerating food production was felt by the government. It was towards this end, India initiated New Agricultural Policy with the application of modern agricultural technology, seed-firtilisers and high yielding variety seeds. As a result of this seed- fertiliser- water-policy there has been phenomenal increase in food production in India what we celebrated it as ‘Green revolution’. Resultantly,

[39] In India the Minimum Support Prices have been periodically upgraded by the committee, which in turn exert an upward pressure on open market prices.

India achieved self-sufficiency in food production in 1970s and has sustained since then.

Nevertheless, the public distribution system has been criticised on several grounds such as urban bias and leakages of food items. Howes and Jha (1991) argued that public distribution system is urban biased. Public distribution system had benefited urban rich than rural poor. Dev and Suryanarayana (1991) examined the basis for this argument on the basis of four criterion and they found that Public distribution system is not urban biased, rather it is rural biased. Considering criterion PDS quantity per market dependent, they show that Public distribution system is rural biased at all India level for rice, coarse cereals, sugar and cloth, as they altogether account for more than 60 per cent of total PDS purchases.

But Kundu (1992) contradicted this argument by stating that larger share of consumption of certain commodities by rural population can be misleading indicator since this does not consider relative rural population, lower PDS prices in rural areas and own produce consumption by rich farmers. He showed that effect of public distribution system is marginal on rural population in the backward states and there is urban bias in the consumption of commodities from public distribution system. Besides urban bias, there was also large scale leakages from public distribution system and consequently the system and food subsidy were subject to severe criticisms in the policy circle.

Therefore, in the context of structural adjustment programme of 1991, with an aim to reduce budget deficit and food subsidy, government decided to reform public distribution system by retargeting the poor (Suryanarayana, 1995). But the these food policy reforms mainly focused distribution side by reducing consumer subsidy and neglected the inefficiency of Food

Corporation of India in procuring and processing food grains and also did not touch producer subsidy.[40] The producer subsidy given in the form of minimum support prices have been much politically influenced by the big land lords in producer states (Jha and Srinivasan, 2001).

Several scholars and policy makers suggested various methods for reforming public distribution system, and all these were either methods of targeting poor or methods of excluding some groups (Swaminathan, 1996). Bhagwati and Srinivasan (1993) suggested commodity based targeting, a system where public distribution system supplies only commodities that are likely to be consumed by the poor, for instance coarse cereals. A similar kind of method was suggested by Ahluwalia (1993), where only inferior varieties of rice and wheat would be distributed in order to restrict the utilisation of PDS to the poor and destitute. Suranarayana (1995) attempted to empirically verify the scope for these two methods and found that consumption pattern of poor have undergone changes against coarse cereals and in favour of superior cereals. Further, it is noted that interregional differences in cereals and calorie intakes were caused by disparities in food grain availability than in income, implying larger role for PDS in supplying subsidised food to poor. Bhagwati and Srinivasan (1993) also proposed food stamps to be given to persons belonging to target groups and holders of these stamps can exchange them to purchase the commodities equivalent to the value. Parikh (1994) recommended that PDS can be substituted by an employment generation scheme that provides equivalent amount of subsidy.

[40] Swaminathan (1996) and Chand (2005) held that accumulation of food grain stocks by FCI much above the required norms and inefficiency of FCI in managing these stocks have incurred additional costs and caused heavy subsidy burden on government.

However, according to Swaminathan (1996) targeting is not right method for a country like India where hunger and food security is widespread. Targeting may involve social costs and may exclude the needy people. She pointed out that even to satisfy the daily cereal requirement per person recommended by ICMR, an additional 32.4 million tones of cereals needs to be distributed through PDS. This fact suggested that even to reach poor, PDS needs to be expanded rather than reducing its size. Nevertheless, it was noted that food subsidies to consumers for basic cereals declined after 1991, as a result of fall in the quantity of food grains supplied through PDS and continuous increase in prices of PDS food grains.

Due to the problems of increasing subsidy costs and targeting error of consumer subsidies, the most significant change in food policy was initiated in June 1997 with the introduction of Targeted Public Distribution System (TPDS). Aim of TPDS has been to provide subsidised food only to BPL families and APL families would be provided food grains comparatively at higher price, which is equal to 90 per cent of the FCI’s economic costs. However, because of the large difference between TPDS price and open market price, huge amount of food grains were diverted to black market, although the offtake statistics show an improvement (Jha and Srinivasan, 2001). The leakages of food grains coupled with limited purchasing power of poor curtailed them from making use of TPDS fully.

Some micro level studies have identified targeting errors under TPDS (Swaminathan and Mishra, 2001 and Khera, 2008). Targeting errors can be of two types, firstly errors of wrong exclusion, which means exclusion of really poor and deserving households from BPL list, secondly errors of wrong inclusion, which means inclusion of non-poor households in BPL list. Swaminathan and Mishra (2001) examined these two types of targeting errors in the context of a village in Maharashtra, using two sets of data collected in 1995 and 2000, aim of which was to compare the changes in targeting errors after the introduction of TPDS. Their analysis suggested decreased incidence of wrong inclusion and on the other hand increased incidence of wrong exclusion with a shift from universal PDS to targeted PDS. In a similar kind of study Khera (2008) estimated the proportion of wrongly excluded and wrongly included households using primary data collected from eight villages of Rajasthan. It is found that among the BPL households defined as per the official criteria, about a quarter have been wrongly included. Moreover, 44 per cent of eligible households are excluded from BPL list.

Both these studies have raised concerns about the accuracy of official criterion of 1997. The criterion was based on income and assets for identifying BPL households, which seems to be problematic for two reasons. First, incomes of poor households are quite uncertain and not consistent throughout the year, particularly of the casual workers and employees of informal sector whose earnings depend on level of employment. Second, there are many conceptual issues in defining assets. The targeting errors were further ascertained by consumptions expenditure data of National Sample Survey in 2004-05, which in case of exclusion errors revealed that only 40 per cent of rural poor households and 27 per cent of urban poor households possessed either BPL or AAY entitlements. In case of inclusion errors it was noted that 68 per cent of non-poor rural households 51 per cent of non-poor urban households were included BPL or AAY list. Suryanarayana and Silva (2007) cautioned that a set of food insecure is larger than the set of poor in India and therefore any attempt to target the food distribution only to poor would penalize food insecure non-poor households.

Besides targeting errors, studies have also exposed some other efficiency issues of public distribution system in India. Serious one among these issues is the illegal diversion of food grains to open market with the help of corrupted officials. According to Jha and Ramaswami (2010), 55 per cent of subsidised grains were illegally diverted. Further poor households received only 29 per cent of total subsidy expenditure, rest 43 per cent was eaten up by illegal diversion and 28 per cent is absorbed by excess operational cost. Khera (2011b) estimated the trends in diversion of grains from PDS to open market for previous 10 years by matching official offtake figures with household purchase data of national sample survey. She found that in 2004-05, 54 per cent of grain was diverted, however in 2007-08 this declined to 44 per cent. Utilisation level of PDS by poor households has not been satisfactory due to several impediments such as poor quality of grains, insufficient geographical coverage, irregular working time etc…In their comparative study on the efficiency of public distribution system in Andhra Pradesh and Maharashtra, Dutta and Ramaswami (2001) showed that utilisation rate is low in Maharashtra because of inadequate geographical coverage. Balakrishnan and Ramaswami (1997) advanced evidences for the inferior quality of PDS wheat, which according to them would induce switch out of PDS, which in turn would directly affect open market prices. Analysing the utilisation of PDS by households in Rajasthan, Khera (2011a) finds lower utilisation of PDS entitlement due to supply constraint and the households purchased wheat from open market at higher prices.

The concurrent occurrence of mounting food grain stock and widespread undernourishment has been a matter of policy concern in India. This is result of large scale procurement of food grains by the government and inadequate distribution of food grains to poor people. The aim of procurement has been primarily to provide price support to politically powerful farmers in grain surplus states. Therefore since 1992-93 procurement of food grains has been higher than the supply. This reckless policy has resulted in high food price inflation in the presence of large food grain stocks in granaries. In his theoretical note Basu (2011) refuted the popular view that poor storage facility was the main reason for inflation and instead he attributed this to excess procurement and less release of food grains. Thus the government needs to form a certain set of rules to release food grains in the time of inflation. It was suggested to release food grains in small batches at a fixed price per unit to traders or consumers.

The draft of the national food security bill prepared by the National Advisory Council (NAC) was published by the government on 21st January 2011 for welcoming suggestions from public. Despite the fact that there is a general consensus among the committees drafted and evaluated food security bill on the need of a universal food security act, finally targeting poor as defined by Tendulkar Committee was recommended due to constrains in food grain procurement and management. Confronting the proposed food security bill Himanshu and Sen (2011) argued that universal food security act is not only desirable but also a more efficient and feasible way to ensure food security for all. They suggested an alternative system with universal entitlement, which is to be linked to the minimum support price. While the system includes three groups like NAC proposal, the inclusion and exclusion was based on results from pilot survey for the BPL census, and to be delinked from the official poverty estimates. Pani (2012) revealed that the shift from in kind transfer to direct transfer would result in inflationary pleasure, and would worsen the crisis of undernutrition and increase the risk of farmers. Mishra (2013) cautions the huge financial implications of food security act. His analysis suggested a higher fiscal cost than what was estimated due to the cost of increasing food subsidy and cost of setting up or running new institutions and bureaucracies.

Although the bill has been criticised on several grounds, act is almost similar to the bill. The National Food Security Act was passed in the parliament on 10th September 2013 to ensure food and nutritional security to the vulnerable groups. The act guarantees that up to 75 per cent of the rural population and 50 per cent of urban population will be provided subsidised food, altogether covering about two thirds of the population. Based on the general division of population into three categories namely, priority, general and excluded the food entitlement is subdivided in to three categories. The priority households will be provided 35 kg (equivalent to 7 kg per person) of rice at 3 Rs and wheat at 2 Rs. The general households will be provided 20 kg (equivalent to 4 kg per person) of rice at 3 Rs and wheat at 2 Rs. The third group excluded will be totally delinked from the ambit of PDS.

The act was expected to be path breaking step towards India's fight against food insecurity and undernutrition as it makes access to food the basic right of every individual. It encompasses the three major existing food security programmes, Public Distribution System, Integrated Child Development Scheme, and Midday Meal Scheme. Public Distribution System will continue to be targeted one, while Integrated Child Development Scheme and Midday Meal Scheme are universal in nature. The act includes special programmes for pregnant women, children, destitute persons, and homeless persons. Besides the nutritional support, pregnant women will also receive maternity benefit of not less than Rs 6000. Children up to 14 years will receive nutritional means either through Integrated Child Development Scheme (ICDS) or through Midday Meals Scheme. It also includes innovative schemes like community kitchen, grievance redressal cell, social audit and technology supported information and monitoring system for procuring and distributing food grains.

Mathew (2015) raised concerns about the slow implementation of food security act because of the political difference between central government and state governments. Most of the schemes announced under act are now neglected and presently the focus is on categorising the household into three groups on the basis of official methodology and restricting subsidised food grains to target groups. Presently 32 states or union territories are implementing food security act, out of which union territories Chandigarh and Puducherry are providing direct cash transfer of food subsidy to the beneficiaries.

2.8 Trade and Food Security

International trade or cross border trade of food items has the potential to indirectly influence food security in a country by its effect on food supply and price. Further trade liberalisation measures by changing the prices will influence the earnings of labour in agriculture and industry (Panagariya, 2002). The question whether the impact of trade on food security of poor will be positive or negative is still a matter of theoretical debate. Nevertheless, it is partially accepted in the context of conventional Heckscher-Ohlin (H-O) theorem that trade liberalisation can improve food security through efficient utilisation of resources, balancing demand and supply, fetching higher income for exporters and lower cost for importers (Brooks, 2014; FAO, 2003).[41] Further, some previous studies have attempted to highlight the role of international trade in stabilising food supply and prices and enhancing food

[41] For detailed discussion on the conceptual links between trade liberalisation and food security and gains from trade refer to the report of FAO (2003) titled 'Trade Reforms and Food Security: Conceptualising the Linkages'.

security. Dorosh (2004) forwarded some evidences that show how the commercial imports of wheat and rice facilitated by trade liberalisation enhanced national food security in Bangladesh. Following a poor harvest in November 1997, rice price increased sharply. Bangladesh government took a series of trade liberalisation measures, particularly removal of a 2.5 per cent tariff on rice import. Resultantly almost 8,94,000 tonnes of rice was imported from India. Similar policy was also adapted in the aftermath of price hike resulted from a flood in 1998. By promoting trade Bangladesh was able to increase food supply and stabilise prices.

Almost a similar sort of enquiry was carried by Sonogo and Amadou (2010) to explore implications of rice market integration among India and Nepal. They believed that rice trade between India and Nepal is crucial to food security in Nepal since 60 per cent of landless households in Nepal depend on coarse rice imported from India. They employed cointegration tests and error correction models on price series of two major central markets, Jogbani in India, and Morang in Nepal. Empirical results suggested an asymmetric cointegration relationship among India and Nepal. It was found that if there is a negative price deviation Nepali traders tend to adjust their prices upward to align with long run equilibrium value more quickly. This tendency among traders in the absence of price stabilization policy hurts the food security of net buyers. Hence, Nepal has to build up national food reserves for food security intervention. Foreign food aid programmes or targeting vulnerable people through social safety net programmes can also be resorted to.

In their study, which aimed to examine the role of private cross border trade of Maize, major staple food in Zambia, on the backdrop of its production shock, Dorosh et al. (2009) recognised that open border policy reduces price volatility. The alternate policy of closing the border in small market like

Zambia induced significant price volatility. It was also shown that even under normal production fluctuations, a closed boarder can create price volatility in the range of hundred per cent within a period of one year. Further, the uncertainties about government policies like interventions in food trade, export and import quotas and price subsidies may unintentionally heighten domestic price volatility by driving private traders out of the market. Therefore it was argued that under favourable policy circumstances private cross border trade can reduce the vulnerabilities arising from negative production shock.

Restrictions on exports by leading producers of food items would raise food prices in the world market. Headey (2011) brought out evidences for the role of trade shocks in shifting the world food prices to higher level after 2008 world food crisis. On the basis of a preliminary observation that international rice prices increased in response to export restrictions by India and Vietnam, he argued that trade related factors could be an important reason for price surge. Analysis of monthly data of major grains from Thailand and United States suggested that trade shocks were extensively imposing their impact on dynamics in price data in all grain markets considered for the study. However, he did not rule out the influence of other factors, such as cheap dollar, strong economic growth, and surplus foreign reserves. Somewhat different sort of analysis on same food price crisis of 2008 was carried out by Edward Yu et al. (2011) to investigate the effectiveness of trade policies implemented against the price rise such as export ban and reduction in import tariff. Deploying a multi country and multi market partial equilibrium model for major grains, they find that international prices of major agricultural commodities increased within a range of 0.1 per cent to 25 per cent due to the trade policy changes by countries. Rice price recorded largest increase of 24 per cent due to export bans and restrictions imposed by major exporting countries followed by wheat

(14.3%) barley (9.2%). Decomposition analysis of price and trade impact of policy intervention gave divergent results for two sets of counties.

The developing countries which implemented trade policy changes, lowered their domestic price and consequently reduced their net exports or increased their net imports, ultimately resulting in gain in consumer's welfare. On the other hand, the group of developing countries with less power in manipulating their trade policies faced higher prices from the world market, and had to lower their imports of agricultural commodities and food grains, resulting welfare loss to consumers. These evidences, cautioning the welfare cost resulting from the imposition of trade restrictions by major trading countries on small countries relying on food imports, should not be neglected while framing trade policies.

2.9 Conclusion

This chapter presented a review of theoretical and empirical literature of household level food security. The conceptual framework of food security has been undergoing significant modifications to integrate new developments in the domain. Although earlier times main attention was given to food availability, later onwards other components such as economic access, food utilisation and food stability were also recognised as equally important. It is demonstrated that that all these components are interrelated in multiple directions, therefore can significantly impact the food security status of households. Various process and outcome indicators are widely used to represent these components and also to understand food security status. Several empirical studies have identified the factors influencing food security status of the households and they can be helpful in formulating the empirical model for the study. The linkages between agriculture and food security is proved by some studies carried out in Indian as well as international contexts. It is also understood that livelihood diversification of households by engaging in nonfarm activities can enhance food security and nutritional status. All these aspects discussed in this chapter are taken into consideration while analysing the food security status of sample households.

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Chapter 3

TOPOGRAPHY, WORKFORCE AND AGRICULTURE IN KUTTANAD

•Contents•

3.1 Introduction

This chapter attempts to elaborate various conditions of agriculture in Kuttanad in the backdrop of its interaction with topographical characteristics and population dynamics. The next section introduces the Kuttanad region. For this purpose, the geographical area and its main constituents are explained. Then the views about the origin of Kuttanad, topographical features such as area, types of land and soil, various agro-ecological zones, and nature of climate are also discussed. A brief description about the history of land reclamations in Kuttanad is attempted in section 3.3. Section 3.4 provides an analysis of the population dynamics, growth and structure of workforce in the general context of Kerala, with a special focus on Kuttanad region. In section 3.5 an attempt is made to explain the recent status of agriculture and cultivation practices in Kuttanad. Finally section 3.6 concludes the chapter.

3.2 Kuttanad: Area and Topographical Features.

Kuttanad is a low-lying wetland region situated on the southwest cost of Kerala and spread over Alappuzha, Kottayam, and Pathanamthitta districts. The region has attracted worldwide attention due to its unique rice cultivation practices and geographical features. It is gifted with incredible natural beauty created by enchanting backwaters interlaced with vast area of paddy fields. It is one among the few regions in the world and only one in India that has been practicing rice cultivation below sea level. Rice cultivation in Kuttanad is carried out 0.60 to 2 meters below mean sea level. Kuttanad Below Sea Level Farming System (KBSFS) make use of several traditional and indigenous farming practices such as manual land reclamation, construction of bunds and dewatering of polder areas.[1] Owing to these distinct features in June 2013 Food and Agricultural Organisation (FAO) of United Nations awarded heritage status to KBSFS by declaring it as Globally Important Agricultural Heritage Systems (GIAHS).[2]

3.2.1 Origin of Kuttanad

There exist two views about the origin of Kuttanad. First view is held by Geologists, to them the delta region of Kuttanad is a recent sedimentary formation and in the past it was an extensive bay of the Arabian Sea into which waters of rivers were discharged. The silt carried by the rivers got deposited at their mouths and this process gradually created the present sea cost, making shallow bay into an extensive backwater system. The lagoons and lakes gradually silted up and gave rise to sedimentary formations which were eventually converted into rice fields and garden lands by gradual process of reclamation.

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[1] The name Kuttanad Below Sea Level Farming System (KBSFS) was used by M.S. Swaminathan Research Foundation (MSSRF) in their report prepared for the State Government of Kerala as an application for the status of Globally Important Agricultural Heritage Systems (GIAHS) of FAO.

[2] The application for the status was jointly submitted to FAO by the Kerala State Government and M.S. Swaminathan Research Foundation (MSSRF) in December 2011 and the status was declared in the international GIAHS forum held at Ishikava Prefecture in Japan during May 29-June 1, 2013.

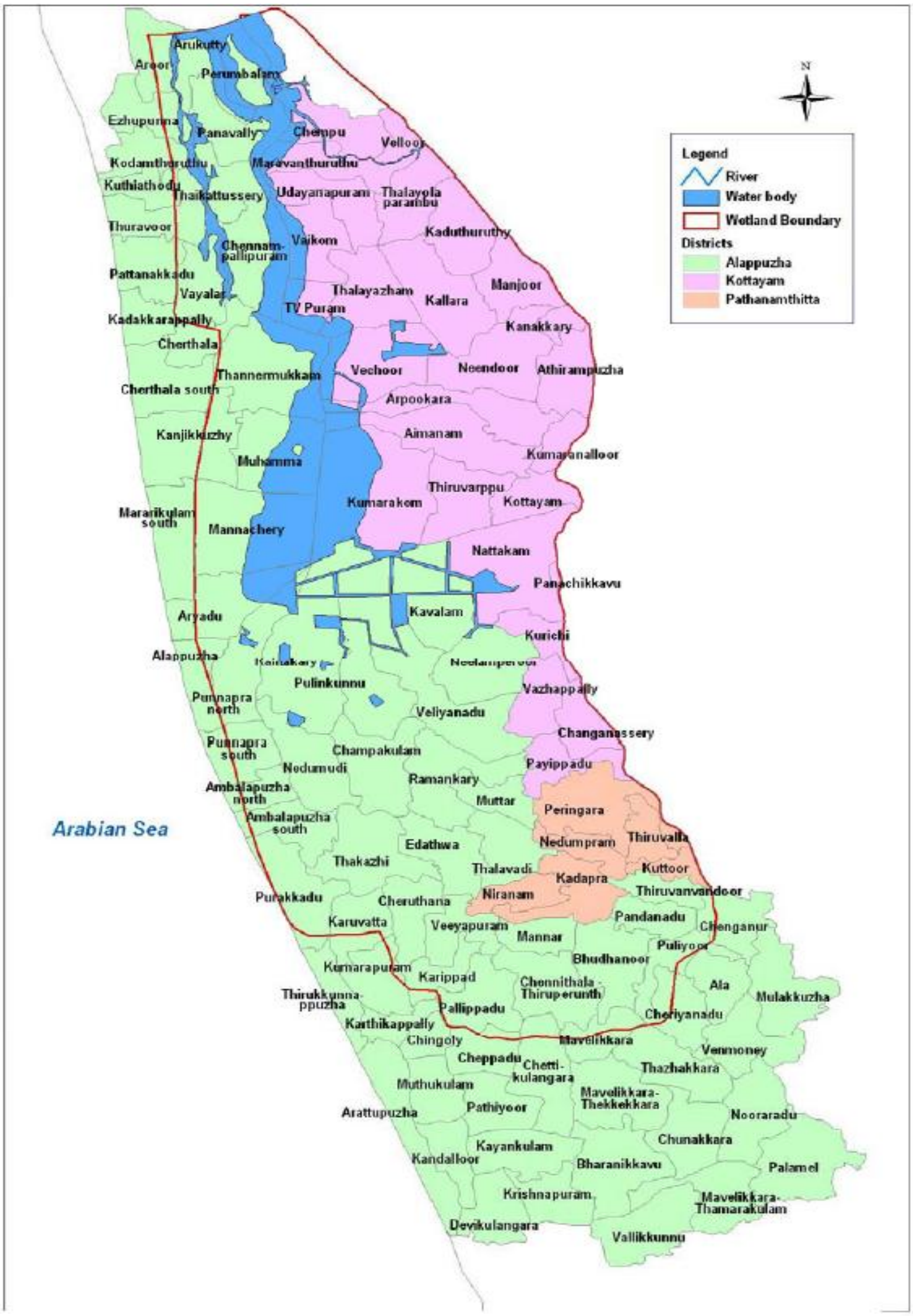
The second and mostly accepted view is that millions of years ago these lands were forest area flourishing in different varieties of trees. Later in a geological event, Arabian Sea expanded up to the base of Western Ghats and engulfed all these forest lands. Years later, Sea withdrew exposing the land, simultaneously trees and vegetations were submerged far below ground level and thereafter were silted up to varying levels giving rise to the low-lying marshal saline lands. As a result of this soils of Kuttanad have vast organic deposit, fossils of timber and shell-fish in varying depths.

3.2.2 Geographical Area and Constituents

Kuttanad has not been a strictly defined area. The boundaries of Kuttanad have been differently noted by various reports at various times.[3] The present study considered the area defined by Kuttanad Package of 2008 as Kuttanad Wetland System (KWS). KWS covers 3 districts, 10 taluks and 64 panchayats. Six taluks of Alappuzha district namely Cherthala, Ambalapuzha, Chengannur, Kuttanad, Karthikappally and Mavelikara comprising of 32 panchayats are part of Kuttanad. From Kottayam district Changanassery, Vaikom and Kottayam taluks consisting of 27 panchayats fall within Kuttanad. Thiruvalla taluk of Pathanamthitta district having 5 panchayats is also included in Kuttanad. Taking all these regions together, Kuttanad Wetland System (KWS) accounts for a total area of about 870 squared kilometers extending between latitude of 908’ and 9052’ and longitude of 76019’ and 76044’. Nearly 57 per cent of KWS come under Alappuzha district, 30 per cent is in Kottayam district and the rest 13 per cent is in Pathanamthitta district.

[3] For instance, as per the Kuttanad enquiry commission report published in 1971, Kuttanad comprise of two districts, only Alappuzha and Kottayam because the Thiruvalla thaluk, which is presently in Pathanamthitta district, was then the part of Alappuzha district.

Figure 3.1 Map of Kuttanad Wetland System (KWS)



Source: Study Report by MSSRF, 2007.

The entire geographical area of Kuttanad is distributed as dry lands, wetlands, and the water spread. More than half of Kuttanad region is wetland. Thomas (2002) noted that Kuttanad covers a total area of about 110,000 hectares of which 66,000 hectares are wetlands, 31,000 hectares are dry lands, and the remaining 13,000 hectares are water spread comprising of lakes, rivers, waterways and channels. Wetlands are low lying water logged areas which situate usually below mean sea level ranging from 0.60m to 2.0m. Wetlands usually remain submerged under water for most part of the year, making them suitable for only rice cultivation. The wetlands are converted into paddy fields though a highly labour intensive process of reclamation and the construction of bunds around the fields leaving the water into canals. Rice cultivation can be carried out only after dewatering the fields. In 2011 rice fields in this area are estimated to be about 50,000 hectares.[4]

Wetlands can further be divided into Virippu lands and Punja lands. Virippu lands are the wetlands having high elevation and are found more in upper Kuttanad. Virippu land spreads across an area of 13,000 hectares, which comprise of 20 per cent of the wetland area in the region. Punja lands are the wetlands with lower elevation mostly at below sea level. Punja lands extents to about 53,000 hectares, which account for 80 per cent of the wetland area in Kuttanad. Dry lands are Garden lands lying about 0.50 to 2.50 meters above mean sea level. They are mostly used for coconut cultivation and human habitation. They are also waterlogged during monsoon and resultantly rice cultivation is mostly undertaken only during Punja season, running from October to March.

3.2.3 Lake and River Systems

An important feature of the region is its vast network of water bodies made up of Vembanad Lake, man-made canals and four major rivers of

[4] As reported by MSSRF and Government of Kerala (2011)

Kerala. Vembanad Lake, the large expanse of water about 80 square kilometers in Kuttanad, extends from Alappuzha in the south to Cochin in the North where it opens to the Arabian Sea. Four rivers namely Pamba, Achankovil, Manimala and Meenachil originate from Western Ghats and enrich Kuttanad's fields by depositing their silts as they spread into large number of water channels before joining Vembanad Lake. The rivers and man-made canals crisscross the wetlands thereby together with the Lake they not only provide irrigation facility for farming but also form the basis for the water transport system and backwater tourism.

The four rivers together contribute annual discharge of about 11000 mm3 water from a catchment area extending to over 5838 square kilometers. The Meenachil river is formed of several streams originating from Western Ghats and it later spreads into a number of water courses. It enters Kuttanad basin at Neelimangalam and passes through Kottayam Taluk of Kuttanad region before emptying itself into Vembanad Lake. It has a total length of 78 kilometers and watershed area of 1208.11 kilometers square. The Pamba river is longest among the four and it originates from at Pulachimalai hill in the Peerumedu plateau in the Western Ghats. It provides irrigation water to the five taluks of Kuttanad regions namely Ambalapuzha, Chengannur, Kuttanad, Karthikappally and Thiruvalla. It has a total length of 176 kilometers and watershed area of 2235 kilometers square. The river enters Kuttanad basin at Erapuzha and shares northern boundary with the Manimala River basin and southern boundary with the Achankovil River basin. Manimala river is a tributary of the Pamba river originating from Muthavara Hills on the Western Ghats. It enters Kuttanad basin at Thondara and passes through Kottayam, Thiruvalla and Kuttanad taluks before joining Pamba river at Muttar. Its length is about 91.73 kilometers and watershed area account for 802.90 kilometers square. The Achankovil river also originate from Western Ghats and passes through Pathanamthitta and Alapuzha districts before meeting Pamba river at Veeyapuram. It has a length of 128 kilometers and watershed area of 1484 kilometers square.

The four rivers after flowing through a network of channels and canals empty themselves into Vembanad lake. They drain an area of nearly 5000 square kilometers. Annual rainfall in the catchment area ranges from 280 cm to 380 cm. Almost 70 percent of rainfall is received during south-west monsoon resulting in floods in Kuttanad and consequently lowlands are submerged under water for few weeks every year. During south-west monsoon the discharge from the lake reaches a peak 3400 m^3 /seconds. North-East monsoon also result in flood but to a less extent. Because of the flood discharges during the monsoon the surface water in Kuttanad remain sweet in spite of its direct connection to the lake and see. However Vembanad Lake may carries saline water to the region when it is subject to tidal actions from the sea.

The nature of water in the lake depends on amount of fresh water discharged by the river systems. When the streams are in flood the lake and inland channels are filled with fresh water. Nonetheless the flow of the rivers falls during December and during summer (from December to May) saline water from the sea spreads to entire area due to the tidal actions in the lake and density currents. Because of this, water in the lake and inland channels down 80 kilometers from Cochin become saline. In the northern part of Kuttanad salinity goes beyond the limits of tolerance for rice cultivation from January onwards and it spreads rapidly to the southern parts. The conditions remain same till the first flood of the succeeding south-west monsoon occurs in June. Therefore the ecology of Kuttanad is largely influenced by Vembanad Lake and Backwater systems.

3.2.4 Soil or Types of Wet Land

The soil in Kuttanad is a combination of sand and clay in dissimilar proportions. Generally in most of the low lying areas the soil is highly acidic and contains toxic salts adversely affecting plants life (Government of Kerala [GOK], 1971). Because the soils of Kuttanad contain sediments of marine origin and marine molluscan shells brought in by deeper portions of backwaters of Vembanad Lake from Arabian Sea at Cochin. On the basis of the type of soil the entire wet land of Kuttanad can be classified into three broad categories, Kayal Lands, Karappadoms and Kari Lands[5]

a. **Kayal Lands:** They consists of the reclaimed beds from the Vembanad Lake and covers an area of 20,000 acres located in the villages of Chennankary, Kainakary, and Pulikunnu in Kuttanad taluk and Thiruvarpu and Kumarakam villages of Kottayam taluk. Field lay 1 to 2 meters below sea level. Soils in these areas are more seriously affected by salinity resulting frequent crop failures.

b. **Karappadoms:** They are generally situated along waterways and rivers and are spread over an area of 168,000 acres. They situate in the interiors of villages on the eastern and southern peripherals of Kuttanad. The fields lying along the waterways are periodically replenished by the deposit of silt carried by the rivers in the flood.

c. **Kari Lands:** This extends to an area of 12,000 acres situated in the Ambalappuzha, Cherthala and Vaikom taluks**.** The name 'Kari' is given because of the intense black colour of the soil. Most of these lands are at or below sea level. The soil is peaty and marshy in nature and is evergreen with wild weeds and grass.

3.2.5 Agro-Ecological Zones in Kuttanad

There are six agro-ecological zones in Kuttanad.[6] This classification is mainly based on three criteria viz., incidence of flood submergence, vulnerability to saline intrusion and acidity of the soil and impact of these factors on the pattern of land utilisation.

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[5] The classification follows GOK (1971), Report of the Kuttanad Enquiry Commission.

[6] Although the report on comprehensive development of Kuttanad prepared by high power committee in 1978 identified seven zones, recent studies and reports considered only six zones.

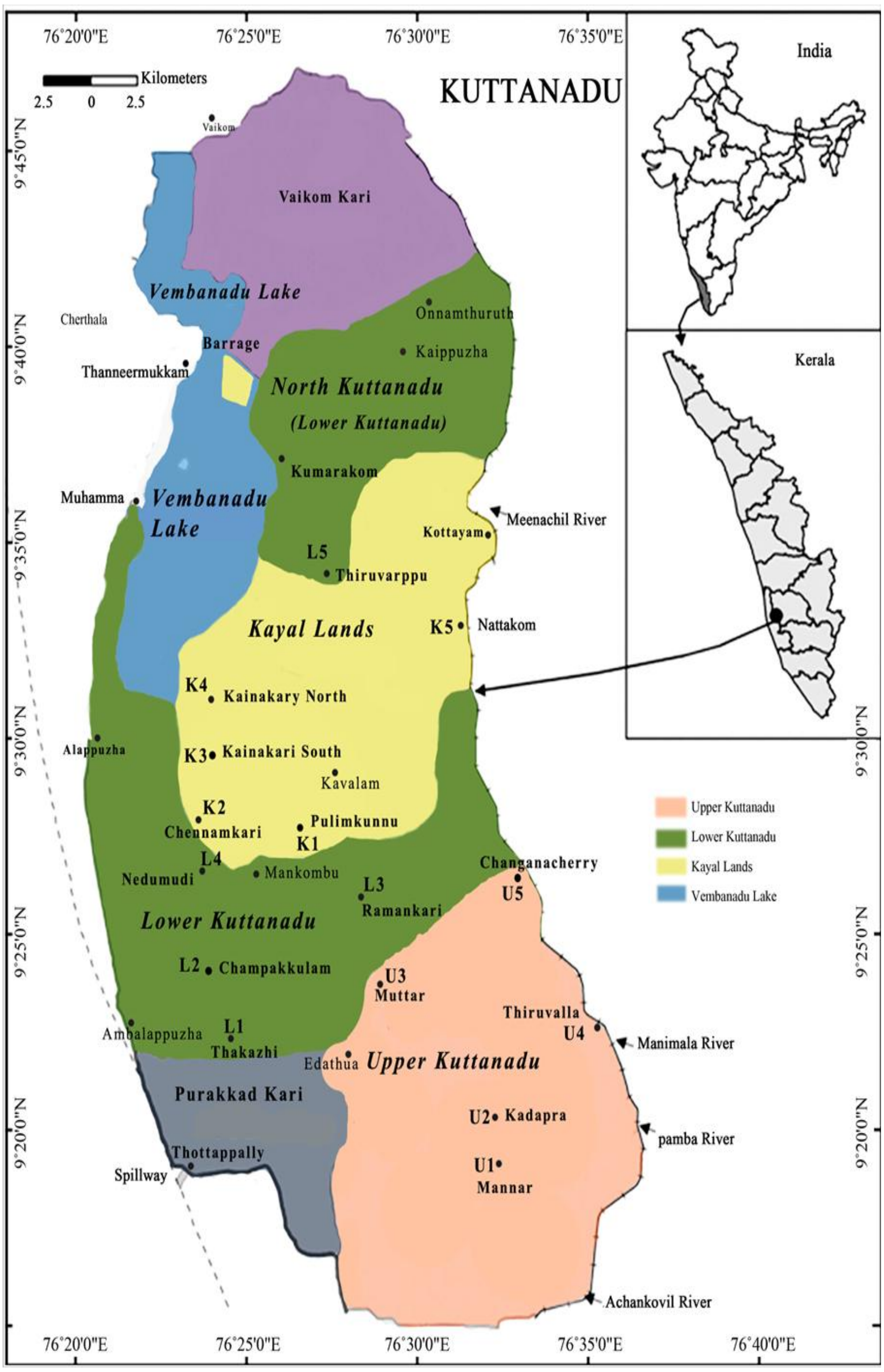
a. **Upper Kuttanad:** This zone covers a total area of 10,576 hectares situated on the south east part of Kuttanad. This area comprise of high lands with elevations ranging from 0.5 meters below to 6.0 meters above MSL and bund levels vary from 0.3 meters to 5.0 meters above MSL. Upper Kuttanad being away from the Vembanad Lake and backwater system is least affected by saline intrusion and flood. The three rivers Achenkovil, Pamba and Manimala pass through this zone.

b. **Lower Kuttanad:** This zone constitutes main area of Kuttanad and it is situated to the north of upper Kuttanad. This zone occupies totally 16,280 hectares of land located in Alappuzha district. Elevations of this area range from 1.5 meters below to 1.0 meters above MSL and bund levels vary from 0.3 meters to 5.0 meters above MSL. This zone is more vulnerable to saline water intrusion and flood.

c. **Kayal Land:** This area comprise of vast expanse of land about 9,464 hectares adjoining the lake and backwaters. It mostly includes padashekharams (rice fields) reclaimed from Vembanad Lake. Over 600 padashekharams are reclaimed recently. This zone lies at the southeastern side of the Vembanad Lake and north part of upper Kuttanad. Elevations of this area vary from 1.0 meters below to 2.0 meters below MSL and bund levels range from 0.6 meters to 1.1 meters above MSL. Being very close to the Vembanad Lake and backwaters this zone faces high risk of saline water intrusion and flood.

d. **North Kuttanad:** This zone lies north of Kayal lands and east of Vembanad Lake and has an area of 6,556 hectares falling in Kottayam district. This zone consists of low lands around lower Meenachil and elevations range from 0.5 meters below MSL to 1.0 meter above MSL. Both flood risk and saline water intrusion is high here.

Figure 3.2 Agro-Ecological Zones in Kuttanad



Source: Vijayan and Ray (2015)

e. **Purakkad Kari:** This is a small area spreading over 3,500 hectares along the south-west cost. It includes almost 43 padashekharams over four panchayats of Ambalappuzha and Karthikappalli and situated 1.5 to 2.0 meters below MSL. This region experience high risk of flood and saline water intrusion through Thottapally spillway.

f. **Vaikom Kari:** This zone is situated at the northern end of the Kuttanad. It covers an area of 7,748 hectares falling in Kottayam district. The elevations vary from 0.5 meters below MSL in the western part of the zone to 6 meter above MSL in the eastern part of the zone. Saline water intrusion is a problem here also. The name 'Kari' is due to the black colour of the soil made by high content organic carbon.

3.2.6 Climate and Rainfall

A uniform climate exists throughout various locations of Kuttanad with temperature ranging from 21^{o}C to 36^{o}C. The area has high humidity. Average annual rainfall is approximately about 300mm. The rainy seasons are during two monsoons. First is southwest monsoon that runs from May to August. Second is North East Monsoon that runs from October to November. Almost 60 per cent of rainfall is received during southwest monsoon, and 30 percent during northeast monsoon.

3.3 History of Land Reclamation in Kuttanad

Land reclamation is usually a natural process that fills sand, dirt or other materials in coastal areas or beds of river and lake enabling the land to rise. Since the natural reclamation takes long time, manual reclamation is often resorted to convert wetlands to agricultural fields by enclosing and dewatering the lands. A considerable portion of paddy fields in Kuttanad has been reclaimed manually by farmers from the backwaters in response to increasing population pressure on land and high price of rice (Panikar, 1978). The reclamation in Kuttanad is unique of its kind for two reasons, firstly this was the most innovative operation undertaken by small farmers in Kerala with inadequate resources, and secondly this was done by locally available human labour making use of local materials with little use of modern technology and machines (Tharamangalam, 1981). The manual reclamation is a complex and lengthy process involving several steps.[7] The first step is to identify the shallow regions in the vast stretches of Vembanad Lake. Then boundaries are marked by erecting bamboo poles. The boundaries are further strengthened by the construction of bunds using coconut poles, bamboo mats, sand, clay and other materials. Construction of bund require several days of manual labour with skill, experience and ingenuity. Then this enclosed area had to be dewatered by bailing the water out of the area to either man-made canals or lake using wooden water wheels. An estimate showed that in order to complete the reclamation process of 2000 hectares of land, about 400 to 500 men were employed for almost one year.

Although the land reclamation in Kuttanad has a long history there is no concrete evidence on the beginning period. However, it is argued by many that the process had begun at least by 1834 (GOK, 1971; Tharamangalam, 1981; and Thomas 2002). The historical development of the land reclamation in Kuttanad can be divided into three phases. Early reclamations prior to 1888 are referred as first phase. During this phase, reclamation activities were confined to scattered plots of lands on the sides of Vembanad Lake where it was shallow. The reason for this was lack of government initiatives as the reclamations were carried out by private cultivators by taking loans from

[7] See MSSRF (2007) and MSSRF and GOK (2011) for detailed discussions.

private money lenders. Therefore only about 1000 acres were converted as paddy fields during the first phase.

The second phase extends from 1888 to 1903 and it is characterised by effective state participation and institutional supports. Government of Travancore undertook some projects itself and also granted loans, subsidies, tax exceptions to the private cultivators. In June 1888 government allocated a sum of Rs 50,000 to be advanced as loans to cultivating tenants for reclaiming and bringing under cultivation the portions of Vembanad Backwater along the shore within the taluks of Ambalapuzha, Changanacherry, Kottayam, Ettumanoor, Vaikom and Shertallai. Further, Individual loans not exceeding the amount of Rs, 5,000 was also given at 4 per cent interest rate on the condition that borrower must start work soon after receiving the loan. If he fails to start work within 12 months of date of loan the rate of interest would rise to 12 per cent per annum.

Moreover, in June 1888 government sanctioned a sum of Rs 2 Lakh for the construction of embankments and other protective works under various schemes in order to bring under cultivation some of the extensive areas of North Travancore which were left uncultivated due to the influx of salty water.[8] Further, in July 1889 it was announced that all reclaimed lands could be registered free of tax for 5 years, after this period an assessment will be imposed equal to one-half of the quantity of seed required for the reclamation.[9] These incentives induced farmers from various parts of North Tranvancore to

[8] The Schemes were Puthenvelikara Scheme, Parur reclamation Scheme, Oomika and Kuttamangalom Schemes, Munambom Scheme, and Kaipuzha Scheme.

[9] Then the reclamation and farming activities were carried out under batter system, where all the transactions are made terms of paddy.

make enormous amount of investment wherever possible after registering lands in their names.

Consequently by the end of the 20^{th} century about 2226 hectares in Vembanad Lake were reclaimed. This enthusiasm suffered a temporary setback in December 1903 when state government interdicted land reclamations due to the apprehension of Madras Government that further reclamations would adversely affect Cochin Port.[10] This put a temporary end to the cultivation in reclaimed land causing heavy loss to the farmers and state economy. The government considered the issue seriously, thus in 1908 Mr. A.H Bostow, Chief Engineer of the state conducted an extensive investigation into the effects of reclamation on tidal waves and concluded that reclamation in Vembanad Lake had no adverse effect on Cochin Port. Further, Mr. Bostow made a noteworthy comment in his report about the value of reclamation in the Lake that the first crop was often sufficient to meet the whole cost of reclamation. Therefore state government sent many correspondences to the Government of Madras, ultimately resulting in a conference of Chief engineers of Madras, Cochin and Travancore in February 1912. After the conference the prohibition of reclamation was withdrawn.

Therefore the third stage began in 1912 with the revival of reclamation. Since then mechanized pump sets using Kerosene and Diesel had been widely used replacing the manually operated wooden wheels. Resultantly the dewatering process became fast and economical. Due to the food shortage experienced during First World War (1914-1918) price of paddy registered an increase. However between 1924-25 and 1931-32 paddy price declined 50 per cent and this brought down the extent of cultivation. Paddy prices started

[10] The encroachment at backwaters reduced tide and flow at the opening of Cochin Port and increased formation of bar which would cause damage to port.

rising during the early years of 1930s and consequently reclamation reached peak in 1930s. During 1930s almost 5261 hectares of land was reclaimed in Pulimkunnam, Neelamperoor, Kainakari, Veliyanadu and Kavalam panchayats.[11] A notable reclamation during this period was 1454 acres (589 hectares) spreading over Q, S, and T blocks by Mr. M.T Joseph Murickumoottil in 1941. He obtained government sanction under the terms that he had to pay a fixed price (Tharavila) Rs 10 per acre in ten installments and no tax would be levied for first two years, thereafter full tax had to be paid. Together with this he reclaimed a total area of 936 hectares of land in 6 blocks, making him the ever biggest land lord in Kuttanad. Of the reclamations, last one was the Holland Project of the early 1960s that converted about 616 hectares of Kayal into dry land.

3.4 Population and Workforce

In this section we examine the changes in the population growth and the distribution of workforce in Kuttanad region. In the present study, the area of Kuttanad Wetland System (KWS) is considered as Kuttanad region. As we have already noted, the area of KWS is not commensurate with any revenue division, and is spread over three districts such as Alappuzha (57%), Kottayam (30%) and Pathanamthitta (13%). Census data or any other official statistics like Panchayath level statistics are made available only for revenue divisions such as taluks and villages or for Local Self Governments such as Community Development blocks and Gram Panchayaths. Therefore there is no systematic data available for the KWS to analyse the changes in population growth and workforce within the region. However, an analysis of the data available for the

[11] Some of the padasekharams with their area are D Block (729 ha), E Block (402 ha), H Block (783 ha), R Block (619 ha), Raja Ramapuram Kayal (539 ha), Mangalam Kayal (402 ha), Parampady Ponupakke padom (352 ha), & L Block and Aappu Kayal (340 ha).

three districts, with a special focus on Alappuzha that forms 57 per cent of Kuttanad region, would help us to arrive at meaningful conclusions. Discussions on the demographic changes are carried out in the larger context of Kerala to see whether the population dynamics in the region is different from that of the state.

3.4.1 General Features of the Districts

Of the three districts, Kottayam was the first to be formed on 1st July of 1949 at the time of the integration of princely states of Travancore and Cochin. Kottayam district was previously the part of erstwhile Travancore state. Presently the district has 5 taluks 95 villages. The taluks are Meenachil, Kanjirappally, Vaikom, Kottayam and Changanassery. Under the local self government system, there are 4 statutory towns and 14 development blocks comprising 75 panchayaths. Total area in the district accounts for 2206 square kilometers without any costal line. The total area in the district is combination of three types land, Kanjirappally and Meenachil taluks have highland and midland areas, while Kottayam and Changanassery, and Vaikom Taluks have midland and low land areas. There are three rivers flowing through the district Meenachil River, Muvattupuzha River and Manimala River. The Meenachil River, with a length of 78 km and catchment area of about 1272 sq.km flows through taluks of Meenachil, Vaikom and Kottayam. The Muvattupuzha River, with a length of 121 km and catchment area of about 1554 sq.km flows through Vaikom taluk and empties in to the Vempanad Lake. The Manimala River flows through Kanjirappally and Changanassery taluks and has got a length of 90 km and catchment area of 847 sq.km.

Table 3.1 General Features of the Districts under Kuttanad (KWS), 2011.

	Alappuzha	Kottayam	Pathanamthitta
Total Area (Sq K.M)	1415	2206.00	2652.00
Length of Coastal Line (in KMs.)	82	0	0
No of Rivers	3	3	4
Number of Revenue Divisions	2	2	5
Number of Taluks	6	5	5
No of Revenue Villages	91	95	68
No of statutory Towns	5	4	3
No of CD Blocks	12	14	11
No of CD Panchayaths	73	75	54

Source: Panchayat Level Statistics-2011, Various Districts, Department of Economics and Statistics, Government of Kerala, Thiruvananthapuram & District Census Hand Book (DCHB) of Various Districts 2011, Directorate of Census Operations: Kerala, Thiruvananthapuram.

Alappuzha district came into existence on 17th August 1957. The district has got 6 taluks namely Cherthala, Ambalappuzha, Kuttanad, Karthikappally, Chengannur and Mavelikkara, altogether they consist of 91 revenue villages. The district has been centre for several radical socio-and political movements, all of which have significantly altered the socio-economic life in Kerala. One important social event was the campaign for the eradication of untouchability organised by T.K. Madhavan in 1925 which succeeded in opening the approach roads to temples for all people from different castes. Most important political movement was the Punnapra-Vayalar Uprising of 1946, organized by communist party against the then Diwan of Travancore Sir C.P Ramaswami Iyer, finally causing his exit from political scene of Travancore.[12] The Punnapra-Vayalar movement helped communist party to mobilise peasants and farmers from lower strata of the

[12] The struggle was against CP's proposal of American Model independent country for Travancore. The severe famine conditions during 1939-43 in Travancore increased the discontent of the people against the Diwan, resulted in more people joining in the movements.

society, which strengthened the base of party across the state, and eventually helping the party to win first election held in the state and to form the first government in 1957. The struggles also brought about changes in agrarian relations by forcing the implementation of land reforms, which significantly altered the structure of land holding in the state. Caste based land holding came to an end, tenants were conferred ownership rights and the landless labourers were provided homestead.[13]

The Alappuzha district has the lowest area in the state about 1415 square kilometers without any forest land. The district possesses a sea cost of about 82 kilometers. The entire area of the district consists of three micro-regions namely (1) Alleppey Coast (2) Kuttanad Low -lying Plains and (3) Chenganoor Rolling Plains. The heights of Both Alleppey Coast and Kuttanad Low -lying Plains are very low and even below sea level. On the other hand Chengannur- Rolling Plain lying in the eastern portion of the District has an average height between 80 and 90 m. Alleppey Coast is a low lying land, along the coast of the District comprising the whole of Cherthala taluk and some parts of Ampalappuzha , Karthikappally and Mavelikkara Taluks. The coast has marshy areas in some places. Kuttanad Low-lying Plains consists of the whole of Kuttanad Taluk and parts of Ampalappuzha, Chenganoor, Mavelikkara and Karthikappally Taluks. Chengannur- Rolling Plain covers Mavelikkara and Chengannur Taluks. There are three rivers flowing through the district, Manimala, Pamba, and Achancovil. In addition to Vembanad lake, the district has Kayamkulam lake.

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[13] However, land reforms implemented in Kerala are often criticised on several grounds, some of which will be discussed in next chapter in detail. See Rammohan (2008) or Ramachandran (1997) for detailed discussions.

Pathanamthitta district was formed very late on 1st November of 1982 by taking the Taluks of Adoor, Ranni, Konni, Kozhencherry from Kollam district and the taluks Pandalam, Thiruvalla, and Mallappally from Alappuzha district. The district possesses a total area of 2652 square kilometers without any sea coast. Forest area covers almost 52.7 per cent of the total area of the district. The district has 5 taluks and 68 revenue villages. The Taluks are Thiruvalla, Mallappally, Ranni, Kozhenchery and Adoor. Under the local self government system, there are 5 statutory towns and 12 development blocks comprising 73 panchayaths. The district is divided into five sub micro regions viz, Chengannur Rolling Plain, Kuttanad Rolling Plain, Kottarakara Undulating Upland, Pampa-Kakki Forested Hills and Adoor Rolling Plain. While Chengannur Rolling Plain has average height between 80m and 90m, the altitude of Kuttanad Rolling Plain is lower than the sea level. Kottarakara, undulating upland region, mainly comprise of a number of isolated hills separated from the mountain chain. Pamba-Kakki Forested Hills region has a plateau like structure and is the extension of mountainous tract of Western Ghats. Three rivers namely Achancoil, Manimala, Kallada and the Pampa are flowing through the district, draining more than 70 per cent of the total area of the district.

3.4.2 Population Growth and Characteristics

Total population of Kerala as per 1901 census was 63.96 lakhs and it almost tripled to 254.54 lakhs in 1981. Between 1921 and 1981 Kerala's population registered higher decadal growth rates on average about 22 per cent (Figure 3.3). However, since 1981 it has been growing at a slower rate and most importantly in 2011 decadal growth rate declined to 4.91 per cent. The same pattern can be observed in the population growth of three districts coming under Kuttanad region. For instance, the decadal growth rate for Alappuzha district between 1961 and 1971 was 17.73 per cent and it declined to 1.06 per cent between 2001 and 2011. For Kottayam the decline was from 16.5 per cent to 1.10 per cent. For the Pathanamthitta district fall in growth rate of its population was even much higher.

It can be observed from the table 3.2 that between 2001 and 2011 growth rate of population of all three districts under Kuttanad declined much faster than that of Kerala. Interestingly Pathanamthitta district registered a negative growth between 2001 and 2011. Three factors are expected to influence the rate of population growth in a region; they are fertility, mortality and migration on large scale. In Kerala's casethe recent decline in growth rate of population has been mainly attributed to decline in birth rate and large scale out migration from the state (CDS, 2006). In 1966 the birth rate was 37. 38 per 1,000 population and the rate fell to 14.7 in 2011. Total fertility rate is a standardised indicator often used to assess fertility trends because it considers only women in reproductive age group. Total Fertility Rate (TFR) is computed as the ratio of total births to total female population in the age group of 15-49 years. The total fertility rate in Kerala was 5.6 per women in 1951, which declined to 3.7 in 1971 and further to 1.7 in 2001.

Figure 3.3 Decadal Growth Rates (%) of Population in Kerala, 1901-2011

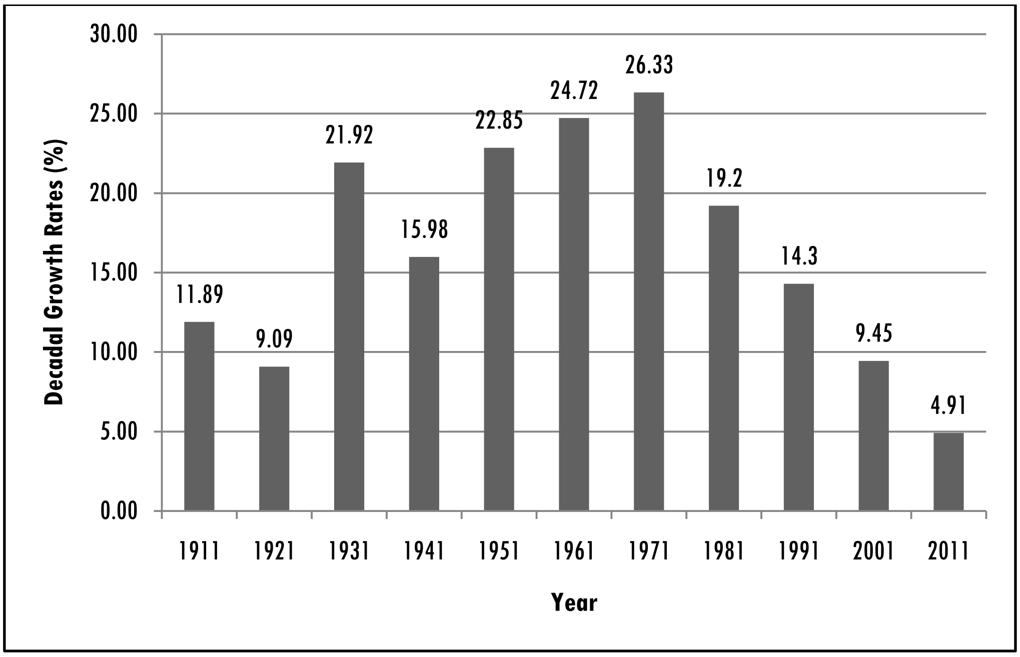


Table 3.2 Population and Decadal Growth Rates in the Districts and Kerala, 1951-2011

Year	Alappuzha		Kottayam		Pathanamthitta		Kerala	
	Population (lakh)	Decadal Growth (%)	Population (lakh)	Decadal Growth (%)	Population (lakh)	Decadal Growth (%)	Population (lakh)	Decadal Growth (%)
1951	15.20	-	13.28	-	-	-	135.49	
1961	18.11	19.1	17.33	30.50	-	-	169.04	24.7
1971	21.26	17.4	15.39	16.55	-	-	213.47	26.3
1981	23.50	10.5	16.97	10.3	-	-	254.54	19.2
1991	20.01	7.3	18.28	7.7	11.88	5.6	290.99	14.3
2001	21.05	5.2	19.52	6.8	12.31	3.7	318.41	9.4
2011	21.27	1.06	19.74	1.10	11.97	-2.77	334.06	4.9

Note: Population data for Pathanamthitta district is available only 1991 onwards, as the district was formed in 1982. The percentage decennial growth rate of Kottayam district during 1951-61 is based on the jurisdiction of the district in 1961, while the growth rate for 1961-71 is based on the jurisdiction after the formation of Idikki district in 1972.

Source: Economic Review, State Planning Board, Thiruvananthapuram, Kerala, Various Issues.

The death rate did not have any significant effect on rate of population growth as it was already low as 10.45 per 1,000 population in 1966 and it did not mark any significant change as it was estimated at 6.8 in 2011. It is widely acknowledged that higher level of female education has played a remarkable role in reducing the fertility and mortality rate in Kerala. Further, Kerala has also been experiencing large scale external migration especially to gulf countries. Although there is no official data on the extent of external migration from Kerala, results of various rounds of Kerala Migration Survey conducted by Centre for Development Studies (CDS) throw some evidences. The survey estimated the total number of emigrants from Kerala in 1998 as 1.36 million and this increased to 2.28 million in 2011.

Table 3.3 Population Density of the Districts under Kuttanad and Kerala (Persons per km^2), 1901-2011

Year	Alappuzha	Kottayam	Pathanamthitta	Kerala
1901	354	-	-	165
1951	825	514	272	345
1961	993	596	336	435
1971	1182	699	389	549
1981	1319	771	426	655
1991	1408	826	449	747
2001	1492	885	468	819
2011	1504	895	452	860

Source: Economic Review, State Planning Board, Thiruvananthapuram, Kerala, Various Issues.

The increasing extent of land reclamation in Kuttanad has also been a result of rising population pressure on land. The Alappuzha district, which constitutes 57 per cent of Kuttanad, had the highest population density in the state of Kerala till 2001. However in 2011 Alappuzha is the second densest district of Kerala after Thiruvananthapuram. According to the 1901 census, the district had a density of 354 persons per km^2 as against the 165 of Kerala and 74 of all India. Population density in Alappuzha district increased to 1504 persons per km^2 in 2011 against 860 of Kerala and 364 of India. It is noteworthy that population density in Kerala is three times higher than the national average and Alappuzha district perhaps is one of the most densely populated region in the country. Population density of other two districts is relatively low, for Kottayam it is 895 persons per km^2 and for Pathanamthitta it is only 452 persons per km^2 in 2011.

The increasing population density has adverse implications for the agriculture in Kuttanad. The first one is lower man-land ratio. Tharamangalam (1981) noted that in 1970s the per capita land available in the Alappuzha district was only 0.088 hectares against 0.224 hectares in Kerala. In 2011 this figure was only 0.066 hectares for Alappuzha and 0.116 hectares for Kerala. Increasing population pressure on land and low man-land ratio, as we shall see later, would result in higher unemployment and underemployment. Further, given the land and technological constraints, one more worker joining the agricultural labour force may not significantly increase level of total output, resulting in disguised unemployment.

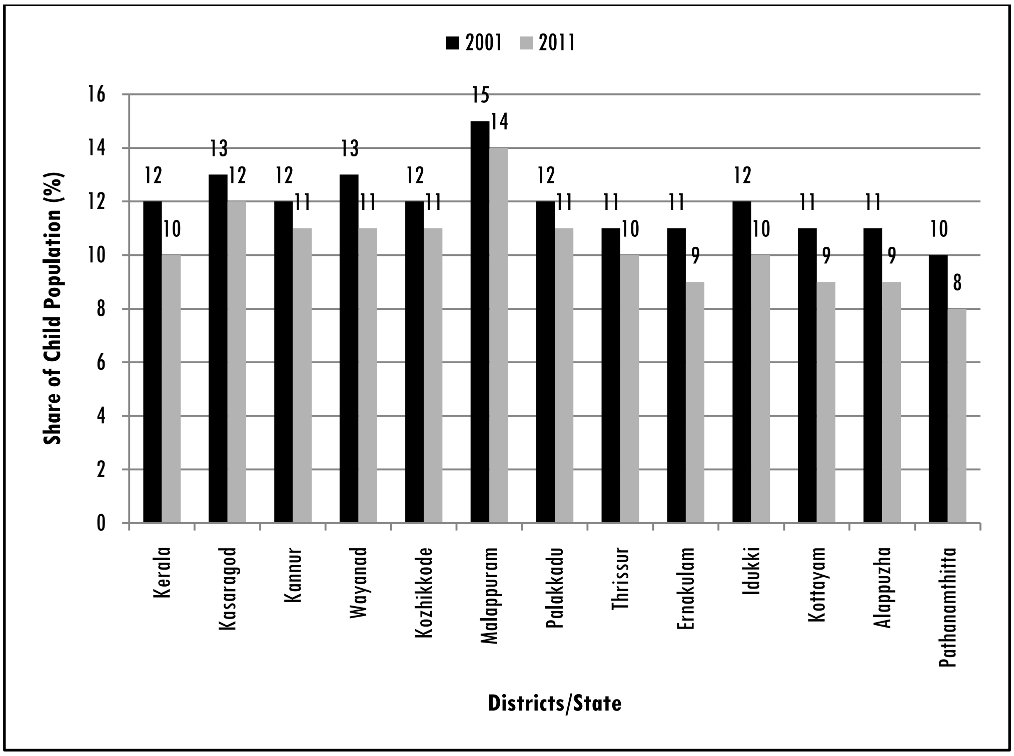
Some demographic characteristics of the population of the three districts are given in table 3.4. Due to the higher population density the number of households is higher in Alappuzha. The proportion of houseless is almost negligible, owing to Kerala's remarkable redistributive policies such as providing house sites to the landless and giving housing finances for the construction expenditure. Degree of urbanization is very high Alappuzha district, percentage of urban population is about 54 per cent against 47 in the state. However, Kottayam and Pathanamthitta districts experience less degree of urbanization. There is no urban agglomeration in both Kottayam and Pathanamthitta. Alappuzha has the highest sex ration in the state as 1100 females per 1000 males. The proportion of female population is also high in the district as about 52.4 per cent against 52 of the state. In case of literacy Kottayam stands first in the state, literacy rate of the district as per 2011 census was 97.21 percent, which is little higher than that of the state. The percentage of SC population is slightly high in Pathanamthitta, while the percentage of ST population very low in all three districts.

Table 3.4 Demographic Features of the Districts and Kerala (2011)

	Alappuzha	Kottayam	Pathanamthitta	Kerala
Total No of Households	535958	486804	322684	7853754
Percentage of Houseless	0.06	0.10	0.08	0.07
Percentage of Urban Population	53.96	28.63	10.99	47.7
Percentage of Female Population	52.4	51.0	52.0	52.0
Sex Ratio	1100	1039	1132	1084
Literacy rate	95.72	97.21	96.55	94
Percentage of SC Population	9.46	7.79	13.74	9.1
Percentage of ST Population	0.31	1.11	0.68	1.45
Percentage of Child Population	8.77	8.52	7.65	10.0
Decadal Growth of Child Population (%)	-15.17	-17.93	-23.76	-8.44
Child Sex Ratio	951	957	967	964

Source: Panchayat Level Statistics-2011, Various Districts, Department of Economics and Statistics, Government of Kerala, Thiruvananthapuram & District Census Hand Book (DCHB) of Various Districts 2011, Directorate of Census Operations: Kerala, Thiruvananthapuram.

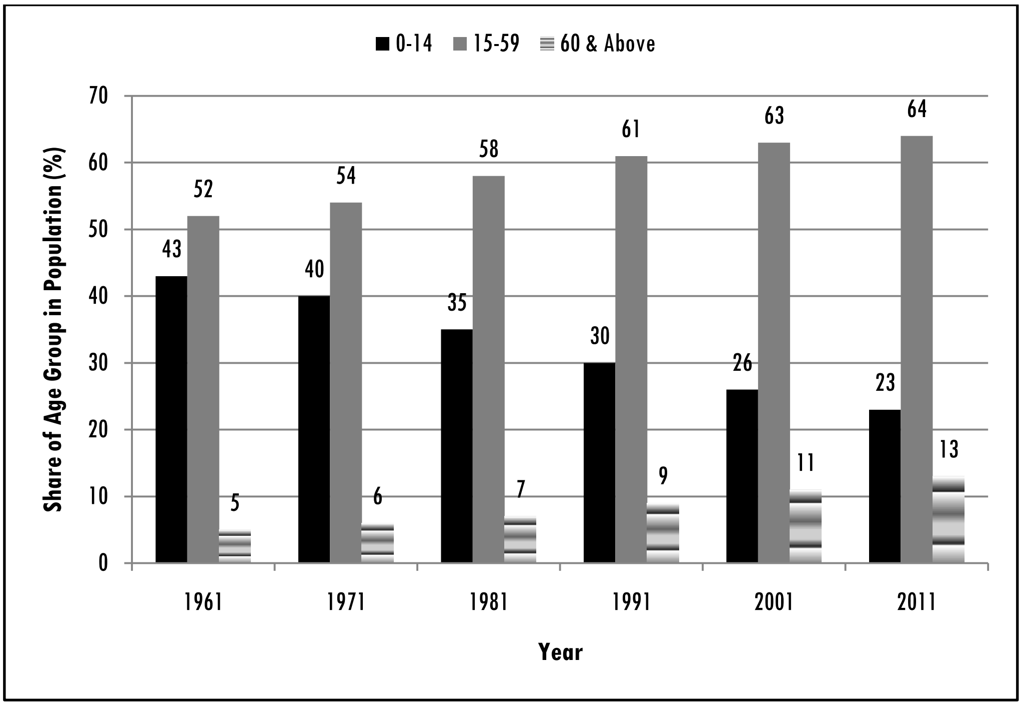
Figure 3.4 Changes in the Share of Child Population (%), 2001-2011



A notable demographic change occurred during 2001-11 in Kerala is the negative growth rate of child population in the state (-8.44%). Child population in Kerala declined from 3793146 in 2001 to 3472955 in 2011. The share of child population in total population has declined between 2001 and 2011 in all the districts (Figure 3.4). Among the all districts, Pathanamthitta registered highest fall of almost about 23.7 percent. Pathanamthitta also has the lowest proportion of child population in 2011 about 8 per cent. Decline in the share of child population is mainly because of decline in birth rate and aging. The declining rate of population growth and negative growth rate of child population indicate that Kerala is approaching zero population growth.

It is a well established fact that Kerala is now enjoying demographic dividend. Demographic dividend is defined as the rise in the rate of economic growth due to rising share of working age people (15-59) in the population. This phenomenon occurs with a declining birth rate and consequent shift in the age structure of population towards adult working ages. Though the birth rate is declining, due to higher fertility in the past, there is higher number working age people, resulting in lower dependency ratio. Share of working age population in the state has increased from 52 in 1961 to 64 in 2011 (Figure 3.5).

Figure 3.5 Distribution of Population by Age Group in Kerala (%), 1961-2011



This has been one factor that induced Kerala's economic growth since 1987-88. Kerala experienced a turnaround in economic growth in 1987-88 as a result of economic reforms and large inflow of remittances (Subramanian and Azeez 2000; Ahluwalia, 2002; Kannan, 2005 & Chakraborthy, 2005). Kerala's highly interventionist development policies in health, education, and basic infrastructure promoted human and social development, thereby improving the capability of people, helping them to migrate and send higher amount of remittances to the state. These linkages of social development with remittances that responded positively to economic reforms created a spurt in economic growth in Kerala (Kannan, 2005).[14]

3.4.3 Changes in Workforce

According to the 1961 census, total workers in Kerala accounted for 56.3 lakh. In 2011 total strength of workers in the state increased to 116.19 lakh. Among the three districts Alappuzha has more number of workers and Pathanamthitta has less number of workers. Male workers constitute a major portion of total workforce, for the state as a whole share of male workers is about 72 per cent, and same is the case of Kottayam and Pathanamthitta. In Alappuzha, Share of male workers is 68 per cent and Share of female workers is only 33 per cent.

Table 3.5 Workforce of the Districts and Kerala, 2011

	Alappuzha	Kottayam	Pathanamthitta	Kerala
Total Workers	804,471	735,735	392,794	11,619,063
Male Workers	536,738	530,322	281,854	8,451,569
	(66.7)	(72.0)	(71.8)	(72.7)
Female Workers	267,733	205,413	110,940	3,167,494
	(33.3)	(28.0)	(28.2)	(27.3)

Note: Figures in the Parenthesis is percentage to total workers.

Source: District Census Hand Book (DCHB) of Various Districts 2011, Directorate of Census Operations: Kerala, Thiruvananthapuram.

Between 1961 and 2011 the total workers in the state increased by 117.82 per cent, which is higher than the increase in population (97.62%) over the same period. This was mainly because, as we have seen, the rising share of working age population in the total population. However, the Work

14 Devaluation rupee in 1991 and shift to market determined exchange rate in 1993 resulted in continuous depreciation of rupee and this in turn significantly increased remittance flow to the state.

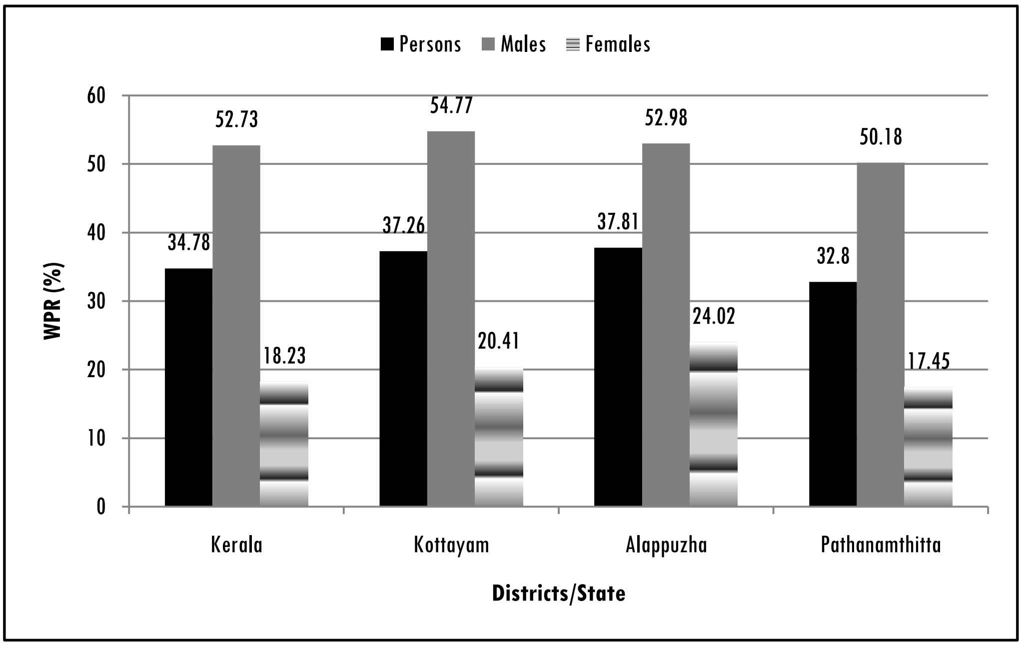
Participation Rate (WPR) in the state is very low when compared to the national average. This was 33.0 percent of total population in 1961, while the corresponding percentage for all India was 43.0 percent. Over last five decades the work participation rates have not shown much improvement in case of the state as a whole. It was only 34.78 per cent in 2011 for Kerala against 39.8 per cent of All India.

Table 3.6 Work Participation Rates of the Districts and Kerala (%), 1961-2011

Year	Alappuzha	Kottayam	Pathanamthitta	Kerala
1961	33.7	-	-	33.0
1971	28.1	27.3	-	29.1
1991	34.1	31.2	-	-
2001	34.4	32.9	-	-
2011	37.8	37.3	32.80	34.78

Source: Economic Review, State Planning Board, Thiruvananthapuram, Kerala, Various Issues.

Figure 3.6 Work Participation Rate (WPR) by Gender, 2011



Nevertheless, work participation rates in Alappuzha and Kottayam districts have improved considerably. For Alappuzha, work participation rate increased from 28.1 per cent to 37.8 per cent between 1971 and 2011, similarly the increase for Kottayam was from 27.3 per cent to 37.3 percent. On the other hand the work participation rate in Pathanamthitta in 2011 was merely 32.80, which is even below the state average. It can be observed from the figure 3.6 that there exists wide gender disparity in work participation rate. The work participation rate of males is more than 50 per cent, while that of females is abysmally low. For the state and Pathanamthitta district, female work participation rate is merely 18 per cent, while in respect of Alappuzha it is about 24 per cent.

Census classifies total workers into two broad categories on the basis of number of days employed, they are Main workers and Marginal workers. Main workers are individual who had worked a major part of the reference period, more than six months in a year. On the other hand marginal workers are the workers, who had worked only less than six months in a year. Almost 80 per cent of the workers are main workers in Kerala. Share of marginal workers only about 20 per cent in the state. Share of main workers is more in Kottayam about 82 percent. On the other hand Alappuzha has 74 per cent main workers and 26 per cent marginal workers. These facts indicate that the workers in Alappuzha get comparatively less number of employment.

Table 3.7 Share of Main Workers and Marginal Workers in Total Workforce in the Districts and Kerala, 2011

	Alappuzha	Kottayam	Pathanamthitta	Kerala
Main Workers	74.13	82.2	74.7	80.3
Marginal Workers	25.87	17.8	25.3	19.7

Source: District Census Hand Book (DCHB) of Various Districts 2011, Directorate of Census Operations: Kerala, Thiruvananthapuram.

The data on the occupational classification of workers given in table 3.8 indicate recent shift in employment pattern towards non-agricultural occupations. In 1971 almost 48.5 per cent workers in Kerala and 46.7 workers in Alappuzha were engaged in agriculture. Among them majority were agricultural labourers. In 1971 Agricultural labourers formed 63.3 per cent of total workforce in agriculture in Kerala, 66 percent in Alappuzha district. More importantly in Kuttanad taluk almost 64 per cent of workers were engaged in agriculture, of them 70 per cent were agricultural labourers. These empirics suggest that Alappuzha and Kuttanad were agrarian economies, where majority of the population was dependent on agriculture for their livelihood. This large dependence on agriculture then was due to the declining status of traditional industries, especially coir industry and the underdevelopment of service sector.

However, the employment scenario in the state has undergone a drastic transformation ever since state moved from low growth path to a higher growth path in 1987-88. Since then remittance flow has been significantly increasing due to the continuous depreciation of the rupee which in turn was a result of changes in exchange rate policy of the country towards market determined exchange rate system. For instance remittance flow to the state has increased from 13652 in 1998 to 49695 crores in 2011. The remittance inflow exerts enormous macroeconomic impact on the economy of Kerala. The remittances amount to almost 36.3 per cent of NSDP of the state and 1.2 times revenue receipt of Kerala (Zachariah and Rajan, 2015). This also has increased the per capita income of the people in the state, giving a boost to their per capita expenditure. Resultantly there has remarkable increase in the demand for goods and services in the economy. The rise in aggregate demand for goods and services promoted the growth of service sector such as trade and commerce, construction, transport and communication etc..Therefore recently more employment opportunities are created in these sectors.

Table 3.8 Occupational Category of Workers in 2011 (%)

	Alappuzha	Kottayam	Pathanamthitta	Kerala
Cultivators	3.14	6.79	10.54	5.77
Agricultural Labourers	8.91	8.57	14.12	11.39
Workers in household Industry	4.46	2.52	2.82	2.35
Other Workers	83.49	82.12	72.82	80.5

Source: District Census Hand Book (DCHB) of Various Districts 2011, Directorate of Census Operations: Kerala, Thiruvananthapuram.

The impact of rise in overall economic growth and growth of service sector is clearly reflected in the census data on occupational categories for the year 2011. In the case of Kerala, almost 80 per cent of workers are engaged in the category of other workers which includes industry and service sector.[15] The proportion of workers engaged in activities related to agriculture is very low, cultivators are merely 5.77 per cent of total workforce, and Agricultural Labourers constitute only about 11 per cent of workforce. In 1971 proportion of cultivators was 17.7 per cent, and the proportion of Agricultural Labourers was 30.7 percent. In respect of Alappuzha the proportions declined from 16.05 to 3.14 per cent for cultivators and 30.06 to 8.91 per cent for agricultural labourers between 1971 and 2011.[16] On the other hand in Alappuzha other workers form 83 per cent of total workers in 2011. Similar change in occupational pattern can be observed in case of Kottayam district as well. Therefore it can be concluded that there is a shift in occupational pattern of

[15] Other workers include all government servants, teachers, factory workers and those engaged in trade, commerce, business, transport banking, mining, construction, political or social work etc... All those workers other than cultivators or agricultural labourers or household industry workers are considered as 'Other Workers'.

[16] The occupational classification provided by census before 2001 was nine-fold and 2001 onwards it changed to four-fold classification. Therefore the periodical comparison is not provided in the table.

Kerala and Kuttanad region towards non-agrarian sectors. In case of Alappuzha the share of cultivators in total workforce declined from 24.70 to 6.79 per cent that of agricultural labourers declined from 28.02 to 8.57 during the period between 1971 and 2011. Pathanamthitta district is no exception to this general trend, except the case that in 2011 it has slightly higher proportion of cultivators and agricultural labourers.

3.5 Agriculture and Cultivation Practices in Kuttanad

Agriculture and cultivation practices in Kuttanad are quite distinct from the other regions of the state because of its peculiar geographical features. As already discussed, major portion of the land in Kuttanad is wetlands which are situated below mean sea level and are submerged under water during monsoon. These marshy wetlands are suitable only for rice cultivation. These rice fields in Kuttanad are reclaimed from the lake and are widely known as 'Puncha Vayals' or Kayal lands. Unlike other regions, here the rice cultivation is possible only after constructing outer bunds and dewatering the field. Further the intrusion of saline water through the lake adds acidity to the soil affecting the fertility. To get rid of all these risks a multifaceted cultivation process is required in Kuttanad.

At present rice is grown in two seasons in Kuttanad. The first is Punja season that runs from November to March. This seasons starts soon after the southwest monsoon (May to August) ended, however goes through the northeast monsoon (October to November). But north east monsoon is of less harmful as only 12 percent of water carried by river systems rained during this time, provided that there is no erratic rainfall. Therefore during Punja almost all Kayal lands are cultivated, an earlier estimate showed that about 40,000 hectares of land were brought under Punja crop. A major risks faced during

Punja is saline water intrusion during summer, incidences of pests and diseases, waterweeds and occasional floods. The second season Virippu is from May to September and coincide with the southwest monsoon, and this period receives 67 percent of catchment of the river systems, resulting higher extent flood. Therefore only less area of (10,000 hectares) Kayal lands are cultivated during Virippu.

3.5.1 A Brief History of Cultivation Process

The cultivation process in Kuttanad has not undergone any significant changes; rather the intensity and scale of operations have increased with the up gradation of technology and machines. Bund construction and dewatering have been the two major operations that require more time and labour. Earlier periods, cultivation was not carried out quite frequently. Till 1916 Punja lands of Kuttanad was cultivated only once in two or three years (GOK, 1971). Rest of the time land was left fallow to get the benefit from silt deposited in them. It was the successful trial conducted in Kuppappurom that proved the feasibly of cropping the area every year without any ambiguity.[17] However even after this, cultivation was undertaken continuously only for two or four years, and then lands were left fallow for one year to regain the fertility.

The dewatering process in the region before the construction of spillway at Thottapally was a tedious task due to unprecedented amount of flood water. Dewatering was carried out with wooden water wheels, consuming considerable time and labour. During that time Punja Crop was sown in September just after southwest monsoon, and harvested in December-January before the intrusion of sea water in the Vembanad Kayal during summer. Later in 1912 the introduction of oil pumping engines increased the scale and pace of cultivation process in

[17] Kuppappurom was an experimental station, and it was later closed in 1912.

Kuttanad. Land reclamation process became fast and cultivation was extended to large areas. The entire cultivation process gained further momentum with the arrival of electric power motors and pumps. Further, construction of Thottappally Spillway made the cultivation process safer as it reduced flood water level and saline water intrusion to some extent.

Thottappally Spillway (TSW) and Thanneermokkom Salt water Barrier (TMB) were the two major projects implemented by the state government to control the flood water level in Kuttanad. The main reason this is that the overall water level in Kuttanad rise beyond the manageable limits due to excess waters coming over the Lower and Upper Kuttanad through the river systems especially in the aftermath of southwest monsoon beginning in May. The rain fall reach its peak in July and it is estimated that six rivers together bring in a total of 6750 Mm^3 water into Vembanad Kayal during southwest monsoon. Most of this inflow is contributed by Pampa River. These conditions keep the entire low lying rice fields of Kuttanad flooded till November retarding any possibility for the second crop after Punja season ending in March. Therefore it was suggested by comprehensive hydraulic surveys conducted in 1930s to construct a spillway to divert the floodwater directly to Arabian Sea at the extreme south of flood limit itself (Thomas, 2002). The construction of spillway was begun in 1951 at Thottappilly, situated 20 kilometers south of Alappuzha town, with an intention to discharge a total of 64,000 cusecs of flood water to the sea during monsoon months.

The spillway was commissioned in 1954. It divides the Thottappally Lake into two parts, one part with fresh water in the east detached from sea, another part with saline water as lake mouth opened to the west merging with Arabian sea. The spillway is designed to discharge 19,500 cubic meters of water per second. However, after it’s commissioning it was found that it can discharge only 600 cubic meters of water per second. There are mainly three reasons for the reduced flow rate. First and foremost is the failure to implement the scheme to improve the width of the leading canals. The width of the leading canal is yet too narrow to carry that much amount of water. When the spillway is opened the flood waters in the canal generate high velocities and this destructs the bunds of adjoining padashekharams causing extensive damage to the rice fields and crops. Second one is the rise in the sea level relative to the water level of Kuttanad due to the strong breezes during rainy seasons. Third problem is the formation of sand bars on the western area of the spillway, which prevents flow of water into the sea.

Intrusion of saline of water through the Vembanad Lake during summer has been a major problem of rice cultivation in Kuttanad. During summer (December-May) water level in the lake falls due to the decrease in the total inflow of rivers into Kuttanad. This creates a reverse flow of water carrying salinity from the sea to the inland water bodies, adversely affecting the rice cultivation during Puncha season (November-March). Therefore to prevent tidal actions and intrusion of salt water into the low lying rice fields of the region, as part of Kuttanad Development scheme, Thanneermukkom Salt Water Barrier was built in 1975 across the Vembanad Lake between Thanneermukkom on the south and Vechur on North.[18] TMB also aimed to facilitate and enlarge cropping during Virippu season. The barrier has helped the farmers by considerably reducing the saline water intrusion and also making it possible to raise second crop.[19]

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18 The construction of the Barrier was started in 1958

19 Nevertheless, the Barrier has also caused ecological problems. Some of them are deterioration of inland fish stock due to the decline in fish breeding in absence of salt water and increase in waterweeds like *African Payal (Salvinia)* in the fields.

Both the spillway and Barrier had impacted the cultivation practices in Kuttanad. Due to the reduced possibility of flood and saline water intrusion, the Punja season was extended from January to May. The traditional Kuttanadan punja crop with 100-105 day duration was consequently replaced by new high yielding variety (HYV) seeds such as Jyothi and Uma which matures within 115-120 days. The extended Punja season increased the incidences of pests and diseases, necessitating heavy application of pesticides. This coupled with the heavy application of chemical fertilisers used for HYV seeds degraded the quality of environment and water bodies in Kuttanad.

3.5.2 Cultivation Practices in Kuttanad

Agricultural operations are similar in kind across various regions of Kuttanad; differences exist only in terms of intensity of operations. It is noteworthy that the most of the cultivation processes in Kuttanad such as dewatering, sowing, harvesting etc.. are mechanized to a greater extent. The cultivations in the rice fields of Kuttanad were undertaken in the form of cooperative farming under a cluster system. A number of farmers, whose rice fields are situating adjacently, join together and put together their fields to form a cluster named '*Padashekharam*'. There is a *Padashekharam Samithi* with a chairman for a group of *Padashekharams*. *Padashekharam Samithi* manages the entire cultivation process of all the *Padashekharams* under its control and chairman take care of the financial affairs.

There are nearly 1231 *Padashekharam* occupying a total area of 59375 hectares with size ranging from 1 hectare to 729 hectares. The huge size of *Padashekharams* made the transportation of fertilisers and produces difficult, adding to the cost of cultivation. Before 1960s these *Padashekharams* were owned by one or few farm families. The implementation of land reform measures since 1969 fixed ceilings on holdings and the surplus lands were redistributed the landless families. For instance, Q (196 ha), S (240 ha) and T (204 ha) *Padashekharams* in Kainakari Panchayath were redistributed to 490, 600 and 510 families (MSSRF, 2007). This significantly reduced the size of land holding. It is noted that about 71 per cent of land holdings in Kuttanad are less than 4 hectares and 42 per cent are less than 1 hectare. Each of these *Padashekharams* are presently owned by hundreds of households, where individual household ownership range between 1 to 5 hectares.

As we have already noted agricultural operations in each *Padashekharam* are managed by the *Padasheharam Samithi*. An outer bund is constructed for each *Padashekharam* to protect the crop from frequent flood and intrusion of saline water. These outer bunds are strengthened regularly by the *Padashekharam samithi* and the cost is proportionately shared by the farmers. The traditional *katta kuthu* method followed to strengthen outer bund. *Katta kuthu* means clay digging from the Kayal (Lake), which involves men diving into 20-25 meters deep into Kayal-bed. However, now days *Katta kuthu* is mechanised, it is carried out with the help of JCB and other machines. The clay taken so from the Kayal is transported to the *Padashekharams* in wooden boats (Vallams). The periodical clay digging also helps to reduce silting thereby increases the depth of the lake. This facilitates water navigation and reduce intensity of the flood. Even though several committees have recommended permanent bunds for *Padashekharam*, it is not yet accomplished.

Dewatering, another major process is also mechanised and is carried out with special pump called *petti and para*, which is run by electric motors fixed in *Padashekharams*. Electric pump sets of 30-50 HP are deployed for dewatering. Motor *Thara* (basement) and pump sheds have to be constructed for installing the water pump system. Speedy and efficient dewatering is essential for timely sowing; otherwise the entire crop calendar may be delayed. The dewatering process normally goes on for about 15 to 20 days until the excess water is completely pumped out from the fields. For the promotion of regular cultivation in *Padashekharam* the state government passed Kerala Irrigation Act in 1942 that institutionalised the dewatering system and pumping subsidy for the rice fields in Kuttanad. The act assigned the administration of dewatering process and the granting of subsidy to the Puncha Special Officers (PSO) at Alappuzha and Kottayam.

The PSO conducts public auction attended by farmers for assigning the contract of dewatering process. Initially 40 per cent of the total expenditure was given as subsidy, which is later enhanced as full subsidy. However, farmers are forced to pay an additional charge to contractors called 'additional nerma' for meeting the extra expenditures on 'motor *thara'* and pump house. Due to the bureaucratic supremacy of PSO, *Padashekharam samithi* has no control over the dewatering process. The contractors often exercise supreme power on determining the cost and timing of dewatering. Such a situation put farmers in peril for two reasons. There can be delay in dewatering process and getting the *Padashekharams* ready for sowing if the subsidies for previous two or three seasons are not paid to contractors. This situation also induces the contractors to increase the *'additional nerma'* from farmers.

In various region of Kuttanad the operations for next year's crop starts with a minimum of two rounds of ploughing soon after the harvest of previous crop in February or March. Various operations are explained in order below[20].

[20] The discussion provided here is about the cultivation process in Kuttanad in general on the basis of Kuttanad enquiry commission report published by Government of Kerala (1971) and Study report published by M.S.S.R.F (2007). The order and intensity of cultivation process may vary across various regions and from one season to another season.

I. **Dry Ploughing:** The operations starts with two round of dry ploughing, one lengthwise and other crosswise, along with the application of powdered lime to neutralize the acidity in the soil. Ploughing is done by tractors. After this water is let in through the sluices in the bunds to flood the fields and the water remains there throughout the southwest monsoon. This flooding is aimed at suppressing the capillary rise of salts from below.

II. **Wet Ploughing:** The second round of ploughing begins with the onslaught of south west monsoon. During this time the water level will go up converting the entire area into a vast sheet of water. However, in July or August the level of water falls, then the wet ploughing is carried out. Wet ploughing is done in the waist deep of water to stir up the soil and let fresh water to infiltrate into the soil.

III. **Repairs to Bunds:** The outer bunds encircling the *Padashekharams* must have been damaged by the floods. The repair of bunds is done in September when the water level declines to manageable levels using the material such as clay, shrubs, twigs, straw and reeds. Clay is taken from Kayal or canal mostly by men and through the process known as *kattakuthu,* where men dive into the deep water, collects clay and put them in boats. Now days *kattakuthu* is done by machines like JCB. Other materials are brought from distant dry lands.

IV. **Dewatering:** Dewatering starts just after the completion of repair of outer bunds. Dewatering is done with special pump called *petti and para* run by electric motors of 30-50 HP. Motor basement and sheds have to set up for this process. The process extends to 15 -20 days until fields are completely drained. Dewatering process for *Padashekharams* is carried out by private contractors assigned by Puncha Special Officer (PSO) on auction basis.

V. **Repairs of Inner bunds and Leveling:** Once dewatering is done, the smaller inner bunds separating individual fields in each *Padashekharam* are repaired. The process is known as 'Edavarambu Kuthal". Simultaneously the inner irrigation canals are also repaired. Then the soil is lightly raked by passing a harrow, locally termed as *'pallikkadi'*

VI. **First Weeding and Puddling:** A distinct feature of the Puncha Cultivation in the region is that weeding has to be completed before the sowing happens. The female labour removes the deposit of weeds to bring the soil into a soft puddle.

VII. **Irrigation:** Some amount of fresh water is then let into the fields to a depth varying from few centimeters to 25 centimeters as per the layout of the land.

VIII. **Sowing:** Presently direct seeding is mostly followed, transplation is confined to lesser areas in Ambalappuzha and Karthikappalli taluks. The sprouted seeds are sown 5 -10 cm of standing water. Sowing for Punja season is done in mid of October and for Virippu in May. Uma and Jyothi are the two HYV seeds most commonly used. Uma matures in 110 days, while Jyothi matures in 115 days.

IX. **Fertilizer Application:** Use of HYV seeds warrants higher extent of fertilizer application in the region. Chemical fertilizers are applied in three rounds. Firstly it is applied within 20 days after sowing, 40 kg of Factomphos, 15 kg Erea, and 20 kg Potash per acre are applied. Second round fertilizer application of same quantity is done between 35 and 40 days. Third round application is carried out between 55 to 60 days with 15 kg of Erea and 10 kg of Potash per acre.

X. **Pesticide Application:** Large scale use of HYV seeds in recent periods resulted in higher incidence of various pests and diseases, which in turn necessitates the application of pesticides. Usually pesticides are applied in three rounds. The first round takes place after 15 days of sowing, which is known as '*kalanashini'*. Second round is applied between 30 and 40 days of sowing when insects are about to appear. Third round is applied after 60 days.

XI. **Gap filling and Top dressing:** The overcrowded portions are thinned out and the gaps are filled twenty five to thirty days after sowing. Simultaneously one more weeding is carried out.

XII. **Harvesting:** Harvesting commences in February and is done with harvesting machine. It costs around 1500 for one acre. The harvest is kept in small heaps in the grounds. The laborers tie the harvests into bundles and move to bunds and roadsides for threshing. The threshed gains is packed in sacks and loaded to Lories or Boats for transporting to private mills.

3.5.3 The Present Status of Agriculture in Kuttanad.

The agriculture in Kuttanad is presently undergoing severe crisis. Recurring crop failures due to flood and crop diseases, increasing cost of cultivation, declining productivity and profitability are the major reasons for the crisis. Consequently there is a general tendency in Kuttanad to either fallow the land or to convert them as garden lands. There has been substantial reduction in the area under cultivation in Kuttanad. In Alappuzha the total cropped (sown) area declined in both absolute terms and as a proportion of total area.[21] Between 1975 and 2011 the net area sown in Alappuzha district declined from 164384 hectares to 87445 hectares (-46.8%). In 1975 net area sown in Alappuzha was 88 per cent of total area, which was much higher that state average (53.3%) and this declined to 62 per cent in 2011. However, Kottayam district experienced much less decline in net area sown from 85 per cent to 75 per cent.

Table 3.9 Land Use Pattern in the Districts under Kuttanad and Kerala in 1974-75 and 2011 (Hectares)

	Alappuzha		Kottayam		Kerala	
	1974-75	2011	1974-75	2011	1974-75	2011
Total Area	186790	141011	215695	220442	3858523	3886287
Total cropped Area (Gross area sown)	244713	108489	271905	206789	3028075	2647461
	(131.0)	(76.9)	(126.1)	(93.8)	(78.5)	(68.1)
Net area sown	164384	87445	182943	164451	2208451	2071507
	(88.0)	(62.0)	(84.8)	(74.6)	(57.2)	(53.3)
Area sown more than once	80329	21044	88962	42338	819624	575954
Cropping Intensity	148.9	124.1	148.6	125.7	137.1	127.8
Land put to non agricultural use	12450	20881	13850	25893	295113	384174
	(6.7)	(14.8)	(6.4)	(11.7)	(7.6)	(9.9)
Land under misc. tree crops	6350	150	4516	133	97687	3690
Fallow other than current fallow	760	3954	1166	3046	20808	51943
Current fallow	530	3145	1849	5808	24545	76028
	(0.3)	(2.2)	(0.9)	(2.6)	(0.6)	(2.0)

Note: Figures in the Parenthesis is percentage to total area.

Source: Economic Review, State Planning Board, Thiruvananthapuram, Kerala, Various Issues & Panchayat Level Statistics-2011, Various Districts, Department of Economics and Statistics, Government of Kerala, Thiruvananthapuram

[21] Total cropped area implies gross area sown, which represents the total area cultivated under all food and non-food crops including the area sown more than once during the year. According to this Concept, the area under various crops in the same plot can be more than the actual area. On the other hand, while calculating the net area sown, area sown more than once will be counted only once.

As we have already noted the reasons for the net area sown are the lower profitability of agriculture and conversion land for non-agricultural uses. The area of fallow lands increased from 760 hectares to 3954 hectares between 1975 and 2011.[22] Similarly the lands put into non agricultural use also increased from 12450 hectares to 20881 hectares. Besides the net area sown, the intensity of the cultivation has also been declining as indicated by fall in the area sown more than once in Alappuzha and Kottayam districts. The area sown more than once in Alappuzha declined from 80329 hectares to 21044 hectares (-73.8), while in Kottayam district the decline was from 88962 hectares to 42332 hectares (-52.4 %). Further, the index for cropping intensity is calculated by taking the ratio of gross sown area to the net sown area. The results suggest that there is a decline in cropping intensity for both Alappuzha and Kottayam and this decline was more than the state average. The decline was from about 149 in 1975 to 124 for Alappuzha and 125 for Kottayam in 2011.

After Palghat, Alappuzha is the main rice producing district in the state. In 2012-13 Alappuzha contributed almost 19 per cent of total rice production in the state. More than 75 per cent of rice area in the Alappuzha district falls within Kuttanad and the contribution of the district to rice production in Kuttanad was 62 per cent. Due to its importance in rice production, Kuttanad is called as 'The Rice Bowl' of Kerala. In the 1970s the share of Kuttanad in total rice area in the state was 25 per cent and in total rice production was 37 percent. However, both area under rice and production of rice declined over the last four decades. Area under rice in Alappuzha district declined by 55.4 per cent between 1982-83 and 2913-14 and production of rice declined by 28.6 per cent.

22 Lands that are kept fallow off out of the net area sown during the previous year are classified as current fallow for the reporting year.

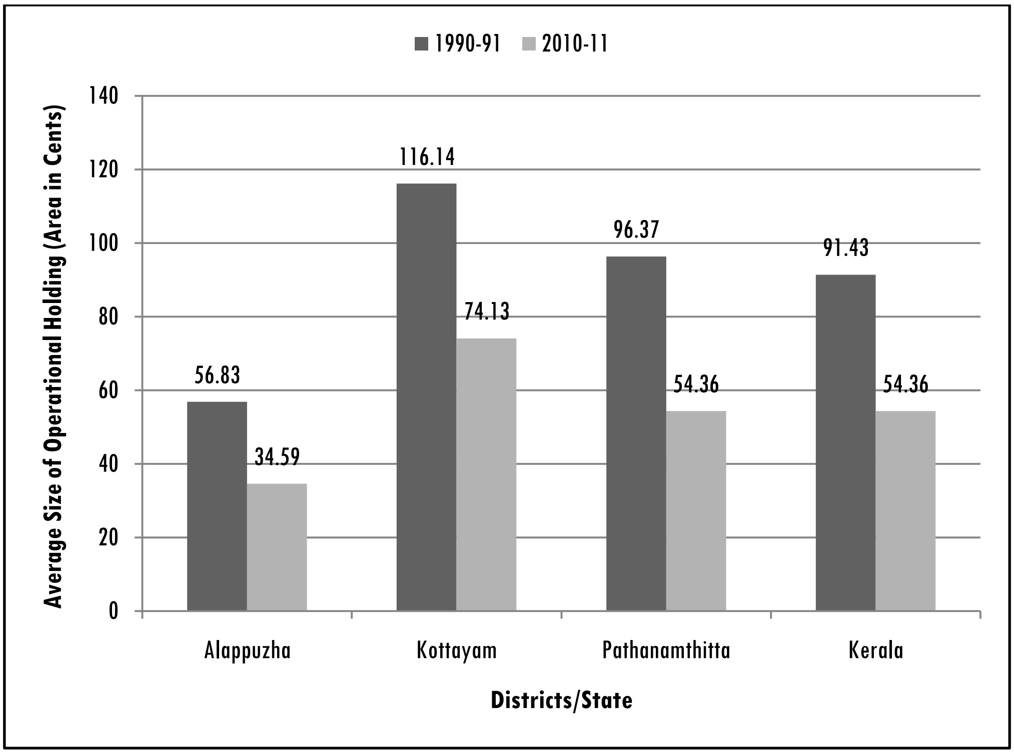
Table 3.10 Area under and Production of Rice in the Districts under Kuttanad and Kerala in 1982-83 and 2013-14

	Year	Area (Hectare)	% Change	Production (Metric Tonne)	% Change
Alappuzha	1982-83	83862	-	149768	-
	2013-14	37402	-55.4	106866	-28.6
Kottayam	1982-83	34596	-	83544	-
	2013-14	15746	-54.5	50729	-39.3
Pathanamthitta	1982-83	-	-	-	-
	2013-14	2468	-	7554	-
Kerala	1982-83	778490	-	1306197	-
	2013-14	199611	-74.4	564325	-56.8

Source: Economic Review, State Planning Board, Thiruvananthapuram, Kerala, Various Issues.

Another major issue of agriculture sector of Kerala in general and Kuttanad in particular is the small size of farm land holding. The land holdings were marginalised after the implementation of land reforms by fixing ceilings on land holding and redistributing excess lands to the landless households. In 2010-11 almost 96.32 per cent of land holdings in the state are marginal holdings with a size of less than one hectare, which makes the application of modern technology and agricultural operations difficult. Further, the average size of operational holding declined over the years. In 1990-91 average size of operational holding of Alappuzha district was 56.83 cents and this declined to 34.59 cents in 2010-11. Other two districts Kottayam and Pathanamthitta also registered a decline in average size of operational holding during the same period (Figure 3.7). It is also to be noted that the average land holding size 34.59 cents of Alappuzha district is much below the state average of 54.36 cents due to high population pressure on land. While the average land holding size of Kottayam is much higher than state average, Pathanamthitta district has average land holding size equal to state as a whole in 2010-11.

Figure 3.7 Average Size of Operational Holdings in the Districts under Kuttanad and Kerala (Area in Cents)



The farmers in Kuttanad who possessed proud legacy of adventurous and innovative cultivation practices, are now experiencing acute agrarian distress. Despite all the initiatives taken by the government and other agencies, rice cultivation in Kuttanad has become less attractive, as indicated by the declining area under cultivation. Incidence of farmers' indebtedness has become a common phenomenon due to the lower profitability from farming. The study report by MSSRF (2007) has identified mainly three reasons for the crisis. First one is the recurring annual cost on the maintenance of infrastructure such as outer bunds, motor thara, pump shed etc..The second is the increasing cost of labour and other inputs such as fertilizers and pesticides. Third is the slow rise in market prices of produces.

Further, there has been substantial decline in the soil fertility due to the heavy application of chemical fertilisers and pesticides, which in turn has adversely affected the overall productivity. Erratic rainfall during summer also poses serious problems to the cultivations and even may result in crop losses. Farm distress has imperiled the livelihood of the people in the region. Though many of them now seek off farm employment, they do not get sufficient days of work. This livelihood crisis, as we shall see later in the forthcoming chapters, tends to keep younger generation away not only from agriculture, but also from the region itself, persuading them to migrate to urban centres.

3.6 Conclusion

The low lying nature of Kuttanad poses many challenges to the rice farmers in the region. Flood during monsoon and saline water intrusion through the lake during summer make the cultivation in the region much riskier. These conditions necessitated to intensify the cultivation process in region. Thus the cultivation process in the region became multi phased, often carried out in the form of cooperative farming. Due to higher incidence of pests and weeds, there is also heavy application of pesticides and fertilisers. All these factors have increased the cost of cultivation, which in turn curtailed the profitability of rice cultivation. The population density in the region is found to be higher, causing rising population pressure on land. Further, a shift in occupational pattern towards non-agrarian sectors was observed as result of growth momentum in the economy in general and service sector in particular.

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Chapter 4

LAND HOLDING, AGRICULTURAL PRODUCTION AND NET FARM INCOME OF SAMPLE HOUSEHOLDS

Contents

4.1 Introduction

The main objective of this chapter is to analyse the production based entitlements of the sample households from the four selected panchayaths located in the Alappuzha district of Kerala. For this purpose, structure of land holding, cultivation pattern, level of agricultural production and utilisation pattern of output are analysed. Along with this, trade based entitlements are also examined by investigating the market related factors such as quantity of produces sold, price of produces and total earnings from the sale of produces.

While analysing the agricultural output and earnings, an attempt is made to analyse the profitability of paddy cultivation in the study area by comparing cost and revenue. Amount of agricultural loans taken and indebtedness among households are also analysed to bring out the extent of agrarian distress in the study area. The production related transfer entitlements such as subsidies and minimum support prices are also examined. Discussions given in this chapter are based on 2011 census data of the selected panchayaths and the results of primary field survey conducted in April and May months of 2014.

This chapter is organised as follows. Section 4.2 provides descriptions about the major characteristics of the sample panchayaths such as area, cultivation pattern, demographic features etc… Section 4.3 discusses the social characteristics of the sample households. Section 4.4 offers an analysis of structure of and inequality in land holding among the sample households. In section 4.5, we look into the cultivation pattern among sample households. Section 4.6 examines the cost structure and total cost incurred by the households for cultivation. Section 4.7 provides the details of subsidies received by households. Discussions on the volume output produced and productivity of paddy are given in section 4.8. Utilisation pattern of agricultural out is expounded in section 4.9. Section 4.10 makes a descriptive analysis of revenue earned by the households from paddy cultivation. Section 4.11 is an analysis of net farm income and profitability of cultivation. Section 4.12 explains the reasons for the low level profit from paddy cultivation. Section 4.13 examines the amount and sources of agricultural loan and level of indebtedness among farmers in the study area. Finally, section 4.14 concludes the chapter.

4.2 Characteristics of the Sample Panchayaths

The sample panchayaths and sample households are chosen by applying multi-stage stratified sampling method.[1] Four panchayaths namely Chambakkulam, Edathua, Kavalam and Muttar are the selected as sample panchayaths from Alappuzha district. These panchayaths represent three major agro-ecological zones of Kuttanad. Both Muttar and Edathua come under Upper Kuttanad agro-ecological zone, while Kavalam is a part of Kayal lands. Chambakkulam falls into lower Kuttanad agro-ecological zone. In Upper Kuttanad land elevation is high, therefore Edathua is comparatively less exposed to flood. This condition has made the agricultural practices and other development activities easier in Edathua. Therefore Edathua is some more developed in terms of social and physical infrastructure. Resultantly employment opportunities are high here. Though Muttar is a part of Upper Kuttanad land elevation is low and cultivation mostly take place below mean sea level. Similar is the case of Chambakkulam and Kavalam.

4.2.1 Geographical Area

Among the select four panchayaths Chambakkulam has the highest area about 2298.31 hectares and Muttar has the lowest area about only 1048.14 hectares during the year 2010-11 (Table 4.1). Similar to the common feature of Kuttanad a major portion of total area in the panchayaths is wetland. More than 80 percent of total area in all four panchayaths is wetland, and in Kavalam out of total area, 87 per cent is wetland.

[1] Detailed discussion about the sampling method is given in chapter 1.

Table 4.1 Area in the Sample Panchayaths by Type of Land in 2010-11

	Chambakkulam	Edathua	Kavalam	Muttar
Wetland (in Hectares)	1971.49	1867.43	1503.84	861.13
As a % of total area.	(85.8)	(82.2)	(87.1)	(82.2)
Dryland (in Hectares)	326.83	403.50	223.10	187.01
As a % of total area.	(14.2)	(17.8)	(12.9)	(17.8)
Total Area (in Hectares)	2298.31	2270.93	1726.94	1048.14
As a % of total area.	(100.0)	(100.0)	(100.0)	(100.0)

Source: Panchayat Level Statistics-2011, Alappuzha, Department of Economics and Statistics, Government of Kerala, Thiruvananthapuram.

4.2.2 Cropping Pattern

To analyse the cropping pattern, there is no Panchayath wise data available for Alappuzha district on the area under important crops. However, respective block wise data is available, which can be used for analysing the cropping pattern, given the fact that physical features and cultivation practices by and large are homogenous across various regions in Alappuzha district. Both Chambakkulam and Edathua panchayaths fall into Chambakkulam Community Development (CD) Block, similarly Muttar and Kavalam panchayaths fall into Veliyanad CD block. Thus the data of these blocks give some idea about the cropping pattern in these areas (table 4.2).

Table 4.2 Area and Production of Important Crops in Respective Community Development Blocks during the year 2010-11

	Area in Hectares		Production in Tons	
	Chambakkulam	Veliyanad	Chambakkulam	Veliyanad
Paddy	15228.89	10350	37381.266	27578.825
	(85.5)	(93.3)	-	-
Areacanut	130.37	96.18	162.7	121.973
Jack Fruit	85.2	81.04	0.15	0.17
Banana	8.63	11.54	36.5	71.5
Tapoica	4.86	10.89	145	358
Mango	217.86	189.05	NA	NA
Other Plantains	162.69	139.53	1618.92	1041.31
Coconut	1745.49	1758.23	8.96*	14.52*
Total	17808.47	11090	NA	NA

Source: Panchayath Level Statistics-2011, Alappuzha, Department of Economics and Statistics, Government of Kerala, Thiruvananthapuram.

Notes: Figures in the Parenthesis is percentage to total cropped area. * denotes Million Nuts.

Major crop cultivated in the study area is paddy. In Chambakkulam block, area under paddy accounted for nearly 86 per cent of total cropped area and the proportion is little higher in case of Veliyanad as 93 per cent in the year 2010-11 (table 4.2). These proportions are much higher than that of Alappuzha district where only 36 per cent of total cropped area brought under paddy. The higher area under paddy in the two blocks also resulted in higher production. Paddy production in 2010-11 was 37381 tons in Chambakkulam block and 27578.8 tons in Veliyanad block. The area and production of other food and commercial crops were very low. However, Coconut, a major commercial crop in Kerala occupied some areas of the two blocks.

4.2.3 Demographic Features

Among the four panchayaths Edathua is the most populated one (table 4.3). Both the number of households (4836) and population size (19094) are higher in Edathua. The main reason is that Edathua is little more urbanised in nature with better infrastructure and other public services. Due to its lower area, Muttar has less number of households (2270) and population (9228). In all the Panchayaths female population is higher than male population and therefore sex ratio is in favour of females as it is commonly found in case of Kerala. Sex ratio of Kavalam panchayath is 1041.97 and that is a little less that of other panchayaths. However sex ratios of all four panchayaths are less than that of Kerala (1100). Unlike the adult sex ratio, sex ratio of children is not in favour of females. Female child population is less that the male child population, and in Muttar it is much lower about 843 females against 1000 males against the district figure 956. The lower child sex ratio is serious matter of policy concern. The child population falling into the age group of 0-6 years is about 10 per cent of total population. It is interesting to note that average family size is only about 4, almost similar to that of Alappuzha district. Share of Scheduled caste population in selected panchayaths is above district average (6.62) and for Muttar it is 10 per cent of total population. Share of scheduled tribe population is very low. Literacy rate is more than 97 per cent and more importantly there is no much gender difference in literacy rate.

Table 4.3 Demographic Features of Sample Panchayaths

	Chambakkulam	Edathua	Kavalam	Muttar
Number of Households	3932	4836	3371	2270
Population: Persons	15848	19094	14010	9228
Male	7636	9139	6861	4453
Female	8212	9955	7149	4775
Sex Ratio (per 1000 males)	1075.43	1089.28	1041.97	1072.31
Average Household Size	4.0	3.9	4.2	4.1
Child Population				
0-6 Years: Persons.	1546	1807	1390	925
As a % of total population	(9.8)	(9.5)	(9.9)	(10.0)
Male	784	916	717	502
Female	762	891	673	423
Child Sex Ratio (per 1000 males)	971.93	972.70	938.63	842.62
SC Population	1239	1872	1094	924
As a % of total population	(7.8)	(9.8)	(7.8)	(10.0)
ST Population	27	30	16	2
As a % of total population	(0.2)	(0.2)	(0.1)	(0.1)
Literate Persons	14056.0	16817	12287	8032.0
Literacy rate	(98.3)	(97.3)	(97.4)	(96.7)
Literate Male	6771.0	8057	6029	3845.0
Literacy rate	(98.8)	(98.0)	(98.1)	(97.3)
Literate Female	7285	8760	6258	4187
Literacy rate	(97.8)	(96.6)	(96.6)	(96.2)

Source: District Census Hand Book (DCHB) of Alappuzha District 2011, Directorate of Census Operations: Kerala, Thiruvananthapuram.

4.2.4 Occupational Structure

Several earlier studies have argued that Kuttanad has been experiencing severe employment crisis.[2] This is attributed primarily to the single cropped cultivation due to flood during monsoon, displacement of labour due to the mechanization of farm activities, and sluggish development of non-farm sectors in the area. The data of total workforce given in table 4.4 brings forth clear evidences for the employment crisis in the study area. The workforce participation rate is low in all the panchayaths, which in turn reflect the high rate of unemployment in the region. In Edathua only nearly 33 per cent of total population is engaged in some economic activities, and the rest of the population is not working. In Kavalam 42 per cent people are working and in Muttar and Chambakkulam workforce constitute about only 36 per cent of total population. There exists astonishing gender difference in workforce participation in all panchayaths. The workforce participation of males on an average is about 56 per cent in Kavalam and for other three panchayaths it is found as nearly 50 per cent. The workforce force participation of females is found significantly lower than that of males. Female workforce participation rate of Edathua is only 18.2 and for Chambakkulam and Muttar it is about 22 per cent. Kavalam has slightly higher Female workforce participation rate about 28 per cent. The lower female workforce participation rate is a common phenomenon in Kerala and the reasons for this are yet to be explored.

[2] Panikar (1978) and Tharamangalam (1981) are some examples.

Table 4.4 Total Workforce in Sample Panchayaths

		Chambakkulam	Edathua	Kavalam	Muttar
Total Workers		5820.0	6291	5867	3310
		(36.7)	(32.9)	(41.9)	(35.9)
	Male	3987.0	4480	3841	2267
		(52.2)	(49.0)	(56.0)	(50.9)
	Female	1833.0	1811	2026	1043
		(22.3)	(18.2)	(28.3)	(21.8)
Non-Workers: All		10028	12803	8143	5918
		(63.3)	(67.1)	(58.1)	(64.1)
	Male	3649	4659	3020	2186
		(47.8)	(51.0)	(44.0)	(49.1)
	Female	6379	8144	5123	3732
		(77.7)	(81.8)	(71.1)	(78.2)
Main Workers as % of Total Workers: All		66.5	61.7	67.8	75.0
	Male	72.9	65.3	79.8	83.8
	Female	52.4	52.8	45.0	55.7
Marginal Workers as % of Total Workers: All		33.5	38.3	32.2	25.0
	Male	27.1	34.7	20.2	16.2
	Female	47.6	47.2	55.0	44.3

Source: District Census Hand Book (DCHB) of Alappuzha District 2011, Directorate of Census Operations: Kerala, Thiruvananthapuram.

Note: Figures in the Parenthesis is percentage to respective total population.

Census classifies total workers into two broad categories on the basis of number of days employed, they are Main workers and Marginal workers. Main workers are individual who had worked a major part of the reference period, more than six months in a year. On the other hand marginal workers are the workers, who had worked only less than six months in a year. In all the sample panchayaths a major proportion of the total workers are main workers. Muttar has higher share of main workers in total workforce about 75 per cent and Edathua has lower share about 62 per cent. Rest of the workforce are marginal workers. Of the total workforce, 25 per cent in Muttar are marginal workers, and the proportion is comparatively higher about 38 per cent in Edathua. When we make a gender wise comparison, it can be inferred that male constitutes major share of main workers in total workforce especially in Muttar (84%) and Kavalam (80%). It is not surprising since male members are main earning members in a family; therefore they tend to work through the year to look after the family. In case of females there is no much difference in the shares of main workers and marginal workers in total workforce as shares of both category falls in a range of 45 to 55 per cent.

Further, there is another census classification based on the sectors employed. They are cultivator, agricultural labour, household industry workers, and other workers. The first two, cultivator and agricultural labour belong to primary sector. A cultivator is a farmer who undertakes and supervises cultivation process in his own or leased in land. Agricultural labour is wage employee who works for wages paid in money or in kind. Household industry workers belong to industrial sector and represented by people running their own small industrial units in their villages or nearby areas. Other workers are workers who do not come under above mentioned three categories, but are employees engaged mostly in service sector activities such as government services, construction, trade, commerce, banking etc…[3]The data reported in table 4.5 on the occupational structure reveals that the more than 50 per cent of workers in the sample panchayaths are engaged in other works, the only exception is Muttar where the proportion is about 45 per cent. In Edathua the proportion is high as 58 per cent. This indicates that most of the workers are

[3] This also includes persons working in factories and plantation owned by others, but these categories are not relevant in case of study area where there are no factories and plantations.

dependent on service sector for their livelihood. Cultivators are very few in the study area. However, agricultural labour constitutes a good proportion of entire workforce, 37 per cent in Chambakkulam and Kavalam and 44 per cent in Muttar work as agricultural laborers. Household industrial workers are very less.

Similar to the general trend male workers are mostly engaged in service sector activities, the proportion ranges from 59 per cent in Edathua to 48 per cent in Muttar. Among females, service sector activity (55.8 %) is higher in Edathua, while in other panchayaths more than 50 per cent of females are agricultural labourers. While examining these figures it follows that in general and also in case of men, service sector employment is predominant, where as women are mostly employed as agriculture labourers. Further, when we probe more into the distribution of workers of these two sectors into main and marginal workers, it emerges that the service sector outnumber agriculture in terms of days of employment. Because other workers working in service sector comprise more (53% to 66 %) of main workers and less of marginal workers, while agricultural labourers comprise more of marginal workers (43% to 70%) and less of main workers. The pattern is more evident in case of women, particularly in Muttar where 75 per cent of women working in agriculture are marginal workers, which indicate that they get only less number of working days.

Table 4.5 Occupational Structure of Sample Panchayaths

	Chambakkulam	Edathua	Kavalam	Muttar
Cultivators as a % of Total Workers: All	10.9	7.9	8.2	7.8
Male	14.9	10.4	11.6	10.8
Female	2.1	1.7	1.7	1.3
Agricultural Labourers as a % of Total Workers: All	37.6	30.4	37.1	44.4
Male	30.1	26.5	29.7	38.9
Female	53.8	40.2	51.2	56.3
Household Industry workers as a % of Total Workers: All	1.6	3.6	2.4	2.4
Male	1.6	4.2	2.6	2.7
Female	1.6	2.3	2.2	1.7
Other Workers as a % of Total Workers: All	50.0	58.1	52.3	45.4
Male	53.4	59.0	56.1	47.6
Female	42.6	55.8	44.9	40.7
Cultivators as % of Main Workers: All	12.3	8.1	10.2	9.0
Agricultural Labourers as % of Main Workers: All	29.4	22.6	28.8	29.4
Male	24.0	21.0	23.4	24.0
Female	45.8	27.7	46.9	45.8
Household Industry workers as % of Main Workers: All	1.8	3.7	2.7	2.7
Other Workers as % of Main Workers: All	56.6	65.6	58.4	52.6
Male	58.7	64.6	61.5	51.8
Female	50.1	68.4	48.1	55.1
Cultivators as % of Marginal Workers: All	8.0	7.4	4.0	4.1
Agricultural Labourers as % of Marginal Workers: All	53.8	42.9	54.7	70.2
Male	46.6	36.7	54.7	64.0
Female	62.6	54.2	54.8	75.1
Household Industry workers as % of Main Workers: All	1.2	3.6	1.9	1.6
Other Workers as % of Marginal Workers: All	37.0	46.1	39.3	24.1
Male	39.1	48.6	35.0	26.2
Female	34.3	41.8	42.3	22.5

Source: District Census Hand Book (DCHB) of Alappuzha District 2011, Directorate of Census Operations: Kerala, Thiruvananthapuram.

4.2.5 Social Infrastructure

Social infrastructure plays an important role in the development of a region. Kerala is well known for social infrastructure established by the government and private agencies. In Kuttanad lack of clean water for drinking is major issue due to the salt contents of the soil. Therefore government is trying to supply public water wherever possible. There is good number of public taps in the panchayaths and Chambakkulam has the highest number of public taps about 342 followed by Edathua (table 4.6). In addition to 265 public taps, Edathua has one public tube well and public bore well. Similarly altogether Edathua has more number of schools (12) and on the other hand Muttar has less number of schools (6).

Only Chambakkulam has the privilege of having a government hospital in its territory. However, there are private hospitals in the other panchayaths, 5 in Edathua and 2 each in Kavalam and Muttar. Further, all the panchayaths have one Primary Health Care Centre or Community Health Care Centre. There is a good network of PDS outlets in Chambakkulam and Edathua and, where as in Muttar and Edathua the PDS outlets are less in number. The fair price shops established by the state government, with an aim to provide basic food and non-food items at lower price, such as Maveli store, Neethi store or Haritha store, are also found in three panchayaths except in Kavalam.

Table 4.6 Social Infrastructure in Sample Panchayaths

		Chambakkulam	Edathua	Kavalam	Muttar
Water Supply: No of Public Taps		342	265	168	218
Schools	Lower Primary	4	6	4	3
	Upper Primary	1	2	1	1
	High School	2	4	2	2
Government Hospital		1	0	0	0
Private Hospital		1	5	2	2
PHC/CHC		1	1	1	1
PDS Outlets		12	13	6	5
Fair Price Shops		1	1	0	1

Source: Panchayat Level Statistics-2011, Alappuzha, Department of Economics and Statistics, Government of Kerala, Thiruvananthapuram.

4.3 Social Characteristics of Sample Households

Table 4.7 shows the distribution of sample households by their social background. Among the total sample households, 72 per cent are Hindus and 28 per cent are Christians. However, it can be observed that majority of the labour households are from Hindu religion. Almost 82 per cent of labour households are Hindus and only 18 per cent are Christians. While among the cultivator households, 56 per cent are Christians and 44 per cent are Hindus. Most of the Christian households are Roman Catholics (RC) except 6 families who are converts from lower Hindu castes.[4]

Of the total households 50 per cent are Other Back Castes (OBC), 20 per cent are Scheduled Castes (SC) and 30 per cent are Forward Castes (FC). Almost 58 per cent of agricultural labour households are from backward castes, mostly Ezhavas, and 26 per cent labour households belong to Scheduled castes.

[4] Caste wise breakup is not shown due to the multiplicity of castes, however can be understood from social category.

Table 4.7 Social Characteristics of Households

	Cultivator Households	Labour Households	All
Family Status			
AAY	0	24	24
	(0.0)	(11.9)	(8.8)
BPL	3	98	101
	(4.2)	(48.5)	(37.0)
APL	68	80	148
	(95.8)	(39.6)	(54.2)
Religion			
Hindu	31	165	196
	(43.7)	(81.7)	(71.8)
Christian	40	37	77
	(56.3)	(18.3)	(28.2)
Social Category			
SC	2	52	54
	(2.8)	(25.7)	(19.8)
OBC/ OEC	19	118	137
	(26.8)	(58.4)	(50.2)
FC	50	32	82
	(70.4)	(15.8)	(30.0)
Total	71	202	273
	(100)	(100)	(100)

Source: Sample Survey.
Note: Figures in parentheses show percentages to column total for each classification.

Cultivator households mostly consist of Forward castes from Hindu and Christian religion (70%) and some of them are backward castes (27%). Regarding the family status, 54 per cent of sample households are APL families, 37 per cent are BPL families and 9 per cent are AAY families. BPL and AAY families are more among labour households.

4.4 Structure of Land Holding among Sample Households

4.4.1 Homestead

There exist two types of land holding, homestead and agricultural land. In Kuttanad homestead or residential area are situated in the dry lands which are above sea level. It is noteworthy that all sample households have their own homestead or house site even though the size is small. The credit for the cent percentage dwelling goes to the state government for implementing much acclaimed redistributive policies, especially the land reform measures of 1970s.[5] Land reform measures were enacted in 1969 and came into effect on 1st January 1970. The land reforms mainly had three sections; first to confer ownership rights to tenants, second to provide ownership rights to landless labourer on their homestead, and third to seize and redistribute surplus lands after fixing ceiling on land holding. The first two measures were successfully implemented. The landless labourers were provided small pieces of homestead, 10 cents in rural areas, 5 cents in municipalities and 3 cents in corporations. The tenants, who were conferred ownership rights on large paddy fields, have now become cultivators.

Table 4.8 Distribution of Households by Size of Homestead

Size of Holding (Acres)	Cultivator Households		Labour Households		All Households	
	No	%	No	%	No	%
0 - 0.05	3	4.2	111	55.0	114	41.8
0.06 - 0.10	21	29.6	64	31.7	85	31.1
0.11 - 0.20	14	19.7	21	10.4	35	12.8
0.21 - 0.50	15	21.1	3	1.5	18	6.6
0.51 – 1.00	12	16.9	3	1.5	15	5.5
Above 1.00	6	8.5	0	0.0	6	2.2
Total	71	100.00	202	100.00	273	100.00

Source: Sample Survey.

The results of the survey reflect the impact of land reforms on the size of homestead. There are homesteads on a range of minimum of 2 cents (0. 02

[5] Herring (1980) and Raj and Tharakan (1983) noted that land reforms implemented in Kerala had received wide attention and been acclaimed as a model due to its effective implementation and substantial redistribution of privileges than elsewhere in India irrespective of similar administrative and political framework of implementation.

acres) owned by poor labour households to maximum of 1.9 acres possessed by cultivator households. Homestead of most of the sample households, particularly of labour households are tiny plots. The homesteads of nearly 114 (42%) households are tiny plots with a size less than or equal to 5.0 cents (Table 4.8).[6] Almost 55 per cent of labour households live in plots with a size less than or equal to 5.0 cents and 32 per cent live in 6 cents to 10 cents. Taking them together it can be seen that 87 per cent of labour households live in homesteads with size less than or equal to 10.0 cents (table 4.8). Further, the average size of homestead of labour households is only 8 cents. On the other hand average size of homestead of cultivator households is 38 cents which is considerably higher that of labour households.[7] It can further be observed that nearly 56 per cent homesteads of cultivators fall into the size between 10 cents and 1 acre, and 6 cultivators possess more than one acre of homestead.

The skewness in the distribution is more evident while analysing the descriptive statistics shown in table 4.9 and the distribution of values shown in figure 4.1. Over all mean size of homestead is 0.16 acres which is higher than the values of median and mode. This implies that the distribution of size of homestead is positively skewed. Positive skewness is ascertained by the coefficient of skewness 3.80. Skewness value above 3 is a clear reflection of considerable positive skewness in the distribution. The positive skewness in the distribution means that the distribution is affected by the large values. It is widely recognised that for a skewed distribution of a variable with ratio scale median would be more representative. Median value of homestead is 0.08 which is less than mean value.

6 Interestingly mode of the distribution is 4 cents with a frequency of 50.

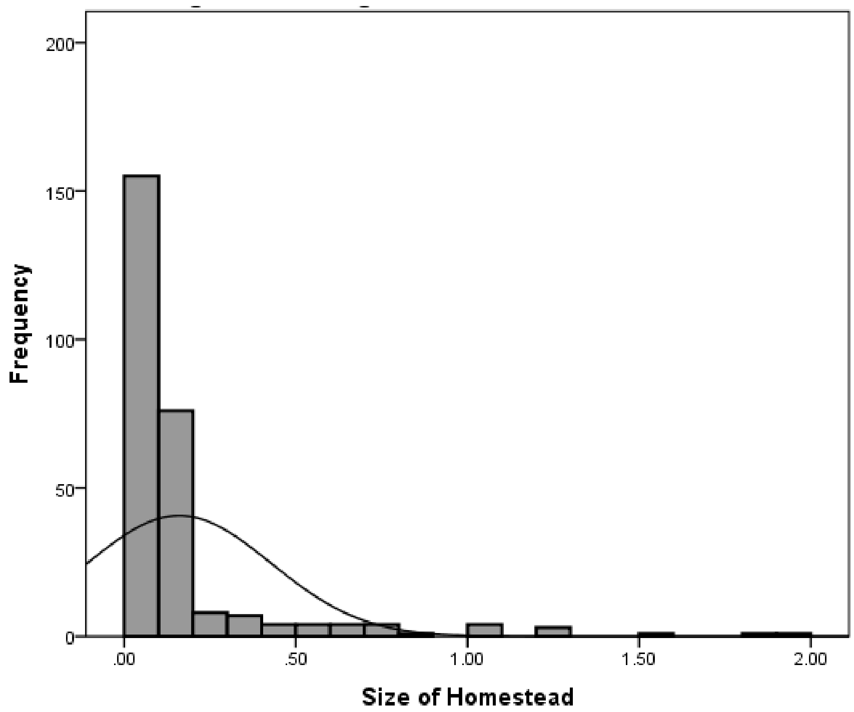
7 The difference in mean value is tested with the help of independent sample‘t’ test and the results are reported in Appendix of this chapter.

Table 4.9 Descriptive Statistics for Size of Homestead

Measure	Statistics
Mean	0.16
Median	0.08
Mode	0.04
Standard Deviation	0.27
Kurtosis	16.40
Skewness	3.80
Range	1.88
Minimum	0.02
Maximum	1.90

Source: Estimated from Primary Data

Figure 4.1: Histogram of size of Homestead



The wide disparity in the size of homestead is due to the fact that labourers were provided all these tiny plots of homesteads by the land reforms measures undertaken by the state government since 1970. Most of these labourers were landless before the implementation of land reforms. They were working as wage labour under landlord or tenant and living in small plots of hutments attached to paddy fields. The land reform measures confirmed them the ownership right of these hutments. Although the slogan of land reforms was 'land rights to the actual tillers of the soil', not the hutment right, it is now widely recognised that the reforms failed to redistribute paddy fields to the agricultural labourers. In fact the reform confirmed the ownership rights of paddy fields to the tenants from upper caste Hindu Families and Christian families. Therefore the inequality in land distribution will be more evident when we analyse the holding pattern of farm land.

4.4.2 Inequality in the Ownership of Agricultural Land.

The data provided in table 4.10 unfolds wide disparities in agricultural land holding by working class and social category. Among the total sample households 63 per cent possess either own land or leased in agricultural land. It is found that only about 52 per cent possess their own agricultural land and remaining 48 per cent households are deprived of agricultural land. It is evident from the land holding pattern by working class and family status that most of the landless households are labour households belonging to BPL or AAY families. A larger proportion of 93 per cent of cultivator households hold agricultural land, while in case of labour households only about 37 per cent have their own agricultural land and rest 63 per cent are landless.[8] Further, mean size of owned agricultural land for cultivator household is 4.18 acres and

[8] This comparison considers only lands originally owned by the households excluding the leased in land. Because lands are leased in only for one or two seasons and the lands have to be returned to the original owner after the lease term, and lessees do not have any control over the leased in lands.

it is significantly higher than the mean size of labour households, which is only 0.44 acres (Table 4.11).[9]

Table 4.10 Ownership Pattern of Agricultural Lands by Working Class, Religion, Family Status and Social Category

Background Characteristics	Number of Households	Possess Own/Leased in land		Possess Own Land		Possess Leased in Land	
		No.	%	No.	%	No.	%
All	273	172	63.0	141	51.6	53	19.4
Working Class							
Cultivator	71	71	100.0	66	93.0	20	28.2
Labour	202	101	50.0	75	37.1	33	16.3
Religion							
Hindu	196	110	56.1	82	41.8	40	20.4
Christian	77	62	80.5	59	76.6	13	16.9
Family Status							
AAY	24	7	29.2	4	16.7	3	12.5
BPL	101	42	41.6	24	23.8	22	21.8
APL	148	123	83.1	113	76.4	28	18.9
Social Category							
SC	54	15	27.8	10	18.5	5	9.3
OBC/OEC	137	84	61.3	61	44.5	31	22.6
FC	82	73	89.0	70	85.4	17	20.7

Source: Sample Survey.

A comparison based on religion reveals that about 77 per cent of Christian families have their own farm land, where as this proportion comes about only 42 per cent in case of Hindu households. It is seen that most of the landless labour households are SC and OBC families from Hindu religion. Moreover, the mean size of owned land of Christian households is higher than that of Hindu households. The main reason for this disparity is the fact that

9 To compare the mean values between classes and categories Independent Samples 't' test (if there are two groups) and One Way ANOVA tests (if there are three groups) are carried out. Levene's Test for Equality of Variances is conducted and P-Values reported here are selected on the basis of results of the test with respect to equality of variance. Tables with complete results are reported in Appendix to this chapter.

during pre independence period Roman Catholic Christians were tenants or cultivators of lands possessed by Brahmins and Nair Landlords. They were also engaged in trade, banking and commerce. Profits from all these activities were reinvested in lands, and they emerged as a leading land owning castes after Brahmins even before independence. They were conferred ownership rights on their holding by land reform measures implemented since 1970.

Table 4.11 Comparison of Mean Value of Owned Agricultural Land of various Categories of Households (in Acres)

Background Characteristics	Mean Land Holding	SD	Mean Differences		P- Value
All	2.73	3.67			
Working Class					
Cultivator	4.18	4.63	Cultivator – Labour	3.74*	0.00
Labour	0.44	0.86			
Religion					
Hindu	1.03	2.81			
Christian	2.39	3.12	Hindu– Christian	-0.66*	0.001
Family Status					
AAY	0.08	0.22	AAY – BPL	-0.13	0.977
BPL	0.21	0.50	APL – BPL	2.24*	0.000
APL	2.45	3.70	APL – AAY	2.37*	0.000
Social Category					
SC	0.16	0.40	SC – OBC/OEC	-0.53	0.417
OBC/OEC	0.69	1.27	FC– OBC/OEC	2.75*	0.000
FC	3.44	4.53	FC– SC	3.28*	0.000

Source: Calculations based on Primary Data
Note: * indicates the mean difference is significant at 1 per cent level.

There also exist wide differences in the land ownership pattern by family status, nearly 76 per cent of APL families own farm land, while only 17 percent of AAY and 24 per cent of BPL families own farm land. Similarly the mean farm land holding of APL families is estimated as 2.45 acres and it is significantly higher than the 0.21 acres mean holding of BPL families. Mean farm land holding of AAY families is as meager 0.08 acres. The differences are also evident in case of social categories. As many as 85 per cent of families from Forward Castes (FC) own farm land, on the other hand only 18.5 per cent among SC and 44.5 per cent among OBC possess farm land. The mean holding of FC amount to 3.44 acres against 1.56 acres of OBC and 0.84 acres of SC households.

All these evidences suggest high extent of inequality in the distribution of agricultural land in the study area. The minimum size of land is 0.13 acres owned by a labourer and maximum size is 25 acres owned by a cultivator. The overall mean value is 2.73 acres. There is positive skewness in the land distribution as suggested by the value of skeweness 3.34. The distribution is affected the large values on the extreme right side of the distribution. The median value is therefore only 1.50 acres, which is even less than the mean value.

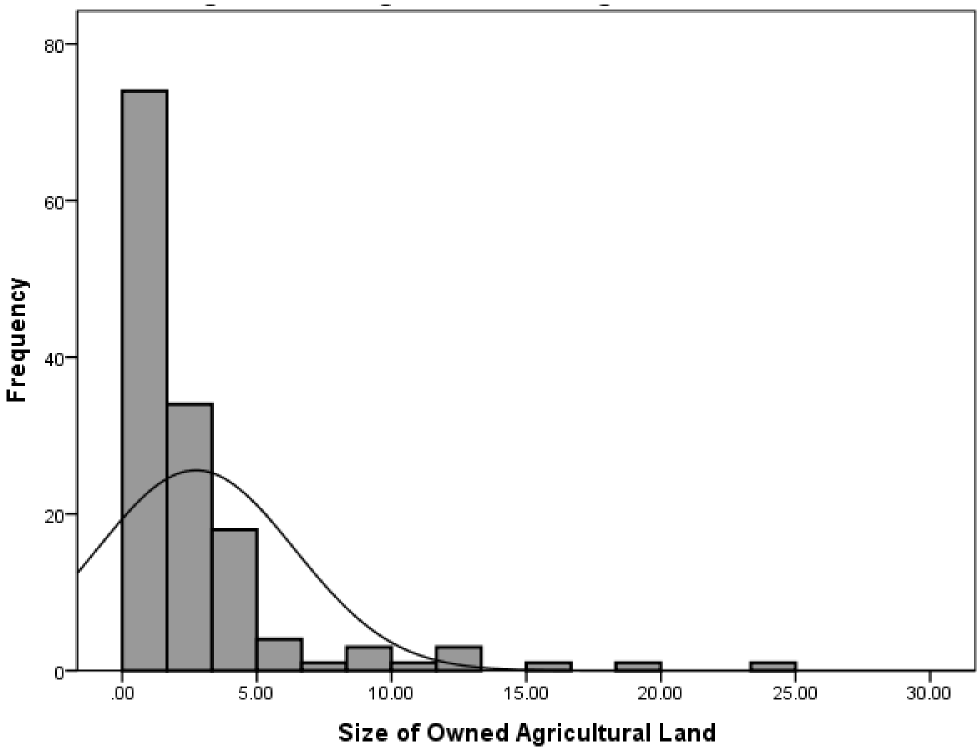
Table 4.12 Descriptive Statistics of Agricultural Land Holding (in Acres)

Measure	Statistics
Mean	2.73
Median	1.50
Mode	1.00
Standard Deviation	3.67
Kurtosis	13.82
Skewness	3.34
Range	24.87
Minimum	0.13
Maximum	25.00

Source: Estimated from Primary Data

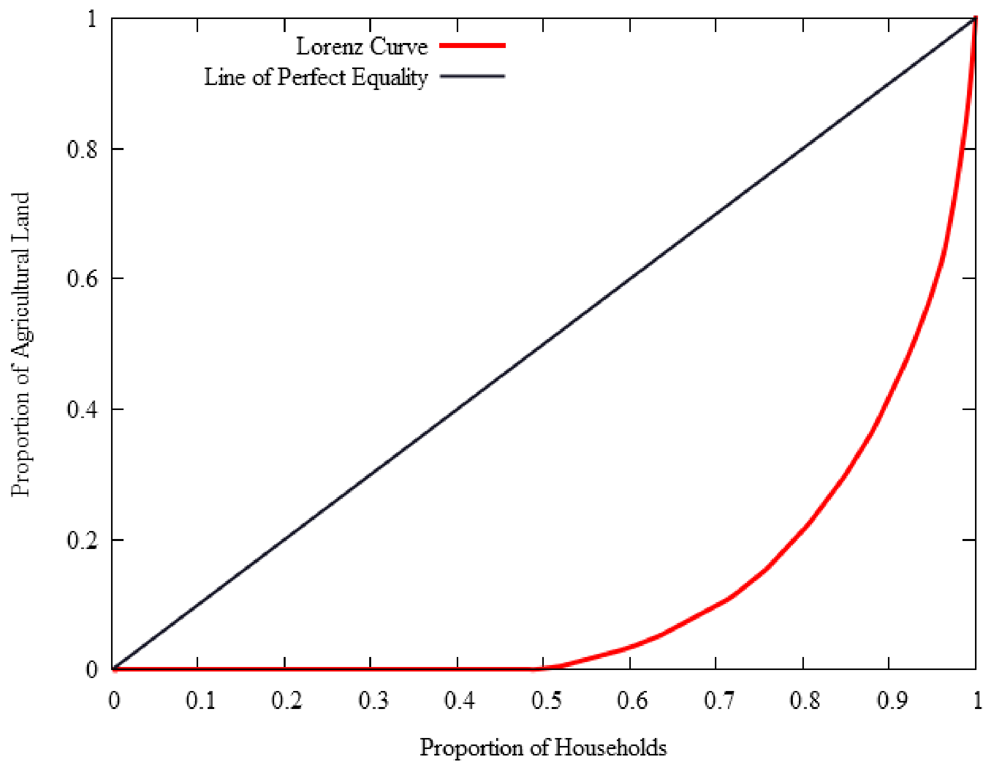
+

Figure 4.2 Histogram of Owned Agriculture Land



In order to further explore the extent of wealth inequality in terms agricultural land, Gini Coefficient is estimated by fitting Lorenz Curve. Gini Coefficient is the ratio of area between Lorenz curve of the distribution and the uniform distribution line to total area under uniform distribution line. The value of Gini coefficient ranges between 0 and 1, while 0 indicates perfect equality, 1 indicates perfect inequality. Any value more than 0.4 is internationally considered as an indicator of excessive inequality (Prasad, 2013). The estimated value of Gini coefficient is 0.77. The value implies excessive inequality in agricultural land ownership among sample households. Interestingly the value is in accordance with a recent estimate of 0.76 by Oommen (2014) for the state as a whole calculated using 66th round NSSO data for the year 2009-10.[10] The Lorenz curve also indicates highly unequal distribution of agricultural land among sample households. It may be noted that both the value of Gini coefficient and Lorenz curve are very close to the case of perfect inequality.

Figure 4.3 Lorenz Curve of Agricultural Land Holding



The higher extent of inequality in the land distribution reflects failure of land reforms to ensure an egalitarian agrarian society. Off course, land reforms succeeded in ending caste based landlordism and repressive tenancy system. Further, the exploitations by landlords in the form of charging higher rents from tenants and paying lower wages to agricultural labourers were

[10] Oommen (2014) has estimated Gini Coefficients for various types of land such as land owned, land possessed, and land cultivated for various social groups. All the values are excess of 0.40 and range between 0.66 and 0.96.

brought to an end. However, the reforms failed to redistribute agricultural lands to the landless labourers. The main reason for this was the faulty conceptualisation of tenancy by treating all tenant-landlord relations as feudal rather than recognizing tenancy as a privileged property form on most of the leased area in the state (Herring, 1980).

The tenancy system prevailed before land reform was based on social hierarchy. Under the system, Brahmins were the land lords, Nairs and Nambiars were tenants, and these tenants transferred lands to Christians in south and Muslims and Thiyyas in north on an inferior tenure called ‘varumpattam’. Cultivation was carried out by employing landless agricultural labourers from Pulaya and Harijan Families. The rich tenants also leased in lands for cultivation and were in possession of large operational holdings. The provision of land reform to confer ownership rights to tenants really benefited the rich tenants, not the landless labourers. The landless labourers were conferred ownership right only on their homestead. The ceiling on land holding and redistribution of surplus lands to landless laborers also could not be effectively implemented due to the delays and loopholes in legislations and large scale illegal land transfers. Therefore land reforms neither provided lands to the actual tillers of the soil nor transferred agrarian power to them. What really happened was merely a transfer of lands from traditional landlords to a new land owning classes, who were neither full time cultivators nor agricultural labourers. Therefore presently agricultural labourers have to lease in land for cultivation.

The results of the survey show that the incidence of leasing in land for cultivation is very low in the study area. Data given table 4.10 reveals that merely 19 per cent of households lease in lands for cultivation. During the survey, labourers attributed the lower incidence of leasing to the high rent charged by the lessors, which significantly increases the cost of production. The average rent for cultivating in one acre land for one season was found as 12,000. However it can go up to even 20,000 in response to increase in demand during favourable climate and production conditions. They also complained that fertilizer and credit subsides are not provided for leased in land. Further, the risk factors such as flood, pests and diseases are more likely to occur in Kuttanad due to the peculiar geographical and climatic conditions. Finally, the deterioration of fertility and productivity of soil, as a result of heavy application of chemical fertilizers and pesticides, brought down the level of output and profitability. The adverse production conditions coupled with low return have reduced the practice of leasing in land for cultivation. Another reason stated by one labourer was that farmers are reluctant to lease out their lands because the mechanization of agricultural operation has helped them to carry out cultivation process by themselves without depending much on the labour.

4.4.3 Pattern of Agricultural Land Holdings among Sample Households

Table 4.13 shows distribution of households by various classes of total land holding. Here we consider operational holding which consists of both owned land and leased in land. The idea is to understand the size of various farm land brought under cultivation. The study area has higher proportion Marginal farmers who hold less than 2.5 acres of land. About 114 (66 per cent) households are marginal farmers. However, they possess only about 23 per cent of total operated area. On the other hand, medium and large farmers together are only 8.2 per cent of all households, but possess almost 41 per cent of total operated area. This clearly indicates the extreme inequality in the pattern of agricultural land holding that we have already estimated. The size of operational holding range from a minimum of 0.13 acres to 30.5 acres, and the mean size of holding is 3.54 acres, where as median only 1.90 acres.

Table 4.13 Distribution of Households by various Classes of Agricultural Land holding

Class and Size of Holding (Acres)	Households		Total Operated Area	
	Number	Percentage	Area in Acres	Percentage
Marginal (< = 2.5)	114	66.3	138.82	22.8
Small (2.6-5.0)	30	17.4	117. 0	19.2
Semi-Medium(5.1-10)	14	8.1	106.6	17.4
Medium(10.1-25)	12	7.0	186.80	30.7
Large(25 & above)	2	1.2	60. 0	9.9
Total	172	100.00	608.68	100

Source: Sample Survey.

4.5 Cultivation Pattern among Sample Households

While analysing the cultivation pattern two aspects discussed in the previous chapter are worth mentioning. First one is that Kuttanad is a wetland region lying below mean sea level and remain submerged under water for most part of a year. This geographical feature makes the region suitable only for paddy cultivation. During the survey it is found that almost all households cultivate only paddy in the farm lands. Only two farmers responded that along with paddy they cultivate tapioca and Aloe Plant, but in a very small area. For the sake of convenience we have excluded these crops from tabulation. Secondly there are two seasons for paddy cultivation in Kuttanad, Punja and Virippu. Punja season starts in November and ends in March. Punja receives only less rainfall during northeast monsoon (October to November) and there is no threat of erratic rainfall. Therefore all Paddy fields are cultivated during Punja season. On the other hand, Virippu that runs from May to September is a rainy season since it coincides with southwest monsoon. During this time there is higher extent of flood. Consequently all the paddy fields would be waterlogged and the bunds would be destructed. Further, saline water intrusion through the lake during this time may result in crop failures. Therefore only fewer areas are normally cultivated during Virippu.

Table 4.14 Paddy Cultivation Pattern among Sample Households, 2013-14

	2013-14	Punja	Virippu
No of cultivating households	170	170	35
% of cultivating households to total land holding households	98.83	98.83	20.34
Total Net cropped area in acres	607.88	607.88	91.5
Net Cropped area as % of total cultivable area	99.9	99.9	15.0
Mean cropped area per cultivating household. (Acres)	4.07	3.58	2.61

Source: Sample Survey.

Table 4.14 shows the cultivation pattern of paddy among sample households during 2013-14. Out of 172 land holding households 170 households cultivated during the agricultural year 2013-14 and only 2 farmers left their lands fallow. However most of the farmers reported only single cropping (79.66%). Only 35 farmers (20.34%) cultivated during both Punja and Virippu, rest 135 (79.46%) did not cultivate during Virippu. Cropped area during the Virippu season was only 15.0 per cent of the total cultivable area. But during Punja season almost 98.83 per cent of land holding households cultivated paddy, and nearly 100 per cent of cultivable area is cropped. The mean cropped area in the agricultural year of 2013-14 was 4.07 acres. The mean cropped area in Punja was higher than that of Virippu. The main reason highlighted by the farmers for not cultivating in Virippu is flood. Many farmers used to cultivate during Virippu in the past, but most them have suffered huge loss, and are now afraid to cultivate during Virippu.

> *Mohannan 55 years old labourer used to cultivate Paddy by leasing in land during Virippu before seven years. He also took loan from the bank. Due to flood he suffered loss in farming and was not able repay the loan. For the last seven years he has been suffering from mental trauma, and undergoing treatment.*

Among the four selected panchayats, land elevation is lower in Chambakulam, Kavalam, and Muttar but higher in Edathua. Therefore Edathua is less subject to flood and therefore paddy cultivation is possible during Virippu here. Out of 35 farmers who cultivate during Virippu, 20 are from Edathua panchayat. These farmers carry out farming activities in their lands independently. But in lower Kuttanad and Kayal lands farming activities are carried out in the form of cooperative farming by the some farmers together.[11] This creates a problem that if two or three farmers in a group are not willing to cultivate during Virippu, then others cannot cultivate because of higher level per capita cost. One small farmer from Chambakulam Panchayat said that small farmers are willing to cultivate in Virippu, but large farmers are not willing to cultivate. Since dewatering, bund construction and the other activities are undertaken collectively, small farmers not in a position to cultivate independently. The farmers wanted the recommendations forwarded by the report of M.S Swaminathan Research Foundation (MSSRF) to be implemented immediately not only to make the second cropping possible but also to retain the sustainability of paddy cultivation in the region. The report has suggested several measures such as construction of permanent bund, effective flood and sanitary management, infrastructural support for paddy cultivation, complete elimination of weeds etc.. Most of the farmers said that

[11] Kavalam comes under Kayal land and Chambakkulam falls into lower Kuttanad agro-ecological zones.

construction of permanent bund can make a tremendous impact on the paddy cultivation as it reduces the annual operational cost and provides security to crops. Farmers desperately said that government has not yet initiated the construction, and the fund allocated has been diverted for some other infrastructural development in the area.

The single cropping of paddy during Punja by majority of the farmers and the absence of paddy cultivation during Virippu, as we shall see in the next chapter in detail, significantly reduces the number of working days of agricultural laborers. This in turn has increased the intensity of underemployment of agricultural labourers in Kuttanad. The flood resulting from south west monsoon during Virippu also affects the entire economic activities in the region. During the survey labourers said that other economic activities, especially the construction activities, are also nearly absent during Virippu, therefore in a year they get only 6 months work during Punja.

4.6 Cost of Paddy Cultivation among Sample Households

We have already discussed the cultivation process in the previous chapter. Unlike the other regions of the state, cultivation process in Kuttanad involves several activities due the topographical peculiarities of the region. The acidity and salt content of the soil in the region requires two rounds of ploughing, several watering and dewatering processes. Further, bunds have to be constructed or repaired during every season. Weeds and regular incidence of pests and diseases warrants higher application of pesticides. Further, to increase the level of output there is high degree of fertilizer application, even above the prescribed NPK norms. Numerous cultivation processes and high level application of pesticides and fertilisers significantly increase the cost of paddy cultivation in Kuttanad.

4.6.1 Cost Structure of Paddy Cultivation in the Panchayats

Understanding the structure of cost of cultivation is really important in two respects. Firstly, it will help us to identify the costlier inputs by analysing share of various categories of inputs to total per acre cost. Secondly, it will give some idea on how various types of costs differ among selected panchayaths belonging to various agro ecological zones. Table 4.15 shows the structure of cost of paddy cultivation in four selected Panchayaths. The cost figures of each process and input are collected from the farmers surveyed in each Panchayath.[12] However Since most of the farmers cultivated only during Punja, cost particulars during Punja are used for preparing the cost structure. In each panchayath some common rates have been paid for each process performed by machines or labour. Further there have been common quantity of pesticides and fertilizers applied per acre, even though there are slight variations depending on the requirements. Therefore per acre rates for various processes and costs for various inputs reported by the farmers are found mostly common with in each panchayath. Therefore these figures are standardised by excluding outlier values and used to project the per acre cost of paddy cultivation to have an idea about the structure of cost of cultivation in the panchayaths.[13] However, it is to be noted that the actual average cost incurred for area cultivated by each farmer is little different from the standardised average cost.

[12] Here we do not consider the cost for leasing in the land, however for the farmers who have leased in the land total cost would be equal to total input and process cost plus rent for leasing in land.

[13] Here the outliers mean two categories of farmers. The first category of farmers, due to losses experienced in the past, spend less on cultivation by reducing amount of pesticides and excluding some operations. The second category spends too much by applying high amount of pesticides and fertilizers.

Table 4.15 Structure of Per Acre Cost of Paddy Cultivation during Punja in 2013-14 (in Rupees)

Items	Chambakkulam	Kavalam	Muttar	Edathua
Ploughing	2250	2250	2250	2250
Bund Construction and Dewatering	1800	2100	1800	1800
Weeding and Puddling	3000	3000	3000	1200
Cost of Pesticides	4900	5860	4900	4000
Wage for Applying Pesticides	1600	2400	1600	1200
Cost of Seeds	1500	1500	1500	1500
Wage for Sowing	500	700	600	600
Cost for Fertilisers	3595	3030	3255	3255
Wage for Applying Fertiliser	1200	1500	1500	1500
Cost of harvesting	3600	4500	4500	4000
Total Per Acre Cost	**23600**	**26840**	**24905**	**21305**

Source: Sample Survey.

Among four selected panchayaths per acre cost of cultivation is high in Kavalam as Rs. 26840 and low in Edathua as Rs. 21305. Kavalam comes under Kayal land agro ecological zone, where fields are much below mean sea level and situated close to the lake. Further incidence of pests and diseases are high in Kavalam. Therefore here additional expenditures are required for bund construction and application of pesticides. Moreover, wage rates are high in Kavalam. Edathua is situated in Upper Kuttanad where land elevation is high and incidence of pests and diseases are low, therefore comparatively less expenditure is required for application of pesticides and weeding. It is to be noted here that costs of cultivation in Kavalam, Muttar and Chambakkulam are much higher than the cost of cultivation in Punja season reported for the state as a whole by the directorate of agriculture as Rs. 23,000 for the year 2013-14.

With regard to the breakup of total cost of cultivation for one acre, the expenditure incurred on ploughing is similar in four panchayaths. For ploughing total cost is Rs. 2250, which includes cost for both dry ploughing and wet ploughing. Rent of tractor for one hour is Rs. 750, dry ploughing normally goes for one hour, while wet ploughing goes for two hours. The bund construction and dewatering are undertaken under the supervision of Padashekharam by the contractors. Though the full subsidy is provided by the government for dewatering, farmers have to pay an additional 'nerma' (charge). For both bund construction and dewatering a 'nerma' equivalent 1 quintal paddy, which is almost Rs. 1800 is paid. In Kavalam for bund construction extra expenditure is required.

Weeding requires 10 women days work, for a day 300 is the wage for women, therefore the total cost for weeding is Rs. 3000. However, in Edathua only 4 days work was required therefore the wage cost of weeding is only Rs. 1200. The cost incurred for the application of chemical pesticides includes the cost of purchasing the pesticides and wages for spraying the pesticides. Normally chemical pesticides are applied four times, one before sowing seeds and three after sowing. Before sowing the seeds *Kalanashini* (Weedicide) is applied to remove the weeds. In an acre 300 Mille Litters of Pesticides such as *Round up* or *Nomini Gold* are required and cost of purchasing is about Rs. 900. Combined with water they amount to 8 cylinders. The task of spraying the pesticides is carried out by men. Wage for spraying the pesticide in an acre is Rs. 400 and only in Kavalam it is Rs. 600. The first round application of pesticides after sowing is done after 14 days to remove the weeds. Here *Nomini Gold* is used, cost and wage are same. After 30 to 40 days of sowing, insects and pests may appear, to prevent this various pesticides such as *Regend, Ecalex or Contaf* are used. This round also involves same cost and wage. However the last round application is little more intensive, because it is done after 60 to 70 days of sowing when crop is about to mature. This aims at protecting the crop and also to give good colour to the crop. The varieties used for this are Fame and Florecuran, cost for this is about Rs. 2500 in Kavalam and Rs. 2200 in other three panchayaths. The total cost for purchasing the pesticides for the all four rounds was found as Rs. 5860 in Kavalam, Rs. 4900 in Chambakkulam and Muttar. The total wage cost for applying the pesticides for the all four rounds is estimated as Rs. 2400 in Kavalam, Rs. 1600 in Chambakkulam and Muttar. In Edathua, after sowing, only first and third rounds fertilisers are usually applied. Second round is not applied unless there is higher threat of insects and pests. Therefore expenditure on pesticides is less as Rs. 4000 and wage cost is Rs. 1200.

Of the two HYV seeds, 90 per cent of the farmers in the study area use Uma and only 10 percent use Jyothi. The quality of Uma rice is not good, and it can’t be used for meals. However farmers prefer to cultivate Uma because it has got strong protective capacity to withstand flood. For one acre, 60 Kg Uma is required and the price for 1 Kg was Rs. 25. Cost of seed is same in all panchayaths as Rs.1500. Wage for sowing is Rs. 500 in Chambakkulam, Rs. 600 in Muttar and Edathua and Rs. 700 in Kavalam.

As discussed in the previous chapter three rounds of application of chemical fertiliser in various degrees are followed after sowing. The first round of chemical fertiliser is applied just 20 days after sowing with 50 Kg FACTOMFOS and 20 Kg Urea and 10 Kg or 20 Kg Potassium[14]. Second round also applies same quantity of fertilisers between 35 to 40 days after sowing. However in the

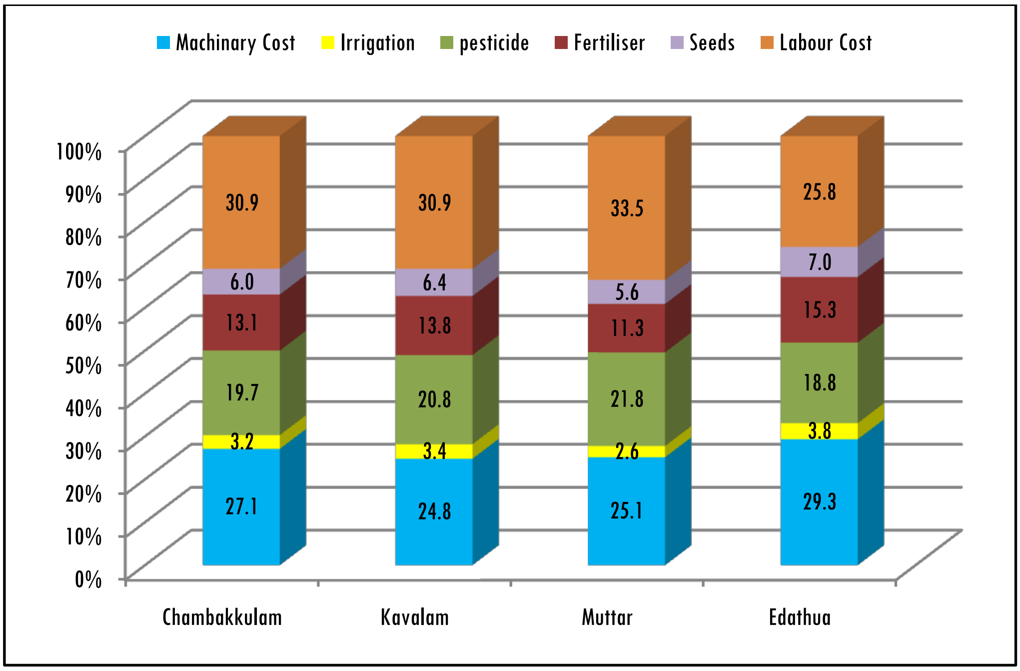
[14] FACTOMFOS is chemical fertilizer produced by The Fertilisers and Chemical Travancore Limited (FACT), Cochin, it consists 20 % Nitrogen, 20 %phosphorus and 13 % sulphur.

third round except in Muttar only 20 Kg Urea and 20 Kg Potassium are applied. In Muttar 20 Kg FACTOMFOS is also applied in the third round. The total expenditure incurred for purchasing fertilizers range between Rs. 3030 to Rs. 3595. Applying first round of fertilizers take 5 hours and wage for the same is Rs. 500 in Chambakkulam and 600 in other three panchayaths. Second round also involves same time and wage cost, however the last round need only 2 hours and half wage cost. Total wage for applying fertilizers was estimated as Rs. 1200 in Chambakkulam and Rs. 1500 in other three panchayaths.

The cost for harvesting is about Rs. 3600 in Chambakkulam. For one hour the charge for harvesting machine is Rs. 1800. In Chambakkulam it takes two hour to complete the harvesting. In both Muttar and Kavalam it takes 2.5 hours and the cost is Rs. 4500. In Edathua per hour charge for harvesting machine is 2000, it takes two hours for harvesting, and therefore total cost of harvesting is 4000.

It is evident figure 4.4 that most costly input is human labour except in the case of Edathua where Machinery is the most costly material followed by labour. In case of Chambakkulam and Kavalam labour cost constitute about 31 per cent of total per acre cost and in Muttar it is even higher as 33.5 per cent. Labour cost includes wages paid for bund construction, weeding, and applying pesticides and fertilizers. For these three panchayaths next costly input is machinery used for ploughing and harvesting. Machinery cost account for 27 per cent of total cost in Chambakkulam and 25 per cent in Muttar and Kavalam. Next two costlier items are cost on pesticides and fertilsers.

Figure 4.4 Share of various Categories of Cost in Per Acre cost



4.6.2 Cost of Paddy Cultivation among Sample Households.

The descriptive statistics on the per acre cost of paddy cultivation during Punja are given in table 4.16. The results indicate the distribution of actual cost incurred on paddy cultivation by the households in the study area. The mean per acre cost of paddy cultivation during Punja for all selected panchayaths is found as Rs. 24528. This estimate fall within range of the standardised per acre cost structure reported in table 4.15, more importantly it is more close to the standardised per acre cost of Muttar panchayath. The mean actual per acre costs for four Panchayaths are also estimated and there is no much differences between standardised per acre cost actual average per acre cost. The average per acre cost in Muttar is Rs. 24659, which less than the standardised cost by only Rs. 246. Similarly mean per acre cost in Chambakkulam is Rs. 23286 and Edathua is Rs. 21165 these figures less than the standardised figures by only Rs. 314 and Rs Rs. 140 respectively.[15] On the other hand the average per acre cost in Kavalam is Rs. 27760, which higher than the standardised cost by only Rs. 960.

Table 4.16 Descriptive Statistics for Per Acre Cost of Paddy Cultivation during Punja

Measure	Statistics for Punja
Mean	24527.64
Median	24630.95
Mode	26000
Standard Deviation	7157.569
Kurtosis	0.326741
Skewness	0.033706
Range	36666.67
Minimum	5333.333
Maximum	42000

Source: Estimated from Primary Data

We can also compare the cost of paddy cultivation in the study area with the cost figures of the state. The department of economics and statics, government of Kerala reports two type of cost figures for an agricultural year, cost of cultivation of winter paddy and cost of cultivation of summer paddy. The paddy cultivation in the winter in the state coincide with the Punja season, therefore cost outline of the winter paddy is selected for the comparison. In 2013-14 per hectare cost of cultivation of paddy during winter was reported as Rs. 55493, which when converted into the cost per acre is equal to Rs. 22,197. Therefore it can be concluded that the per acre cost in the study area is higher than that of the state average. Further, the average costs of cultivation in three Panchayaths such as Muttar, Kavalam, and Chambakulam are higher than state average, while that of Edathua is less than the state average.

[15] One reason for this would be the pesticide and fertilizer subsidy received by farmers, which reduces the actual cost incurred by them from the standardised cost estimated.

Table 4.17 Distribution of Per Acre Cost of Paddy Cultivation during Punja

Per Acre Cost	Frequency	Percentage
Up to 10,000	7	4.12
10,001-20,000	37	21.76
20,001-30,000	99	58.24
30,001- 40,000	26	15.29
Above 40,000	1	0.58
Total	170	100

Source: Sample Survey

Coefficient of skewness is close to zero, i.e. 0.03 which indicates that per acre cost of paddy cultivation is symmetrically distributed around its mean in Punja. Almost 58.24 per cent of the farmers incurred per acre cost between Rs. 20,001 to Rs. 30,000 for paddy cultivation during Punja. However the distribution is flatter as the value of kurtosis is much below 3. The minimum cost is Rs 5333. The maximum cost is Rs. 42000, which indicates that the farmer has leased in land for cultivation. The value of standard deviation indicates that approximately the cost figures vary by Rs. 7157.56 from its mean.

Table 4.18 Descriptive Statistics for Per Acre Cost of Paddy Cultivation during Virippu

Measure	Statistics
Mean	21156.65
Median	22000.00
Mode	26000.00
Standard Deviation	6251.72
Kurtosis	0.88
Skewness	-0.30
Range	32000.00
Minimum	5000.00
Maximum	37000.00

Source: Estimated from Primary Data

Since only 35 farmers cultivate during Virippu, the descriptive statistics of per acre cost may not be informative. Mean per acre cost is Rs. 21156.65, which is less than that of Punja. The reason for this is that farmers normally do not invest much during Virippu due to high risk of crop failure. The distribution is negatively skewed indicating that most of the values lie below mean value. Minimum cost is Rs. 5000.0 and maximum cost is Rs 37000.

4.7 Subsidies Received for Cultivation

The state government provides subsidies for inputs, dewatering and loans taken from banks. Input subsidies are subsidies given for pesticides and fertilisers. Entire cost of dewatering is met by the government, however initially only 40 percentage of the cost is released to the farmers. The pesticide and fertilizer subsidies are sanctioned during cultivation period. The famers submit bills to panchayaths through *Padashekharam Samithi* and the subsidy amount would be credited to the bank account. Pesticide and Fertilizer subsidies are paid together, it amount to approximately Rs. 1000 for one acre. Therefore households with higher large lands receives high amount of subsidies. Credit subsidies are provided through the banks on the interest rates. If the borrowed amount is repaid without any default, the government meets half of interest payment. If there is any default, which normally happens given the delay in the receipt of payment for the output sold to government procurement, the households have to bear the entire interest burden.[16]

[16] Farmers were complaining that there is four to six month delay in the payment of output bill by the government.

Table 4.19 Input Subsidies Received by Households by various Classes of Land holding in 2013-14.

Class and Size of Holding (Acres)	Average amount of Subsidy in Rupees	Subsidy as a percentage of total annual cost of cultivation (%)
Marginal (<=2.5)	2458	7.6
Small (2.6-5.0)	5526	4.7
Semi-Medium(5.1-10)	7814	3.6
Medium(10.1-25)	29370	7.6
Large(25 & above)	34750	2.8
Total	6448	6.6

Source: Sample Survey.

Of the total 170 cultivating households in 2013-14, only 114 (67%) households received input subsidy. There is close association between the amount of subsidy received and the size of land holding (table 4.19). Marginal farmers whose, size of holding is less than 2.5 acres on an average received a subsidy of Rs. 2458 in 2013-14. The subsidy amount is higher for higher classes. For medium class it is Rs. 29370 and for large class it is Rs. 34750. Overall average of subsidy amount is Rs. 6448, of course this value is influenced by large values. Median and mode values are Rs. 2000 indicating most of the households received total subsidy approximately equal to Rs. 2000. It can be understood from table 4.19 that input subsidy forms only very low share of total annual cost of cultivation. As a whole, only 6.6 per cent of total cost of cultivation is met from input subsidies. For various classes of land holding the input subsidy forms only less than 10 per cent of total cost, for semi-medium and large it is even less than 5 per cent.

4.8 Volume of Output and Productivity

Adverse weather conditions and declining fertility of the soil have seriously affected the production and productivity of paddy in Kuttanad. Further, other constraints such as shortage of labour, increasing cost of production and lack of timely institutional intervention make the paddy cultivation in the area a tedious task. Several farmers raised a concern that there is a lack of timely institutional support to farmers. Government has not taken any initiatives to construct a permanent bund and also for flood management. Further compensations are not properly paid if there is any crop failure. The ultimate result of all these unfavorable factors is declining number farmers as well as amount of paddy production in the area. While explaining the problems of cultivation, several farmers opined that after three or four years number of people cultivating paddy will be significantly declining, if the present situation continues like this.

Table 4.20 Output of Paddy Produced by the Households

	2013-14	Punja	Virippu
Total number of Cultivating farmers	170	170	35
Gross Cropped Area in Acres	699.38	607.88	91.50
Total Output of Paddy in Quintal	14459. 01	12885.9	1573. 08
Average Output Per Household	85. 04	75.79	44.95
Minimum Output Per Household	0.10	0.10	1.50
Maximum Output Per Household	757.50	645.00	176.18
Standard Deviation of Output	121.77	113.41	43.52
Average Per Acre Output in Quintal	19.94	20.6	16.70
Minimum Per Acre Output in Quintal	0.10	0.10	1.75
Maximum Per Acre Output in Quintal	32	32	28

Source: Sample Survey.

The gross cropped area which includes area sowed more than once in the agricultural year 2013-14 was 699.38 acres by the 170 sample households. A total of 14459 quintal output of paddy was produced by the households from both seasons, of which 12886 (89%) quintal was produced in Punja and 1573 quintal was produced in Virippu. Average output per household was 85.04

quintal for the whole year, 75.79 quintal for Punja season and 44.95 for Virippu season. The minimum output was 10 kg., which seem to be little strange. However, in fact it was result of crop failure for a household who have cultivated in one acre land during Punja. Maximum output per household during 2013-14 was found as 757.5 quintal. It was produced by a household who had cultivated in 29.5 acres of land, of which 4.5 acre was his own land and rest 25 acre was leased in. He also obtained maximum output in Punja and Virippu. The values of standard deviation suggest higher variability in the output produced by households. However, it is not surprising given the large extent dispersion in land holding.

The productivity of paddy is measured in terms of average output per acre and it was found to be 19.94 quintal for the year as a whole. Season wise comparison reveals that productivity was higher in Punja than in Virippu. Output per acre in Punja was found as 20.6 quintal, while that of Virippu was only 16.70 quintal. Panchayat wise comparison of output rate during Punja reveals that Kavalam had highest average output equivalent to 23.6 quintals per acre, while Chambakkulam has the lowest average output equivalent to 19.14 quintals per acre. Maximum per acre output was 32 quintal per acre obtained during Punja season. Results provided in table 4.21 reveal that 45.88 per cent of households have got per acre output ranging from 20.1 to 30 quintal. Per acre output of nearly 53.5 per cent of households amount less than 20 quintal. Only one household received per acre output more than 30 quintal.

Table 4.21 Distribution of Per Acre Output of Paddy Produced in Punja

Per Acre Output in Quintal	Frequency	Percentage
0. 01 -10	15	8.83
10.1-20	76	44.70
20.1-30	78	45.88
30.1- 40	1	0.59
Total	170	100

Source: Sample Survey.

4.9 Utilisation Pattern of Output by Sample Households

With regard to the utilisation pattern, households mostly prefer to market their output, rather than keeping at home for own consumption. They sell produces to government procurement mechanism. Kerala state civil supply corporation (SUPPLYCO) has been conducting decentralised procurement of paddy by providing minimum support price to farmers. The main aim of procurement policy is to promote the paddy cultivation in the state, and especially in Kuttanad, which is widely known as the rice bowl of Kerala. The procurement mechanism is operated through private mills. The government entrusts private mills for each Padashekharam every year to procure the paddy from the fields. The mill owners collect the output from field itself and issue farmers the bill and the same bill is also is submitted to respective Krishibhavan. Then SUPPLYCO credits payment for the farmers to their bank accounts. Bank releases the amount to farmers after verifying the bill held by farmers. For 1 Kg. Paddy 18 rupees was paid as minimum support price in 2013-14.

It can be inferred from the table 4.22 that almost all farmers sell a major portion of their output to government procurement mechanism. During Punja season 170 (100%) farmers together sold 99.46 per cent of their total output to government procurement mechanism. Similarly during Virippu season 34 (97.14%) farmers sold 99.49 per cent of their total output to government procurement mechanism. Only very few farmers, 20 (11.76%) in Punja and 6 (17.14%) in Virippu, keep a meager portion of output at home. It is to be noted here that this portion of output is kept at home not for only for own consumption, but for preparing seeds for cultivation during next year.

Table 4.22 Utilisation Pattern of Output of Paddy

	2013-14	Punja	Virippu
Number of Farmers Selling Output to Government procurement.	170 (100)	170 (100)	34 (97.14)
Number of Farmers Keeping Output at Home.	20 (11.76)	20 (11.76)	6 (17.14)
Amount of output sold to Government procurement.	130351 (99.46)	12815.8 (99.46)	1564.98 (99.49)
Amount of output Kept at home.	78.2 (0.54)	70.1 (0.54)	8.1 (0.51)

Source: Sample Survey.
Note: Figures in the parenthesis are percentages to respective total.

The major reasons for not taking the produces to home for own consumption are higher transportation cost, low quality of rice and difficulties faced for processing. The fields are quite distant from the houses of farmers; especially Kayal lands are situated in extreme locations, making the transportation very difficult. To transport produces from Kayal lands, which have no access to roads, boats are usually used. Therefore taking agricultural output home involves lot of efforts and transportation cost. It is easy for the farmers to sell the output to the private rice producing mills because they collect output from the field itself and also bear the transportations costs. However farmers have to bear packing and loading charges. Loading charge for one quintal is Rs. 75 and packing charge for one quintal is Rs. 25, therefore additional cost for one quintal would be Rs. 100.

Rice produced by from *Uma* is of low quality and can’t be used for meals. Therefore farmers prefer to sell it out. During the survey farmers responded that they are really worried to consume the rice produced by them due to high degree application of chemical pesticides. They shared the concern that after some years the people in the region will suffer chronic diseases like cancer due to the application of pesticides. Because the pesticides applied in paddy fields also affect the water bodies and fish wealth.

In addition to transportation cost farmers also face other difficulties for processing the output. They do not have adequate store houses to stock the output. Additional labour cost and charges for flour mills are required. Further flour mills do not exist in near places. Due to the procurement mechanism small flour mills do not have work and resultantly most of them are shut down.

Another reason reported by the households was that the rice is available from retail outlets of public distribution system at subsidized rate for AAY or BPL families and even if not subsidized, but at lower prices when compared market prices, to APL families. So the households do not want to take hell lot of efforts to process the output for own consumption.

4.10 Revenue from Paddy Cultivation.

Total revenue from agricultural production is calculated simply by multiplying the quantity sold by price. Since most of the farmers sell output to government procurement mechanism, the minimum support price for paddy Rs. 18 per k.g. is the common price for all farmers. It is already shown that production and productivity is high in Punja season, and resultantly major share of revenue in the agricultural year of 2013-14 is raised in Punja season only. From the two seasons of agricultural year of 2013-14, 170 households earned total revenue of nearly Rs. 2.6 crores by producing and selling a total output of 14459 quintal paddy.

Table 4.23 Total Revenue from Paddy Cultivation (in Rupees)

	2013-14	Punja	Virippu
Total Revenue	2,60,39,790	2,32,25,544.00	28,16,964
Average Revenue Per Household	1,53,175.23	1,36,620.85	82,851.88
Standard Deviation	190239	176404.7	39061.12
Minimum Revenue	180	180	2700
Maximum Revenue	13,63,500	11,61,000.00	3,11,724

Source: Sample Survey.

The revenue per household was found to be about Rs 1.53 lakhs for the year, Rs. 1.36 lakh for Punja season and Rs. 82.8 thousand for Virippu season. The household who suffered crop failure and left with only 10 kg of rice after cultivating in 1 acre land during Punja earned minimum revenue Rs. 180. The maximum revenue obtained in the year was about Rs. 13.63 lakh by a household who cultivated in 29.5 acres of land. The same household obtained maximum revenue in both Punja and Virippu. The values of standard deviation indicate wide variations in the revenue which is expected given the higher inequality in land holding. Therefore, more meaningful inferences can be drawn from the analysis of per acre revenue of the households.

Table 4.24 Descriptive Statistics for Per Acre Revenue during Punja

Measure	Statistics
Mean	36662.50
Median	36000
Mode	45000
Standard Deviation	10891.67
Kurtosis	1.19
Skewness	-0.98
Range	57420
Minimum	180
Maximum	57600.00

Source: Estimated from Primary Data

Here the analysis is focused on Punja season since there is adequate number cultivating households during Punja. Average Per acre revenue in Punja season was Rs. 36662.5 as reported in table 4.24. This is almost equivalent to the earnings from 20 quintal paddy. The minimum per acre revenue is Rs. 180 and Maximum per acre revenue is Rs. 57600. The value of standard deviation reveals that on an average the per acre revenue of households deviate from the mean value by Rs. 10892. The coefficient of skewness is found to be -0.98, which suggests distribution is slightly negatively skewed. This implies that distribution is influenced by few extremely lower values of per acre revenue.

It can be observed from table 4.25 that the per acre revenue of about 38 per cent households lie in between Rs. 30001 and Rs. 40000. Similarly per acre revenue of about 32 per cent households fall into the class of Rs. 40001-Rs. 50000. Average Per acre revenue of Virippu season is Rs. 29957.79 which is much lower than that of Punja season. The descriptive statistics provided in Table 4.26 reveal that per acre revenue of Virippu has got negative skewness and high dispersion. The minimum per acre revenue is Rs. 3150 and Maximum per acre revenue is Rs. 50400.

Table 4.25 Distribution of Per Acre Revenue during Punja

Per Acre Revenue in Quintal	Frequency	Percentage
Up to 10000	5	2.94
10001-20000	11	6.47
20001-30000	20	11.76
30001-40000	65	38.24
40000-50000	55	32.35
Above 50000	14	8.24
Total	170	100

Source: Sample Survey.

Table 4.26 Descriptive Statistics for Per Acre Revenue during Virippu

Measure	Statistics
Mean	29957.79
Median	36000
Mode	36000
Standard Deviation	12887.63
Kurtosis	-0.46745
Skewness	-0.68859
Range	47250
Minimum	3150
Maximum	50400

Source: Estimated from Primary Data

4.11 Net Farm Income and Profitability of Paddy Cultivation.

Net farm income is measured in terms of Nat Value Added (NAV) by the farmer. NAV is obtained by deducting the total costs from the total revenue. Total cost consists of material costs which includes costs incurred on fertilizer, pesticides, and seeds, labour cost, machinery cost, loading and packing cost. Revenue earned from selling the output is considered as total revenue. The net farm income can be positive, i.e. profit or negative i.e. loss. It is found that out of 170 cultivating households in the agricultural year of 2013-14, 140 (82.4%) households earned profit from paddy cultivation, while about 30 (17.6%) households suffered loss. The percentage of households earned profit is slightly higher in Punja.

The Net farm income per household in 2013-14 is Rs. 35146.1. The same figure for Punja season is considerably higher than that of Virippu. Net farm income per household in Punja is Rs. 31205.3, while it is only Rs. 19141.3 in Virippu. Mean per acre net farm income is only Rs. 11377 in 2013-14, Rs. 10098 in Punja and Rs. 6328 in Virippu. The lower annual per acre net farm income is due to single cropping and lower productivity and high cost of cultivation. The maximum net farm income, which means maximum profit, is found as Rs. 3.87 lakh. The minimum net farm income, which means maximum loss, is found as Rs. 1.93 lakh.

Table 4.27 **N**et Farm Income from Paddy Cultivation 2013-14, Punja and Virippu

	2013-14	Punja	Virippu
Number Households Earned Profit	140 (82.4)	139 (81.8)	26 (74.3)
Number Households Suffered Loss	30 (17.6)	31 (18.2)	9 (25.7)
Mean Net Farm Income per household	35146.1	31205.3	19141.3
Minimum Net Farm Income per household	-1,93,700.0	-1,12,500.0	-91325.0
Maximum Net Farm Income per household	3,87,500.0	3,87,500.0	1,25,886.0
Mean Per Acre Net Farm Income	11377.0	10098.0	6328.0

Source: Sample Survey.

The conversation with farmers and the results of the survey reveal that in order to reach the breakeven point, a farmer should get 15 quintal yield per acre if he does not lease in the land. With 15 quintal yield farmer would get total revenue of Rs. 27,000. We have already seen that per acre cost of cultivation is nearly Rs. 25000 without leasing in the land for cultivation. In addition to this, farmers have to pay additional cost of Rs. 1500 for packing and loading 15 quintal rice. Adding this and some other imputed cost would make total expenditure of farmer approximately about Rs. 27,000. However, 15 quintal yield per acre would not give the farmer any economic surplus and he will be left with nothing after six month efforts and all the money spent on cultivation. To earn some economic surplus at least 20 quintal rice per acre should be produced. Form this much, a yield farmer would get total revenue of Rs. 36000 and the net farm income for a season would be about Rs. 9,000. Per acre yield much above 20 quintal would earn sufficient amount of profit.

However if a farmer lease in land, he has to bear additional expenditure of Rs. 12,000, which would make his total expenditure about Rs. 39,000. In this case he has to produce 22 quintal rice per acre to cross the breakeven point, any amount of output more than 22 quintal would give him some economic surplus. But given the production conditions and high cost of cultivation it is really hard to obtain this target.

Now it is better to carry out descriptive analysis of profit and loss separately to understand the magnitude of economic surplus earned by the households and also the extent of loss from cultivation. The descriptive statistics of economic surplus or profit earned from rice cultivation during 2013-14 are shown in table 4.28. Maximum revenue earned is Rs 3.87 lakh and minimum revenue is Rs 300. Estimate of standard deviation also indicate high extent dispersion in the economic surplus. The mean net profit is Rs. 47650, which is considerably higher than the median and mode. Coefficient of skewness suggests a positively skewed distribution, which in turn indicates that there is upward bias in the mean value as it is influenced by large values. In this case median would be more representative average. Median is only Rs. 24375. Further it is shown in table 4.29 that almost 44 per cent of households received annual profit from cultivation less than Rs. 20,000. Other 24 per cent received profit between Rs. 20001 and 40,000. Annual income of this much amount is very low for a household in Kerala given the high cost of living in Kerala.

Table 4.28 Descriptive Statistics of Profit from Paddy Cultivation, 2013-14.

Measure	Statistics
Mean	47650
Median	24375
Mode	7000
Standard Deviation	67316.58
Kurtosis	9.64
Skewness	2.94
Range	387200
Minimum	300
Maximum	387500

Source: Estimated from Primary Data

Table 4.29 Distribution of Profit from Paddy Cultivation, 2013-14.

Profit in Rupees	Frequency	Percentage
Up to 20,000	61	43.6
20001-40000	34	24.3
40001-60000	16	11.4
60001-1 Lakh	13	9.3
1.001 Lakh-2 Lakh	7	5.0
2.001 Lakh-4 Lakh	9	6.4
Total	140	100

Source: Sample Survey.

The low level of net profit is a result of single cropping, high cost of production, low productivity and production. These evidences reveal that farming has become unviable activity in Kuttanad. The insufficiency of farm income requires the household to depend also on nonfarm activities for livelihood. The extent of non-farm activities and earnings from non-farm activities will be discussed in detail in next chapter. Average per acre profit is found as Rs. 15205 for 2013-14.

Table 4.30 Descriptive Statistics of Profit from Paddy Cultivation during Punja and Virippu

Measure	Statistics for Punja	Statistics for Virippu
Mean	43412	30990.04
Median	20000	21450
Mode	5000.0	50.00
Standard Deviation	67852.4	31356.39
Kurtosis	10.2	2.32
Skewness	3.0	1.589
Range	387300	125836
Minimum	200	50
Maximum	387500	125886

Source: Estimated from Primary Data

A comparison of profit obtained from two seasons is given table 4.30. Mean profit is high in Punja as Rs. 43412. However the median profit is considerably low as Rs. 20000 due to the positive skewness in the data. On the other hand, even though the mean profit in Virippu is lower as Rs. 30990, but median profit is slightly higher as Rs. 21450, due to lack of skewness in the data. This could be due to the less number of observations for Virippu season. Maximum profit in Punja is similar as of the year. The average per acre profit in Punja is found as Rs. 13733; on the other hand it is only Rs. 11,158 for virippu.

Table 4.31 Descriptive Statistics of Loss from Paddy Cultivation, 2013-14.

Measure	Statistics
Mean	-23207
Median	-10050
Mode	-193700.00
Standard Deviation	37824.77
Kurtosis	14.46
Skewness	-3.49
Range	192700
Minimum	-1000
Maximum	-193700

Source: Estimated from Primary Data

Table 4.31 reports the descriptive statistics of loss incurred from rice cultivation in the year 2013-14. The mean loss is Rs. 23,207. There is negative skewness in the distribution and the distribution is affected by the large negative values. Maximum loss estimated is Rs.1,93,700 for a farmer named Pankajakshan.

> *Pankajakshan is from Chambakkulam , he has cultivated in 13 acres during Punja and Virippu. However in both season the production was very low due to the insects and crop diseases. His per acre yield in Punja was only 1.25 quintal and that of Virippu was only 1.75 quintal. For both seasons he has invested almost about Rs. 2.63 lakh, but he received only Rs. 0.70 lakh, resulting in a huge los off Rs. 1.93 lakh.*

Farmers from other places also shared similar type of experiences.

> *Unnikrishnan is from Kavalam, and he has cultivated in 5 acres of land during both Virippu and Punja. Unlike in the previous case he has got fairly good yield in Virippu as 20 quintal per acre, resultantly he was able to earn some normal profit of Rs. 43,400. However, from Punja cultivation he received only 6 quintal output per acre due to insects and crop diseases, resulting in a loss of Rs. 73,900, which offset the profit earned in Virippu, and finally he suffered a loss of Rs. 30,500 in the year 2013-14.*

The ongoing discussions reveal that the annual Paddy cultivation in the study area yield either low level net profit or some amount of loss. Per acre surplus income of about Rs. 15205 per year or Rs. 13733 in a season is far from adequate for household to live a decent life. The inadequacy of economic surplus from cultivation has created a gloomy situation among farmers and they have lost interest in paddy cultivation. Now they are not in a position to raise sufficient amount of income for not their own reasons even after taking all the efforts and investing much amount of money. The interplay of geographical and agro-climatic conditions with adverse economic factors has made the cultivation process in Kuttanad economically unworthy. Several farmers were saying that after some years, number of cultivators will significantly decline because the young people in the region are trying to divert themselves to other non-farm activities to earn their livelihood.

4.12 Reasons for Low Profitability

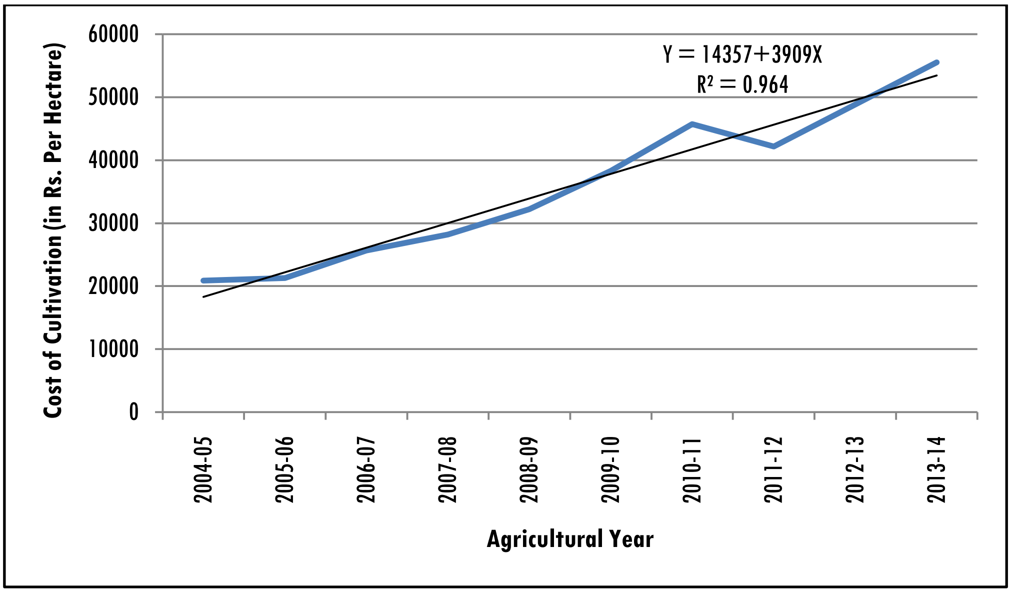
There are several reasons for the low level profit or loss from farming. Foremost among them, as we noted earlier, is the single cropping in the study area. We have seen that only 20 per cent land holding households cultivate during Virippu season and the rest prefer to leave their land fallow due to the absence of a strong permanent bund. The absence of permanent bund makes the cultivation process during Virippu risky due to the threat of rain and flood. The second reason is relatively higher increase in the cost of production when compared to the revenue. To understand the temporal change in cost of paddy cultivation, we use the annual data on the cost of cultivation of winter paddy reported by department of economics and statistics in Kerala.

Figure 4.5 shows the estimated linear trend line for the cost of cultivation of winter paddy. There is clearly an upward linear trend in the data, which suggest that the cost of cultivation is increasing at a constant rate every year.[17] The per hectare cost of cultivation of winter paddy was Rs. 20886 in 2004-05 and it rose to Rs. 55493 in 2013-14, registering a percentage growth of 165.7 per cent. Slope coefficient of the trend equation indicates that per hectare cost of paddy cultivation in winter on an average increases by Rs.

[17] Other statistics of the estimated linear trend equation is reported in the appendix.

3909 every year. On the other hand the revenue from cultivation in Kuttanad seems to have not experienced an increase of this magnitude. Total revenue depends on the quantity produced and price. Between 2004-05 and 2013-14 total production of paddy in Alappuzha district increased from 78491 metric ton to 106866 metric ton. The percentage growth in total production was only about 36 percent. This was due to low productivity growth; productivity has registered only 17 percentage growth by increasing from 2441 kg per hectare to 2857 kg per hectare over the same period. However, the minimum support has been raised annually by the government. The minimum support price was increased from Rs. 7 per kg in 2004-05 to Rs. 18 per kg in 2013-14, an increase of almost 157 percent. However due to low growth in production and productivity total revenue has not improved much. The higher increase in cost of cultivation has considerably reduced the profitability of paddy cultivation in Kuttanad.

Figure 4.5 Linear Trend Line of Cost of Cultivation of Winter Paddy



Among various categories of cost, labour cost forms a major share of total cost. Wage of the labourers is increasing annually. The reason for this is that the wage in agriculture in Kerala is set exogenously in the secondary or territory sector, especially in the construction sector. The wage in the construction sector increases every year due to excess demand for labour over supply of labour.[18] The wage set in construction sector gets transferred to agriculture because the labourers working in agriculture demand higher wage equivalent to that of construction sector on the basis of opportunity cost. Similarly, the machinery charges are also on the rise every year because of the increase in labour cost and rising oil prices. Further, the costs of material inputs such as pesticide and fertilsers have also experienced considerable increase.

Another major reason is low productivity. The only way to cover the increasing cost of production is to enhance the productivity. However, productivity of rice in Kuttanad has been adversely affected by saline water, pesticides and chemical fertilisers. The intensive cultivation every year with heavy application of chemical fertilisers and pesticides has brought down fertility of the soil. The productivity in the study area is only about 20 quintal per acre. Given the high cost of production it is not enough to raise adequate surplus income.

The topographical features and agro-climatic conditions in Kuttanad raise numerous problems for farmers. The low lying paddy fields with close proximity of lake and canals always make cultivation process vulnerable to flood and saline water intrusion. Further, the incidence of pests and crop

[18] The construction sector in Kerala has been experiencing growth momentum due to the spurt in overall growth of the economy resulted from liberalisation measures and remittance flow from Gulf nations.

diseases are high in Kuttanad. Both these factors not only lead to crop failure but also significantly increase cost of cultivation. To prevent flood and saline water intrusion outer bunds have to be maintained strongly. To protect the crop from pests and insects higher amount chemical fertilisers have to be applied.

Another issue highlighted by farmers is ineffective institutional invention. The government is accused of not implementing the recommendations of MSSRF, especially to construct the permanent bund. Construction of permanent bund can bring in lot of changes in the cultivation process. It will protect fields from flood and reduce expenditure on bund construction. The permanent bund can make the second cropping possible in the region. Another issue was that if any crop failure is there, adequate amount of compensation is not paid. Further the subsidy for fertilizers and pesticides are enough to cover the cost actually incurred on them. There is four to six month delay in sanctioning the payment after the procurement of rice. This increases the interest burden for the farmers who have borrowed from the banks. Therefore to promote the rice cultivation effective institutional intervention is required in all areas of cultivation process such as infrastructural development, subsidy enhancement, zero interest credit facilities and compensations for crop failure.

4.13 Agricultural loan and Indebtedness among Farmers

Out of 170 cultivating households 79 households (46.5%) have taken agricultural loan from various sources for cultivation. The maximum amount of loan is Rs. 6 lakh by two farmers, one has cultivated 25 acres of land during Punja, other one has cultivated in 10 acres of land during Punja. The minimum amount of loan is Rs. 5,000. The mean amount of loan is Rs. 84202, however it is influenced by large values due to positive skewness in the data. Therefore median would be more representative, median of loan amount is found as Rs. 30,000. The distribution of the households by the amount of loan in table 4.32 reveals that loan amount of nearly 33 per cent of households is less than Rs. 20,000, while about 32 per cent have borrowed between Rs. 20001 and Rs. 50000. Therefore 55 per cent have taken loan less than or equal to Rs. 50,000. The loan amounts of 25 per cent of households fall in between Rs. 50001 to Rs. 2 lakh.

Table 4.32 Distribution of Households by the Amount of Loan

Amount Borrowed	Frequency	Percentage
Up to 20,000	26	32.9
20001-50000	25	31.6
50001-1 Lakh	11	13.9
1.001 Lakh-2 Lakh	9	11.4
2.001 Lakh-4 Lakh	6	7.6
4.001 Lakh-6 Lakh	2	2.5
Total	79	100.0

Source: Sample Survey.

Cooperative bank is the most important source of agricultural loan, and it is followed by State Bank of Travancore. Almost 57 per cent of households have taken agricultural loan from cooperative bank and 24 per cent of households have taken loan from state bank of Travancore (table 4.33). Preference of farmers towards cooperative banks is because of the accessibility, procedural easiness and good customer relations. Cooperative banks are situating in near proximity of the households. Further the procedure of application for the loan and other formalities are not that strict in cooperative banks when compared public sector banks. The staff and Board of members of the cooperative banks are cordial in approach and keep good relation with customers. The interest rate charged by cooperative banks, public sector banks and private sector banks are same as 8 per cent. This is the interest rate charged for priority sector lending by banks. Out of this 8 per cent interest payments, 4 per cent will be provided by the government as subsidy, if loans are repaid in time. However due to the delay in releasing of payment by the government for the rice procured, farmers are not usually in a position to make the timely repayment.

Table 4.33 Multiple Response Table for Source of Loan

Source of Borrowing	Frequency of Responses	Percentage of Total Responses	Percentage of Households
Cooperative Banks	45	47.9	57.0
State Bank of Travancore	19	20.2	24.1
Federal Bank	8	8.5	10.1
State Bank of India	10	10.6	12.7
Neelambari Micro Finance	3	3.2	3.8
Private Money Lenders	4	4.3	5.1
Baroda	2	2.1	2.5
Indian Overseas Bank	2	2.1	2.5
Indian Bank	1	1.1	1.3
Total	94	100.0	---

Source: Sample Survey.

Among the 79 households who have taken loan from various sources, only 13 households have made the repayment fully, the rest 66 have not started repayment due to the delay in getting payment from the government for the procured rice. This means that 38.8 per cent of total cultivating households and 83.54 per cent of households who have taken loans are indebted. Government has procured the rice with the help of private mills in March but even in June the payments to farmers are not made. Therefore they have not started repaying the loan even in June. Therefore all these 66 farmers are fully indebted out of their loan. The mean amount of indebtedness is Rs 75,000; however median is only about Rs. 28500, which indicate that amount of indebtedness of most of the households centres around this value.

Indebtedness of 33 per cent of households are less than Rs 20,000 and Indebtedness of 35 per cent of households are in between Rs. 20001 and 50000. Maximum amount of indebtedness is 6 lakh.

Table 4.34 Distribution of Households by the Amount of Indebtedness

Amount Borrowed	Frequency	Percentage
Up to 20,000	22	33.3
20001-50000	23	34.8
50001-1 Lakh	9	13.6
1.001 Lakh-2 Lakh	7	10.6
2.001 Lakh-4 Lakh	3	4.5
4.001 Lakh-6 Lakh	2	3.0
Total	66	100.0

Source: Sample Survey.

4.14 Conclusion

This chapter examined the production based entitlements of sample households. Analysis of data on land holding reveals that there exists excessive inequality in the ownership of agricultural lands among sample households. The privileged socioeconomic groups such as cultivators, Christian families, APL families and forward castes have higher land holding than their underprivileged counterparts. It was observed that majority of the land holding are marginal holdings. Kuttanad is more suitable for paddy cultivation since it is a wetland region lying below mean sea level. Out of the two paddy seasons in the study region almost all farmers cultivate in Punja, but only few cultivate in Virippu season due to flood and other risks. Cost of Paddy cultivation in the region is higher than that of other regions in the state. Labour cost forms major share of total cost.

Per acre output in Punja is found to be much higher than that of Virippu. Almost 99 per cent of total output is sold to government procurement mechanism. The average per acre revenue earned is just enough to cover cost of cultivation without leasing and some amount of normal profit. If the farmer has leased in land he would end up with loss from cultivation. Therefore incidence of leasing in land for cultivation is very low in the region. Majority of farmers (82%) earned some net profit in 2013-14. However mean net farm income is found to be very low. Single cropping, risks associated with cultivation process, increasing cost of cultivation and stagnation in production and productivity are the major reasons for lower profitability. Nearly 47 per cent of cultivating farmers have taken loans from institutional sources and most of them could not repay the loans due to delays in settlement of procurement bill. Resultantly 38.8 per cent of the cultivating farmers are indebted. The chapter as a whole unfolds agrarian crisis experienced by Kuttanad region.

Appendix to Chapter IV

Table 4.1A: Results of Independent Samples 't' test for Differences in Mean Agricultural Land Holding by Working Classes

Working Class	Mean Land Holding (in Acres)	SD	If variances are	*t*-statistics	P- Value
Cultivator	4.18	4.63	Equal	10.99	0.000
Labour	0.44	.86	Not equal	6.77	0.000
Mean Difference	3.74*				
Levene's Test Statistics for Equality of Variances		F Statistics: 96.61		P- Value: 0.00	

Source: Calculations based on Primary Data
Note: * indicates the mean difference is significant at 1 per cent level.

Table 4.2A: Results of Independent Samples 't' test for Differences in Mean Agricultural Land Holdings by Religious Status

Religion	Mean Land Holding (in Acres)	SD	If variances are	*t*-statistics	P- Value
Hindu	1.03	2.81	Equal	-3.49	0.001
Christian	2.39	3.12	Not equal	-3.34	0.001
Mean Difference	-1.37*				
Levene's Test Statistics for Equality of Variances		F Statistics: 5.64		P- Value: 0.018	

Source: Calculations based on Primary Data
Note: * indicates the mean difference is significant at 1 per cent level.

Table 4.3A: Results of One Way ANOVA for Differences in Mean Agricultural Land Holdings by Family Status

Family Status	Mean Land Holding (in Acres)	SD	Mean Differences from Post Hoc Tests for Multiple Comparison		P- Value
AAY	0.08	0.22	AAY – BPL	-0.13	0.977
BPL	0.21	0.50	APL – BPL	2.24*	0.000
APL	2.45	3.70	APL – AAY	2.37*	0.000
ANOVA Results		F Statistics: 23.05		P- Value: 0.000	

Source: Calculations based on Primary Data
Note: * indicates the mean difference is significant at 1 per cent level.

Table 4.4A: Results of One Way ANOVA for Differences in Mean Agricultural Land Holdings by Social Category (in Acres)

Social Category	Mean Land Holding (in Acres)	SD	Mean Differences from Post Hoc Tests for Multiple Comparison		P- Value
SC	0.16	0.40	SC – OBC/OEC	-0.53	0.417
OBC/OEC	0.69	1.27	FC– OBC/OEC	2.75*	0.000
FC	3.44	4.53	FC– SC	3.28*	0.000
ANOVA Results		F Statistics: 35.09		P- Value: 0.000	

Source: Calculations based on Primary Data
Note: * indicates the mean difference is significant at 1 per cent level.

Table 4.5A: Results of Independent Samples 't' test for Differences in Mean Size of Homestead by Working Classes

Working Class	Mean Size of Homestead (in Acres)	SD	If variances are	*t*-statistics	P- Value
Cultivator	0.38	0.43	Equal	9.71	0.00
Labour	0.08	0.08	Not equal	6.02	0.00
Mean Difference	0.30*				
Levene's Test Statistics for Equality of Variances		F Statistics: 168.18		P- Value: 0.00	

Source: Calculations based on Primary Data
Note: * indicates the mean difference is significant at 1 per cent level.

Table 4.6A: Estimates of Linear Trend Equation for Cost of Cultivation of Winter Paddy

	Coefficients	Standard Error	t - statistics	P-value
Intercept	14357.47*	1654.18	8.68	0.000
X (Time Dummy)	3909.02*	266.59	14.66	0.000
R Square: 0.964				

Note: * indicates 1% level of significance

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Chapter 5

EMPLOYMENT CONDITIONS AND LIVELIHOOD OUTCOMES OF THE HOUSEHOLDS

Contents

5.1 Introduction

This chapter deals with household based entitlements such as employment status, wage rate and earnings of members of the household. Various sources and magnitude of household income are examined. An analysis of income inequality among various categories of households is carried out. It is widely recognised that employment status of household members to a greater extent determines their economic access to food. Further, for the labour households whose main source of income is wage labour, total of days of employment is also important since it affects their total earnings in a month. In the previous chapter, we have seen that there is nearly complete absence of cultivation process in Virippu season, resultantly the net farm income of the households was found to be low in an agricultural year. This would imply that agriculture neither provides adequate income to cultivator households nor sufficient days of employment to labour households in the study area. As a result, the households would try to diversify their livelihood by engaging in non-farm activities. Some members in the households, especially young members with better education and skills, are expected to find regular wage or salaried employment in manufacturing or service sectors. Further, the less educated and unskilled members shift themselves to non-agricultural work if days of employment in agriculture is inadequate. Even the agricultural workers tend to do additional jobs to improve their total income. Therefore all these factors influence the employment dynamics in the study region.

On this backdrop, this chapter examines various aspects of employment in the study region. Section 5.2 elaborates the demographic profile and educational status of household members since they are expected to have some impact on employment status. Section 5.3 discusses the employment status, category of employment, occupational structure and incidence of subsidiary activity among members of sample households. A comparative analysis of level of employment of agricultural labour and non-agricultural labour is attempted in section 5.4. Section 5.5 provides a discussion on various sources of total household income and also an analysis of income inequality among sample households.

5.2 Demographic Features and Educational Status of Sample Households.

5.2.1 Demographic Features

Demographic features of the households to a greater extent can influence their economic status, depending on the extent of demographic dividend and dependency ratio. Demographic dividend refers to the economic prosperity resulting from higher share of working age population. On the other hand higher dependency ratio put extra economic burden on the households. Table 5.1 presents a detailed account of demographic features of the household. The size of sample population comprising all members from the sample households is 1306 persons, of them 670 (51.3%) are males and 636 are females (48.7%). Therefore the sex ratio is not in favour of females among the sample households. Taking all households together there are only 949 females for every 1,000 males, the ratio is much lower than that of Alappuzha district and state average. For Alappuzha district the ratio is 1100 and for the state as a whole it is 1084. Sex ratio of labourer households is much lower as 949. Average size of the household size is 4.78. About 69 per cent of the households had family size between 3 and 5, and for 25 per cent it was between 6 and 8. Family size is little higher among labourer households.

Table 5.1 Demographic Features of Households

Demographic Features	Cultivator Households	Labour Households	All
Population	334	972	1306
Average Household Size	4.70	4.81	4.78
Household Size (%)			
1-2	8.5	3.0	4.4
3-5	62.0	71.8	69.2
6-8	26.8	23.8	24.5
9 & above	2.8	1.5	1.8
Sex Composition (%)			
Male	50.9	51.4	51.3
Female	49.1	48.6	48.7
Sex Ratio (per 1000 males)	965	944	949
Age Composition (%)			
0 -14	19.2	21.9	21.2
15-59	60.2	60.8	60.6
60 & Above	20.7	17.3	18.2
Dependency Ratio (in 100)			
All	66.2	64.5	64.9
Young	31.8	36.0	35.0
Elderly	34.3	28.4	30.0

Source: Sample Survey.

The age structure of the population is really important since it will help us to understand relative share of working age population and dependents, which in turn influence the earning and spending levels of households. Working age people (15-59) in a household would earn income for the family, while young age (0-14) and old age (60+) dependents would incur health and education expenditures. It can be observed that working age population constitute major share of total population. About 61 per cent of total population belong the working age population (15-59), indicating that the households enjoy demographic dividend. However the share is little less than that of the state, as per 2011 census share of working age population in Kerala was 64 per cent. The benefits of the demographic dividend can be realised only if there are adequate employment opportunities. The young age dependents, consisting of both children below 5 years and school going children in the age group of 5-15 years, constitute 21 per cent of total population. On the other hand share of old age dependents is 18 per cent. Taking young age dependents and old age dependents together would make the total share of dependents to 39 per cent.

With an aim to understand the burden of dependents on the working age population, the dependency ratio is calculated as the ratio of total number of dependents to total working age population and it is expressed in 100. The results show that there were over all 65 dependents for 100 working age population, 35 were young dependents and 30 were old dependents.

5.2.2 Educational Status

Educational status is generally expected to influence the employment status of the person. Higher level of education is an indicator of better capability of a person, which would enable him secure better job. Higher education also promotes the upward economic mobility of a person by facilitating migration to urban centres or other countries, where a person can secure better employment and earn high income. However among the sample population majority of the population have completed only school level education, especially in labour households. As we have observed in case of the sample panchayats the literacy rate is high as above 99 per cent, there are only 2 illiterate persons. The data provided in the table 5.2 shows that about 21 per cent of sample population has completed only primary education, they are mostly aged persons. Further, it can be seen that 35 per cent of the total population have completed secondary school education and 13 per cent have completed higher secondary education. Merely 10 per cent of the population has completed graduation.

Table 5.2 Educational Status of Population

Educational Status	Cultivator Households		Labour Households		All	
	No	%	No	%	No	%
Illiterate	0	0.0	2	0.2	2	0.2
Primary	40	12.7	215	23.6	255	20.8
Upper Primary	29	9.2	139	15.3	168	13.7
SSLC	87	27.6	339	37.2	426	34.7
Plus Two or PDC	45	14.3	109	12.0	154	12.6
Diploma/Certif-icate Course	33	10.5	47	5.2	80	6.5
Graduation	65	20.6	52	5.7	117	9.5
Post Graduation	15	4.8	7	0.8	22	1.8
Phd	0	0.0	1	0.1	1	0.1
Total	314	100	911	100	1225	100

Source: Sample Survey.

Considerable differences in educational attainment exist between cultivator households and labourer households. In the cultivator households 21 per cent of persons have completed graduation and 5 per cent have completed post graduation, while the respective percentage for labour households are only 5.7 and 0.8. This is because of the fact that the cultivator households are in better position to finance the studies of their children, either from their past savings or by raising educational loan from banks on collateral of their lands. On the other hand, labour households completely depend on their wage labour, earnings from which are not sufficient to cover expenditure on education along with other expenditures. Members from labour households are also under pressure to drop their studies and go for any job to support their families. *For instance, a 19 year old boy named Vipin, who was studying B.A in an aided college, missed most of his classes during the academic year since he accompanies his brother for his electrical work to support his family to finish the construction of their house. Presently they are residing in a hut made of coconut leaves.* Lower educational status of the members of the labour households to some extent hinders their upward social and economic mobility.

5.3 Employment Status of Sample Population

In this section we examine the activity status of the population, whether they are employed, unemployed, or out of labour force. Some of the key indicators of employment and unemployment are estimated and analysed. Then the various categories and sectors of employment are examined with an aim to understand which categories and sectors of employment are predominant. The categories of employment may indicate whether workers are regularly employed, self employed or casual labour.

5.3.1 Usual Activity Status of Sample Population

The data on the activity status of the members of the households were collected using the employment concepts of National Sample Survey Organisation (NSSO). The activity status in general refers to participation in economic or non-economic activities by individuals during the last 365 days. Mainly there are three categories of activity status, employed, unemployed and out of labour force.[1] The persons who have been working or engaged in some economic activity over the reference period are considered as employed. They are considered as workers and they constitute the workforce. The persons who have been seeking and available for work but could not engage himself in any economic activity are treated as unemployed. Employed persons plus unemployed persons forms the labour force. Out of labour force implies the person was neither engaged in any economic activity nor available for work. This category mainly comprise of children, students, house wives, old aged and sick persons.

There are mainly three measures of activity status based on three types of reference periods. The first one is *usual activity status* that uses one year or 365 days reference period. Second is *current weekly status* that uses one week reference period. Third is *current daily status* that considers each day in the reference week. The study has used usual activity status and collected data on employment by taking one year as reference period from April 2013 to March 2014.[2] The period covers one Punja season as well as one Virippu season. The usual activity status is a combination of *usual principal activity status* and *usual subsidiary activity status* of a person and is denoted as principal status

[1] The detailed discussions on the concepts of employment are given in Manual of Labour Statistics (1), Central Statistical Office, Ministry of Statistics and Programme Implementation, Government of India, New Delhi or the Report on Employment and Unemployment in India published by NSSO, Ministry of Statistics and Programme Implementation, Government of India.

[2] Although the Virippu season runs from May to September, for the data on employment, we have considered the period from April to September, since field preparation for cultivation starts before one month of the normal season. Similarly for Punja season, we have considered period from October to March.

plus subsidy status (*ps+ss*). The reference period for both concepts is 365 days. Usual principal activity status (UPS) refers to the activity status on which an individual spent more time over the preceding 365 days. Usual subsidiary activity status refers to the activity status on which an individual spent less time over the preceding 365 days. However in this study the strict classification as principal activity and subsidiary activity on the basis of number of days spent on each activity cannot be followed for some agricultural labourers who get less days of work in agriculture. These labourers are employed more number of days in non-farm work. However, on the priority base they were considered as agricultural labourers and their principal activity was taken as wage labour in agriculture.

Table 5.3 Usual Activity Status of Population (Principal Status +Subsidiary Status)

Activity Status	Cultivator Households		Labour Households		All	
	No	%	No	%	No	%
Employed	157	45.6	468	48.6	625	47.9
Unemployed	13	3.8	53	5.5	66	5.1
Out of Labour Force	174	50.6	441	45.8	615	47.1
Student	85	24.7	276	28.7	361	27.6
House Wife	49	14.2	42	4.4	91	7.0
Old Aged	18	5.2	66	6.9	84	6.4
Children	22	6.4	52	5.4	74	5.7
Sick/ Disabled	0	0.0	5	0.5	5	0.4
All Persons	344	100	962	100	1306	100

Source: Sample Survey.

It is shown in table 5.3 that almost 48 per cent of the population is employed in some economic activity considering both principal status and subsidiary status.[3] The proportion of unemployed in total population is 5 per cent. Adding employed and unemployed together the labour force account for 53 per cent of the sample population. The labour force participation rate (LFPR) is reported in table 5.5. The members who are out of labour force constitute 47 per cent of the sample population, among them majority were students. Labour force participation rate and employment rate are slightly higher among labour households than the cultivator households. This could be poverty driven. Due to the lower level of income more members from labour households tend to work in order support their family. Another interesting fact observed from the results is the activity status of the aged. We have already noted that 18 per cent of population is aged, however only 6.4 per cent of the aged are out of labour force, which in turn implies that the rest are part of the workforce.

The usual activity status of the sample population by gender is shown in table 5.4 and some key indicators of employment and unemployment are reported in table 5.5. The results suggest that labour force participation rate and proportion of employed are higher among males than females. Almost 60 per cent of male population is part of labour force and 40 per cent is out of labour force. On the other hand only 45 per cent of female population comes under labour force and the rest 55 per cent are out of labour force. Further, unemployment is higher among females than males. The proportion of employed among male population as indicated by WPR is about 60 per cent, while it is only 36 per cent for female population. About 10 per cent females are unemployed, while only 1 per cent of males are unemployed. Higher employment rate of male population is distress driven. They try to compensate the loss or low profit from agriculture by engaging in other non-farm

[3] The proportion of employed persons in total population is also known as Worker Population Ratio (WPR), which is reported in table 5.4.

activities. Some of them have become casual workers, who take up all sort of work to meet their family expenditure.

Table 5.4 Usual Activity Status of Sample Population by Gender (Principal Status+ Subsidiary Status)

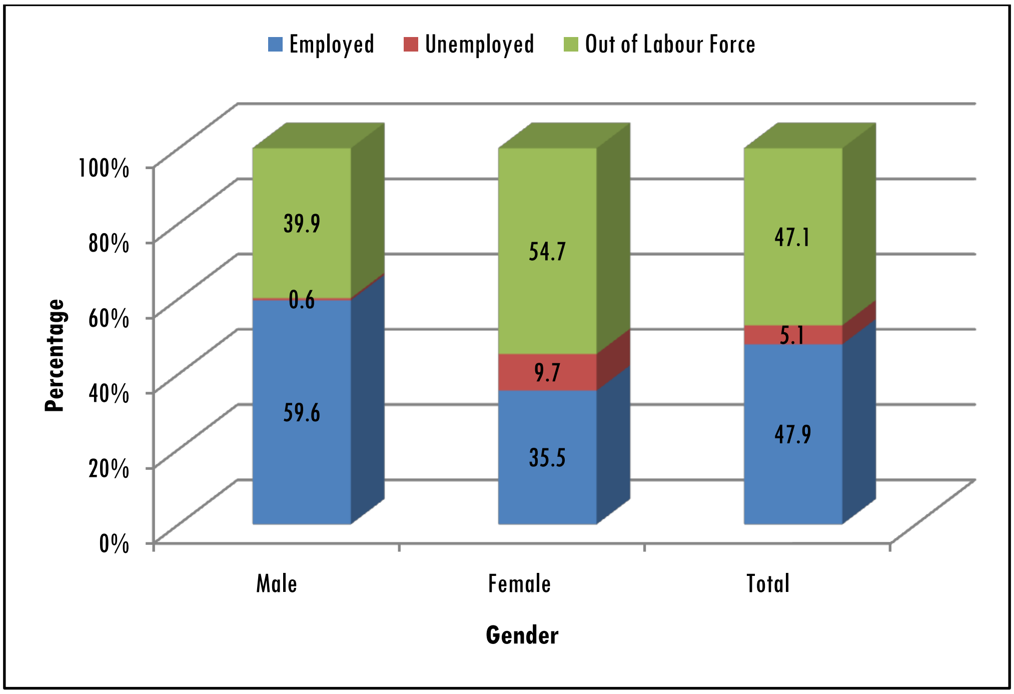
Activity Status	Male		Female		All	
	No	%	No	%	No	%
Employed	399	59.6	226	35.5	625	47.9
Unemployed	4	0.6	62	9.7	66	5.1
Out of Labour Force	267	39.9	348	54.7	615	47.1
Total	670	100.0	636	100.0	1306	100.0

Source: Sample Survey.

The unemployment rate, defined as the ratio of unemployed persons to total labour force, is found as 9.6 per cent for the sample population.[4] There is wide gender disparity in unemployment rate; unemployment rate of men is merely 1 per cent, while unemployment rate of women is about 22 per cent. The overall unemployment rate of sample population is higher than the unemployment rate for Kerala. The unemployment rate in Kerala in terms of usual activity status reported by the 68th round (2011-12) employment survey of NSSO was 7.7 per cent for rural persons and 7.4 per cent for urban persons. The real dependency ratio is estimated as the ratio of real dependents comprising both out of labour force and unemployed to total population. Unlike the age specific definition of dependency ratio this would show the proportion real dependents in the total population.

[4] Unemployment rate = no of unemployed persons / (no of employed persons+ no of unemployed persons).

Figure 5.1 Usual Activity Status of Sample Population by Gender



The real dependency ratio for general population is 52.1 per cent, which is lower than the age specific dependency ratio of 65 per cent. The reason for the lower real dependency ratio, as we shall see later in this chapter, is the working status of aged people. Age specific dependency ratio considers people aged more than 60 as dependents even if they are working. While real dependency ratio does not consider employed people with an age of more than 60 as dependents, rather considers them as working. Therefore in a population with aged working members real dependency ratio can be low.

Table 5.5 Key Indicators of Employment and Unemployment by Working class and Gender (Principal Status+ Subsidiary Status, in Percentage)

Key Employment Indicators	Cultivator Households	Labour Households	Male	Female	All
Labour Force Participation Rate (LFPR)	49.4	54.2	60.1	45.3	52.9
Worker Population Ratio (WPR)	45.6	48.6	59.6	35.5	47.9
Proportion of Unemployed (PU)	3.8	5.5	0.6	9.7	5.1
Unemployment Rate (UR)	7.6	10.2	0.99	21.53	9.6
Real Dependency Ratio (RDR)	54.4	51.4	40.4	64.5	52.1

Source: Sample Survey.

5.3.2 Category and Sectors of Employment: Usual Principal Activity Status.

The category of employment in terms of principal activity status shown in table 5.6 reveals that 64 per cent of the workers of sample population are casual labourers. This is followed by the category of regular salaried employees (15%) and self employed employers (13%). Workers of cultivator households are employed in privileged jobs. Nearly 48 per cent of workers of cultivator households are self employed as employers and 35 per cent are regular salaried employees. On the other hand almost 83 per cent of workers from labour households are causal labourers.

Table 5.6 Category of Employment as per Principal Status by Working Class and Gender (in Percentage)

Employment Indicators	Cultivator Households	Labour Households	Male	Female	All
Self Employed as Worker	3 (1.9)	10 (2.1)	10 (2.5)	3 (1.3)	13 (2.1)
Self Employed as Employer	78 (49.7)	0 (0.0)	72 (18.0)	6 (2.7)	78 (12.5)
Regular Wage Employee	10 (6.4)	30 (6.4)	29 (7.3)	11 (4.9)	40 (6.4)
Regular Salaried Employee	55 (35.0)	40 (8.5)	59 (14.8)	36 (15.9)	95 (15.2)
Casual Labour	11 (7.0)	388 (82.9)	229 (57.4)	170 (75.2)	399 (63.8)
Total	157 100	468 100	399 100	226 100	625 100

Source: Sample Survey.

The gender classification indicates that majority of men and women workers are employed as casual labourers, however the proportion of casual labourer is higher among female (75%) than male (57%). The proportion of employer is higher among male (18%) than female (3%). The proportion of regular salaried employee is more or less similar among male and female as it is close to 15 per cent.

Let us also examine whether the category of employment differ among workers belonging to various age groups. The results provided in table 5.7 suggest that most of the youngsters are employed as regular salaried employees. On the other hand workers from middle age group are mostly cultivators and casual workers. It is a clear indication that educated youth are moving away from agriculture. They are more interested in employment status with regularity and high remuneration. The reason for lower real dependency ratio discussed previously is quite evident from the table. The aged (60+) people are also the part of the work force. There are about 98 aged casual labourers and 38 self employed cultivators. The employment status of aged as casual workers is worrisome because of the fact that this was due to the distress experienced by the households.

Table 5.7 Category of Employment as per Principal Status by various Age Groups

Employment Indicators	15-24	25-34	35-45	45-59	60+	All
Self Employed as Worker	0 (0)	0 (0)	10 (6.0)	2 (1.1)	1 (0.7)	13 (2.1)
Self Employed as Employer	0 (0)	3 (2.5)	10 (6.0)	27 (15.3)	38 (27.7)	78 (12.5)
Regular Wage Employee	9 (37.5)	16 (13.3)	12 (7.1)	3 (1.7)	0 (0.0)	40 (6.4)
Regular Salaried Employee	12 (50.5)	58 (48.3)	19 (11.3)	6 (3.4)	0 (0.0)	95 (15.2)
Casual Labour	3 (12.5)	43 (35.8)	117 (69.6)	138 (78.4)	98 (71.5)	399 (63.8)
Total	24 (100)	120 (100)	168 (100)	176 (100)	137 (100)	625 (100)

Source: Sample Survey.
Note: Figures in the parenthesis show percentage to column total.

Data on the occupational structure of workforce for principal activity status reported in table 5.8 gives a detailed break up of employment. It is found that almost 49 per cent of the sample population work as casual agricultural labour and 15 percent are casual workers involved in other activities. It is interesting to note that MGNREA is making significant contribution to employment of women in the study area. Almost 70 women are MGNREA workers. MGNREGA workers formed 31 per cent of women workers and 41 per cent of women casual workers. Even women working as agricultural labourers engage themselves in MGNREGA work as additional work. This employment programme is really important for the households with only female working members. These households derive major portion of their income from this employment programme. Further, the programme also helps other women to support their family to a greater extent provided the fact that men are getting only less days of employment. Compared to the working days in agriculture, MGNREGA provides more working days. Let us examine two cases here to understand the importance of MGNREGA for the poor rural households.

Table 5.8 Occupational Structure of Work Force as per Principal Status

Occupation	Frequency	Percentage
Cultivator	73	11.7
Own Business	5	0.8
Self Employed as Worker	13	2.1
Regular Wage Employee in Community Services	11	1.8
Regular Wage Employee in Construction	12	1.9
Regular Wage Employee in Manufacturing, Trade & Finance	12	1.9
Regular Wage Employee in Gulf Countries	5	0.8
Agricultural Labourers	304	48.6
MGNREGA Worker	70	11.2
Construction Workers	19	3.0
Other Casual Workers	6	1.0
Govt Salaried Employee in Community Services	16	2.6
Nurse in Private Hospitals	17	2.7
Nurse in Gulf and Non-Gulf Countries	8	1.3
Salaried Employee in Other Private Community Services	6	1.0
Salaried Employee in Gulf and Non-Gulf Countries	17	2.7
Salaried Employee in Trade, Commerce, Manufacturing & Services	31	5.0
Total	625	100.0

Source: Sample Survey.

Mini is a widowed woman aged 41 from living in Kavalam. Her husband committed suicide about 2 years ago because of loss and indebtedness resulted from farming. She has three children, the elder of them is 9 years old boy and he is mentally handicapped. Since she cannot go for job in his presence and afford education expenditure, she admitted him in a residential special school run by a Christian charity missionary in Kottayam. The second child is studying in second *standard and the third is yet to join the school. She is left with these three dependents. Mini is working as agricultural labour. She had only 35 days of work during Punja season in 2013-14, and she had no work during Virippu season due to flood. Because of this, she also took up MGNREGA work for 85 days during Punja season. During Virippu season there was no MGNREGA work due to flood. She purchases food items solely from public distribution system. Without these two social security programmes she would not have been able to survive and life the family would have been in peril.*

Another family with two members aged more than 60, Gopalan and Rajamma, live in Muttar. They have no children. They work as agricultural labourerers, however Gopalan got only 25 days of work during Punja season and Rajamma had only 32 days of work. Rajamma also engaged in MGNREA work and received 100 days of work. Rajamma said as aged person it is easy for her to work more days in MGNREA since these works are less effort taking.

Table 5.9 Distribution of Work Force by Type of Industry as per Principal Status, (in Percentage)

Sl No	Industry	Cultivator Households	Labour Households	All
1	Agriculture, forestry and fishing	52.9	78.8	72.3
2	Mining and quarrying	0.6	0.4	0.5
	Total of Primary Sector (1+2)	53.5	79.3	72.8
3	Manufacturing	3.2	3.6	3.5
4	Electricity, gas and water	0.6	0.0	0.2
5	Construction	6.4	6.2	6.2
	Total of Secondary Sector (3+4+5)	10.2	9.8	9.9
6	Wholesale and retail trade and restaurants and hotels	5.7	2.6	3.4
7	Transport, storage and communication	7.0	2.1	3.4
8	Finance, insurance, real estate and business services	3.8	0.6	1.4
9	Community, social and personal services	19.7	5.6	9.1
	Total of Tertiary Sector (6+7+8+9)	36.3	10.9	17.3
	Total (1 to 9)	100	100	100

Source: Sample Survey.

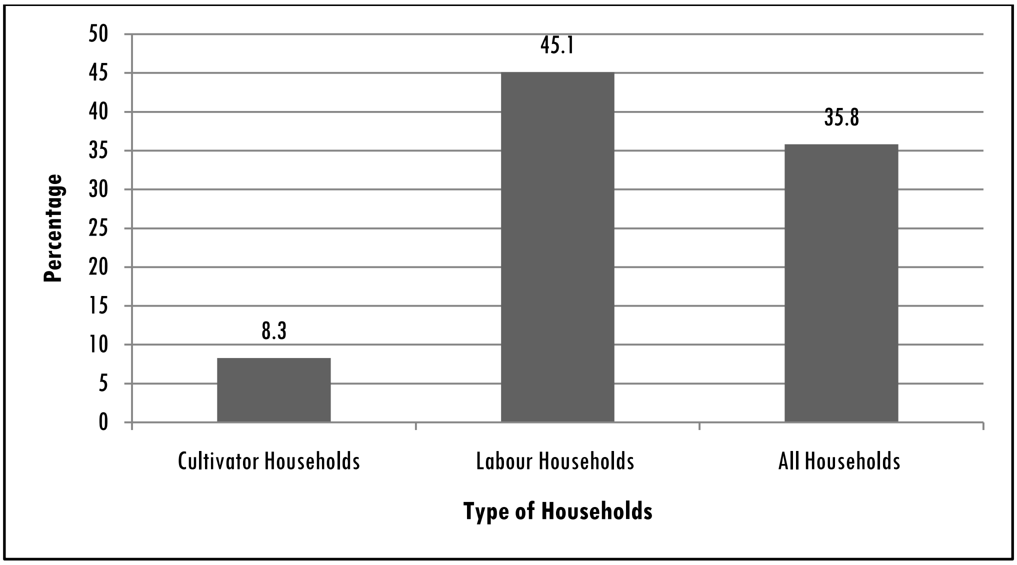
About 12 per cent of population are employed as cultivators. There are some (9%) regular salaried employees working in various services such as community services, hospitals, trade and commerce. We can also find incidence migration among the sample households, about 30 persons (5 %) in the sample population are migrants. Out of this 30, 8 persons are wage employees in gulf countries, 8 persons are nurses and 17 persons are regular salaried employees.

Further Table 5.9 presents distribution of workforce by industry. It is found that almost 73 per cent of the workforce earn their livelihood from primary sector. Proportion of Persons employed in service sector is 17 per cent of workforce and that of secondary sector is only 10 per cent. The prominent subsector is agriculture, forestry and fishing, which employs almost 72 per cent of the workforce.

5.3.3 Participation of Workers in Subsidiary Activity.

The persons employed in principal economic activity may also pursue some economic activity for a minor period over the one year as additional work; which is known as usual subsidiary activity. Normally workers from labour households try find additional works to earn extra income when income from agriculture is not sufficient to meet family expenditure. The figure 5.2 shows the incidence of subsidiary activity among workers by various types of households. The incidence of subsidiary activity is found higher among labour households than cultivator households. It is seen that 35 per cent of the total workforce are engaged in subsidiary economic activity. While 45 per cent of workers from labour households are engaged in subsidiary activity, the percentage is only 8.3 for cultivator households. Higher participation of workers from labour households in subsidiary activity, as we shall discuss in forthcoming sections, can be attributed to the less number of days of employment in agriculture. The agricultural labourers get only few days of employment for their principal activity in agriculture in a year due to single cropping and mechanisation of cultivation processes. Therefore they try to find additional jobs to improve their earnings.

Figure 5.2 Participation Rate of Workers in Subsidiary Activity by Type of Household (in Percentage)



The results provided in table 5.10 suggest that the total workers engaged in subsidiary activity numbered 224, of them 211 (94.2%) are from labour households. Further subsidiary activity mostly comprise of casual labour. Out of 224 persons, the subsidiary activity of 201 (89.7) workers take the form of casual labour. The casual labour comprise of mainly manual works such as cooli works in dry lands, loading, digging the clay, construction works, works in boats etc.. Most of the workers were saying they carry out any sort of manual work offered to them since it is very difficult to find works. They do not tend to specialize in any activity because it will limit their choices. This clearly indicates that casualisation of employment is going on in the study area among agricultural labourers.

Table 5.10 Category of Employment as per Subsidiary Status by Working Class

Category of Employment	Cultivator Households	Labour Households	All
Self Employed as Worker	2	12	14
Self Employed as Employer	8	1	9
Casual Labour	3	198	201
Total	13 (5.8)	211 (94.2)	224 (100)

Source: Sample Survey.
Note: Figures in the Parenthesis show percentage to the row total.

Let us also examine the questions what is the participation rate of principal status casual workers in subsidiary activity and which type of casual workers, agricultural or non-agricultural, participate more in subsidiary activity. Out of 224 workers with subsidiary activity, 213 are casual workers having casual work as their principal activity, and the rest 11 were self employed farmers. Further a break up of casual workers participating in subsidiary activity as agricultural and non-agricultural provided in table 5.11 reveals that 98.1 per cent casual workers are agricultural workers. The results also show wide disparity in the participation rates of subsidiary activity among agricultural and non-agricultural workers. Almost 69 per cent of agricultural workers are engaged in subsidiary activity, whereas merely 4 per cent of non-agricultural workers participate in subsidiary activity. The higher participation rate in subsidiary activity among agricultural workers and lower among non-agricultural workers again reflect that agricultural workers get only less days of work in their principal activity and non-agricultural workers get satisfactory days of work in their principal activity.[5]

[5] This argument is substantiated later by attempting a comparative analysis of number of days worked by agricultural and non-agricultural labourers in their principal activity.

Table 5.11 Participation Rate of Casual Workers in Subsidiary Activity

	Agricultural	Non-Agricultural	All
Total Number of Casual Workers	304	95	399
Number of Casual Workers Engaged in Subsidiary Employment	209	4	213
Percentage of Casual Workers Engaged in Subsidiary Employment (%)	68.8	4.2	53.4
Percentage share in Subsidiary Employment (%)	98.1	1.9	100

Source: Sample Survey.

5.4 Level of Employment and Earnings of Casual Labourers.

5.4.1 Level of Employment

We have already noted that almost 64 per cent of the workers are casual labourers including agricultural labourers and other casual workers. Unlike the regular wage or salaried employees, total earning of casual labourers depends on the level of employment, which means total number of days employed. Hence an attempt is made to assess the level of employment of casual labourers in general and agricultural labourers in particular by examining the total number of days employed. The analysis is spread across two seasons the agricultural year of 2013-14.

Data provided in table 5.12 unfolds the employment crisis experienced by casual workers in Kuttanad. It is seen that during Punja season all casual workers got work. On the other hand during Virippu season most of them are unemployed. Merely 25 per cent of the total casual workers were employed during Virippu due to lack of cultivation activities in the season. In the previous chapter we have seen that only 20 per cent of the farmers have cultivated during Virippu. During the Virippu season the region received heavy rain which ultimately resulted in flood. Most of the area was submerged under water making the cultivation and economic activities difficult to be carried out. Flood has affected not only agriculture but also all other sectors, therefore the entire region became economically inactive during Virippu season. It can be noted that only 26 per cent of agricultural workers and 20 percent of non-agricultural workers are employed during Virippu season.

Table 5.12 Level of Employment among Casual Workers as per Principal Status

	Punja	Virippu	2013-14
Number of Total Casual Workers Employed	399	100	399
Percentage of Total Casual Workers Employed (%)	100.0	25.1	100
Number of Agricultural Casual Workers Employed	304	80	304
Percentage of Agricultural Workers Employed (%)	100.0	26.3	100
Number of Non-Agricultural Workers Employed	95	20	95
Percentage of Non-Agricultural Workers Employed (%)	100	21.1	100
Days of work for Total Casual Workers (No of Days Per Worker)	42.47	21.03	47.74
Days of work for Agricultural Workers (No of Days Per Worker)	35.94	16.38	40.83
Days of work for Non-Agricultural Workers (No of Days Per Worker)	63.36	39.6	71.69

Source: Sample Survey.

Both agricultural workers and non-agricultural workers were sharing their adverse employment conditions during the survey. Workers from Chambakkulam, Kavalam and Muttar said that they could not get any job during Virippu season because these regions were flooded over the four months of the season. In Muttar the flood was worse than other region. There were even no proper transportation facilities, and region remained in isolation, affecting the entire livelihood activities in the region. Not only agricultural activities were affected, but almost all sectors were deeply affected by flood during Virippu. Consequently less work was offered during Virippu to labourers. This suggests that majority of the workers were practically unemployed during the six months in Virippu season. Agricultural workers responded that only during Punja season they get work and that too for 30 to 40 days only. They said that due to insufficiency of working days many agricultural workers are now days shifting to construction work.

However construction workers also experienced lack of work during Virippu. Therefore the construction sector is also active only during six months of Punja season and a construction worker may possibly get 30 to 40 days of work. As a coping mechanism, workers in general and construction workers in particular, resorted to short term migration. They migrate to nearby cities such as Kottayam, Kochi, Changanasseri, and Thiruvalla for construction and other works. In these areas the construction sector is active even during Virippu season. Some workers work there for the entire year due to reason that they get more days of work even during Punja in these areas than in their local area. Some casual workers, not many, migrate to Perumbavoor to work in manufacturing units during Virippu.

Therefore when we analyse the employment days of casual workers in the study region for year 2013-14 and also for two seasons, all the above discussed patterns may emerge in the results. Data on the employment days per worker given in table 5.12 reveals that there exists exorbitantly lower level of employment among casual workers, especially among agricultural workers in the study region. Taking the two seasons together for the year of 2013-14, as per principal status, on an average a casual worker received only 48 days of employment.[6] Sector wise comparison reveals that there is wide disparity in the level of employment of agricultural workers and non-agricultural workers. In 2013-14 agricultural workers had work only for about 41 days. On the other hand, non-agricultural workers received more days of employment equivalent to 72 days. However even this is not sufficient days of employments. Now the season wise comparison suggests that all casual workers had only 21 days of

[6] Combined mean is calculated since the number of workers for Punja and Virippu seasons are different.

employment during Virippu, while in Punja they had 43 days of employment. Days of work of non-agricultural workers are higher than the agricultural workers in both seasons.

The lower level of employment can be clearly understood from the distribution of workers by days employed during the period under study. Majority of the casual workers had only less than 60 days of work in 2013-14. The working days of about 46 per cent of workers range between 21 to 40 days, similarly working days of about 31 per cent of workers range between 41 to 60 days in the year of 2013-14 (table 5.13). The underemployment is worse among agricultural workers. Almost 55 per cent of agricultural workers are employed only for 21 to 40 days in 2013-14. Most of these agricultural workers got work during Punja and in Punja about 68 per cent of agricultural workers received working days between 21 and 40 days (table 5.14). The working days almost of 75 per cent of agricultural workers are less than 20 in Virippu (table 5.15). There are few agricultural labourers (6) who had more than 80 days of work in 2013-14. These labourers are working under big land lords with large fields and they work for same land lord throughout a season by supervising entire cultivation process in the fields.

Table 5.13 Distribution of Casual Workers by Days Employed in the Year 2013-14 as per Principal Status

Days Employed	Agricultural Workers		Non-Agricultural Workers		Total Casual Workers	
	No	%	No	%	No	%
1-20	17	5.6	2	2.1	19	4.8
21-40	168	55.3	15	15.8	183	45.9
41-60	90	29.6	34	35.8	124	31.1
61-80	23	7.6	20	21.1	43	10.8
81-100	3	1.0	9	9.5	12	3.0
Above 100	3	1.0	15	15.8	18	4.5
Total	304	100.0	95	100.0	399	100.0

Source: Sample Survey.

Table 5.14 Distribution of Casual Workers by Days Employed in Punja Season of 2013-14 as per Principal Status

Days Employed	Agricultural Workers		Non-Agricultural Workers		Total Casual Workers	
	No	%	No	%	No	%
1-20	24	7.9	2	2.1	26	6.5
21-40	206	67.8	16	16.8	222	55.6
41-60	61	20.1	36	37.9	97	24.3
61-80	13	4.3	20	21.1	33	8.3
81-100	0	0.0	9	9.5	9	2.3
Above 100	0	0.0	12	12.6	12	3.0
Total	304	100.0	95	100.0	399	100.0

Source: Sample Survey.

Table 5.15 Distribution of Casual Workers by Days Employed in Virippu Season of 2013-14 as per Principal Status

Days Employed	Agricultural Workers		Non-Agricultural Workers		Total Casual Workers	
	No	**%**	**No**	**%**	**No**	**%**
1-20	69	86.3	6	30.0	75	75.0
21-40	8	10.0	9	45.0	17	17.0
41-60	1	1.3	0	0.0	1	1.0
61-80	2	2.5	2	10.0	4	4.0
81-100	0	0.0	2	10.0	2	2.0
Above 100	0	0.0	1	5.0	1	1.0
Total	80	100.0	20	100.0	100	100.0

Source: Sample Survey.

In order to understand the extent of decline in days of agricultural work, let us consider the results reported by Panikkar (1978) in his study on employment and food intake among agricultural labourers in Kuttanad. He reported that male agricultural worker received work for 124 days and female workers had work for 132 days for a year when there was cultivation during both Punja and Virippu.[7]

[7] A 70 year old agricultural worker from Muttar shared his memories that, before fourty years they had agricultural work for nearly 80 to 90 days in a season. Then all cultivation processes were undertaken by labourers only. After harvesting they used to receive the full payment in the form of paddy, which they used for meeting expenditures on education and marriage of their children. Therefore all the ceremonies and functions were conducted soon after harvesting.

During Virippu male workers had 66 days of work and female workers had 72 days of work. While during Punja male workers had 57 days of work and female workers had 59 days of work. Non-agricultural activities were marginal, as it was found that men and women were employed in non-agricultural work only for 9 days and 6 days respectively.

When we make a comparison of these figures with the results of this study, the following conclusions would emerge. Firstly, there is alarming reduction in the days of employment of agricultural workers from almost 125 to 41 days. Secondly there is considerable increase in the non-agricultural activities. The days of non-agricultural work has increased considerably on an average from 9 to 72 days and the agricultural sector has become less important in terms on number of days employed. Further, unlike in 1970s then non-farm activities were marginal among agricultural workers; presently they participate in non-farm activities to supplement income earned from agriculture.

While going through the days of employment of non-agricultural workers it is seen that 36 per cent workers received working days between 41 to 60 and 21 per cent workers had work between 61 to 80 days in 2013-14 (table 5.13). There are 15 non-agricultural workers who received more than 100 days of work. Some of these workers are skilled workers like electricians and plumbers who work in other regions. Some of them are construction workers who migrated shortly to nearby urban areas in search of employment. These construction workers get more than 100 days of work. For instance, thirty five years old Suresh is a construction worker working at Kottayam. He had almost 150 days of employment in 2013-14.

The level of employment in terms of subsidiary status also needs to be assessed. We have already mentioned that mostly agricultural workers undertake subsidiary activity due to the insufficient working days in agriculture.[8] As we observed in case of principal status, subsidiary activity is also higher in Punja than in Virippu. Almost 96 per cent of the workers with subsidiary activity found employment during Punja season, whereas only 13 per cent had work during Virippu season (table 5.16). Average working day of subsidiary activity for Punja was 47 and that of Virippu was 27 days. Combining these two averages, in 2013-14 an agricultural worker received additional job for 44 days. Hence when we take the principal activity days and subsidiary activity days of agricultural labour together, they add to a total of 85 days of employment. However it is to be noted that 31 per cent of agricultural workers did not participate in subsidiary activity.

Table 5.16 Level of Employment among Casual Workers as per Subsidiary Status

	Punja	Virippu	2013-14
Number of Total Casual Workers with Subsidiary Activity Employed	204	28	213
Percentage of Total Casual Workers with Subsidiary Activity Employed (%)	95.77	13.14	100
Days of work for Total Casual Workers with Subsidiary Activity (No of Days Per Worker)	46.81	27.11	44.43

Source: Sample Survey.

The ongoing discussions reveal that there exists higher level of underemployment among casual workers of the study region. The employment days received by casual workers especially agricultural laborers are less than 100, which would indicate that for major part of the year these workers do not have any employment. There are several reasons for this higher extent of underemployment. The first and foremost among is single cropping. The cultivation process is restricted to Punja by the natural factors such as rain and flood, therefore the region is economically active only during Punja season.

8 Here for the convenience of discussion, we exclude 4 non-agricultural workers.

The second reason is that higher degree of mechanization of cultivation processes. Most of the cultivation processes such as dewatering, ploughing, and harvesting are carried out by machines. The mechanization has displaced labour from these activities and considerably reduced employment days of labour. In Muttar on experimental basis two more machines, seeding machine and pesticide spraying machine, are brought in a Padashekharam monitored by government. Presently both these activities are carried out by labourers. Pesticide spraying machine may replace 10 workers. The government has a plan to extent the usage of these machines to other areas, which will have large displacement effect on labour. Another reason is lack of manufacturing units in the region to provide employment. Increasing population pressure on land also resulted in higher level of underemployment. Discussions with labourers during survey revealed that labourers are allotted certain number of days work in a season by Padashekharam committee. Since there are many workers, an individual worker may get only less days of work.

5.4.2 Wage Rates and Earnings of Casual Workers.

Total earnings of casual workers also depend on the wage rate. Further, wage rate is widely recognised as important indicator of economic status of labourers. Wage rates of labourers by gender and sectors are given in figure 5.3. It is observed that there exists wider disparity in the wage rates of male and female workers. The wage rate of male worker is found to be much higher than the wage rate of female worker for both agricultural work and non-agricultural work. For agricultural work, on an average, a male worker is paid 535 rupees per day, while a female is paid 280 rupees. In all the selected panchayaths this disparity in wage was quite evident. In Chambakkulam and Edathua wage rate for men is 500 rupees and for women it is 260 rupees. Wage rates are higher than these in Kavalam and Muttar. In both these panchayaths men received 600 rupees per day and women received 300 rupees per day.

The gender disparity in wage rate also exists in non agricultural sectors. For non agricultural work male workers gets 580 rupees, female worker gets 180 rupees. It is interesting to note that male worker gets higher wage for non-agricultural work. On the contrary female worker gets higher wage for agricultural work. This is because of the fact that the non-agricultural work of female workers mainly comprise of MGNREGA works. The average wage rate of 180 rupees paid to women for non-agricultural work is actually the wage rate of MGNREGA. In 2013-14 the wage rate of MGNREA was 180 rupees per day.

Figure 5.3 Wage Rates of Workers by Gender and Sector

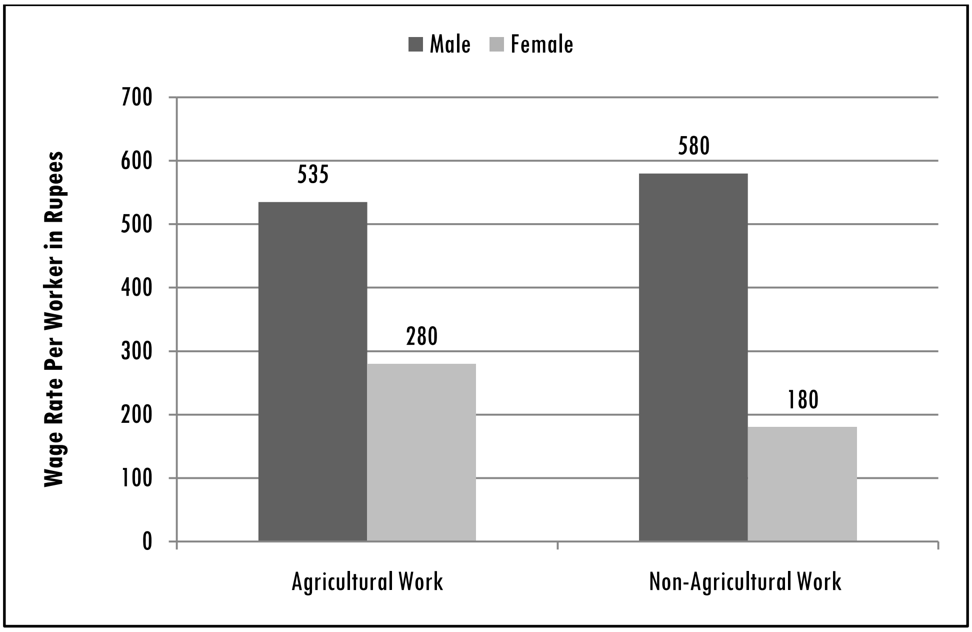


Table 5.17 Annual Earnings of Workers from Principal Employment (Earnings per Worker)

	Male	Female	All
Agricultural	22481.18	10215.33	18446.36
Non- agricultural	65790.67	10559.56	24661.12
Total	27040.07	10357.07	19914.17

Source: Sample Survey.

Table 5.17 shows the annual earnings of workers from principal employment. The annual average earning from principal employment of all kinds of workers taken together is estimated as 19914 rupees. It can be observed that earnings of non-agricultural workers are much higher than the earnings of nonagricultural workers in case of principal employment. This difference can be attributed to the higher wage rate and higher number of working days in non-agricultural activities. As we observed in case of wage rate, there is gender disparity in the annual earnings. Annual average earning of male workers is about 27040 rupees, while that of female workers is only 10357 rupees. The average annual earning of male non-agricultural workers is 65790 rupees, which highest among various categories. They were able to earn this because of higher wage rate and more working days, while the average annual earnings of male agricultural workers is low as 22481 rupees. We don't find much difference in earnings among female agricultural workers and non-agricultural workers. Though the female non-agricultural workers get more working days, due to lower wage rate their total earnings are not much higher than that of agricultural workers.

Table 5.18 Earnings of Workers from Subsidiary Employment (Earnings per Worker)

	Earnings per Worker
Male	24272.66
Female	9511.013
All	17991.11

Source: Sample Survey.

The figures given in table 5.18 are the earnings of agricultural workers from their subsidiary activity. They perform subsidiary work to earn additional income due less days of work and low income from agriculture. A male agricultural worker on an average earns 24273 rupees from subsidiary employment in a year. However a female agricultural worker earns only 9511 rupees in a year. If we add the earnings of agricultural workers from both their principal activity and subsidiary activity, the total earnings male worker would be 46,754 rupees which is still less that than the average annual earnings of non-agricultural male worker. For a female agricultural worker average earnings from both principal activity and subsidiary activity would be 19726 rupees in the year.

5.5 Household Income: Sources and Disparities in Magnitude

In this section we analyse the relative contributions of various sources to total household income. The total household income is estimated by adding the net farm income from cultivation, earnings of working members from both principal and subsidiary employment and the income from assets and other sources. A descriptive analysis of income is carried out with a view to understand the differences in average income of various kinds of households. Finally to understand the extent of income inequality among sample households, Gini coefficient is estimated.

5.5.1 Sources of Household Income

The relative contribution of various sources to total household income is presented in table 5.19. It can be observed that for the general population and also for the cultivator households remittance turns out to be the major source of income. This is because of huge amount of remittance earned by the migrants from the households. Though the migrants are very few in number, 21 from cultivator households and 10 from labour households, their earnings are large in size when compared to the native workers.

Table 5.19 Contribution of various Sources to Annual Household Income (in Percentage)

Sources of Income	Cultivator Households	Labourer Households	All
Cultivation	14.7	5.0	10.6
Agricultural Labour	0.0	23.4	9.9
MGNREGA	0.2	5.9	2.6
Non-Agricultural Labour	0.5	17.8	7.8
Regular Wage/ Salaried Employment	28.1	27.2	27.7
Own Business/Own Employment	10.2	3.0	7.1
Remittance	46.4	17.3	34.0
Other Sources	1.1	0.4	0.8
Total	100.0	100.0	100.0

Source: Sample Survey.

Contribution of remittance to the income of all households is 32 per cent and for the cultivator households it is little high as 46 per cent. The reason for the relatively higher share of remittance in the total income of cultivator households is that the migrants from these households are qualified professionals, especially nurses working in Gulf countries and non-gulf countries. In gulf countries monthly earnings of nurses on an average amount to 50,000 rupees and in other countries like Canada, UK, USA they earn more than 1 lakh rupees. The next important source for all households as well as cultivator households is regular wage and salaried employment. The contribution of regular employment to total income is about 28 per cent for all and cultivator households. The next two important sources for cultivator households are cultivation and own business or own employment. The cultivation process comes only third in terms of contribution to income. Therefore it can be concluded that land holding and cultivation activity may not necessarily lead to better economic status.

It is surprising to note that the major source of income of labour households is regular wage or salaried employment as it contributed 27 per cent of total monthly income. Agriculture labour ranks only second as source of income for labour households and only 23 per cent of total income is derived so. There are almost 60 regular wage or salaried employees in labour households. Most of them are either professional like nurses, accountant, and company employees or skilled workers like welder and Electrician. Unlike agricultural labourers these employees have consistent days of employment with relatively high remuneration, resulting in higher total earnings. Though there are more agricultural labourers, they get only less than 100 days of work and remain unemployed for the rest part of the year. Despite the high wage rate of agricultural labour than in other states, less days of employment significantly curtail their total earnings. Hence it can be inferred that agricultural labour is no longer a major source of income even for labour households. Non agricultural labour contributes about 18 per cent and remittance contributes about 17 per cent of total income. The migrants from labour households mainly comprise of nurses, company employees, skilled and unskilled workers.

Earlier in this chapter it was argued that MGNREGA provide employment to good number of women. The employment days in MGNREA are considerably high. However wage rate is only 180 rupees per day, which is considerably lower than the wage for agricultural work. Because of the lower wage rate, the total income earned form MGNREA is lower and relative share of MGNREGA in total income of labour households is quite marginal (6%).

In the analytical context of the study it should be noted here that neither cultivation nor agricultural labour contributes much to the household income. Agriculture is not appearing to be an important source of livelihood. Resultantly the younger members in the households tend to work in non-agricultural sector, especially in regular wage and salaried employments. Most of them are working as professionals and skilled workers. Some of them have migrated to gulf and non-gulf countries and also to urban centres. It is their earnings that contribute major share of total household income.

5.5.2 Disparities in Magnitude of Income

Table 5.20 reports the descriptive statistics of the monthly household income by working class. The average monthly income of all households is 17004 rupees. The coefficient of skewness suggests that the income distribution is highly positively skewed, which in turn indicate that there are few households with large income. The maximum monthly income is 4,21,250 rupees earned by an cultivator household. The minimum income is only 388 rupees, which indicates that the household incurred huge loss from cultivation, which could not be compensated even by the earnings from other sources.

Table 5.20 Descriptive Statistics of Monthly Household Income

Measure	Cultivator Households	Labourer Households	All
Mean	36927.03	10001.62	17004.2
Median	20550	6541.667	7490
Mode	30083.33	2400	2400
Standard Deviation	62055.46	10985.46	34931.92
Kurtosis	22.34192	16.3778	73.78692
Skewness	4.224246	3.573339	7.446979
Range	425504.2	80763.33	425504.2
Minimum	464.00	388.333	388.333
Maximum	421250	80375	421250

Source: Estimated from Primary Data

A comparative analysis of the average monthly incomes across various socio-economic groups is carried out using independent samples 't' test and one way ANOVA test and the results are provided in Table 5.21.[9] The results reveal that there exists glaring disparity in average monthly income of various

[9] To compare the mean values between two groups Independent Samples 't' test is used and if there are three groups One Way ANOVA test is carried out. Levene's Test for Equality of Variances is conducted and P-Values reported here are selected on the basis of results of the test with respect to equality of variance. Tables with complete results are reported in Appendix to this chapter.

socio-economic categories. The average monthly income of cultivator household is significantly higher than that of labour households. The average income of labour household is only 10002 rupees. On the other hand the average income of cultivator households is 39,927 rupees, which is two and half times higher than that of labour households. The value of standard deviations is found to be higher among cultivator households, which implies that the variation of income is higher among cultivator households.

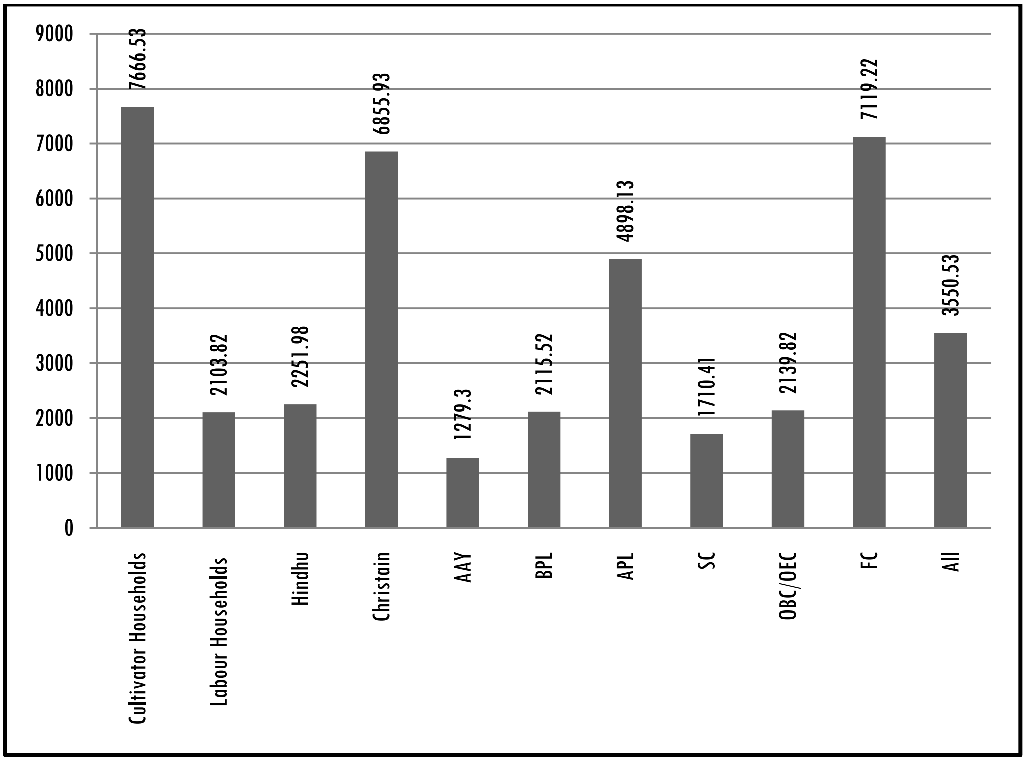
Table 5.21 Comparison of Mean Monthly Income of various Categories of Households (in thousands)

Background Characteristics	Mean Monthly Income	SD	Mean Differences		P- Value
All	17004.2	34931.92			
Working Class					
Cultivator	36927.03	62055.46	Cultivator – Labour	26925.41*	0.001
Labour	10001.62	10985.46			
Religion					
Hindu	10730.1	11425.80			
Christian	32974.7	60599.32	Hindu – Christian	-22244.5*	0.001
Family Status					
AAY	6320.8	4410.66	AAY – BPL	-3676.42	0.885
BPL	9997.2	8521.94	APL – BPL	17197.70*	0.007
APL	23518.5	45938.18	APL – AAY	7551.08**	0.060
Social Category					
SC	8557.2	8584.31	FC – SC	25838.87*	0.000
OBC/OEC	9923.9	10421.86	FC – OBC/OEC	24472.18*	0.000
FC	34396.1	58552.88	OBC/OEC – SC	1366.68	0.964

Source: Calculations based on Primary Data

Note: *,** indicates the mean difference is significant at 1 per cent and 10 per cent levels respectively.

Figure 5.4 Average Monthly Per capita Income of various Categories of Households



A religion wise comparison reveals that the average monthly income of Christian households is higher as 32,975 against average monthly income of Hindus of 10,730 rupees. With respect to the family status, the monthly average income of APL families are considerably higher than that of BPL and AAY families. Similarly with regard to the social category, the average income of forward caste households is significantly higher than that of backward castes and scheduled castes families. It is noteworthy that the pattern of income disparities is almost similar to that of disparities in land holding that we observed in the previous chapter.

However, the distribution of households by monthly income shown in table 5.22 shows a slightly different picture. Although monthly incomes of labour households are less, there are some poor households even among cultivator households having monthly income less than 5,000 rupees. Monthly incomes of 28 per cent of cultivator households are less than 5,000 rupees. These households have incurred loss in cultivation. This transitory negative shock has reduced their income for the year. However, more than 60 per cent of cultivator households have monthly income more than 10,000 rupees. There are also highly rich cultivator households having monthly income of more than one lakh. It can be observed that majority of the labour households have monthly income less than 10,000 rupees. Monthly incomes of nearly 35 per cent of labour households are less than 5,000 rupees and about 30 per cent of labour households had income between 5,000 and 10,000 rupees. However some labour households also have comparative higher monthly income, there are almost 10 households having monthly income more than 30,000 rupees.

Table 5.22 Distribution of Households by Monthly Income

Income Class	Cultivator Households		Labourer Households		All	
	No	%	No	%	No	%
0000 – 5000	20	28.2	70	34.7	90	33.0
5001-10000	8	11.3	73	36.1	81	29.7
10001-20000	7	9.9	41	20.3	48	17.6
20001-30000	6	8.5	8	4.0	14	5.1
30001-50000	14	19.7	7	3.5	21	7.7
50001-1 Lakh	10	14.1	3	1.5	13	4.8
Above 1 Lakh	6	8.5	0	0.0	6	2.2
Total	71	100.0	202	100.0	273	100.0

Source: Sample Survey.

5.5.3 Analysis of Income inequality

The presence of lower income families among cultivating households and higher income families among labour households suggest that there are income inequalities within these groups. From the earlier analysis it is evident that there exist income inequalities not only between various socio-economic groups but also within these groups. Therefore before we carry out more empirical exercise, let us first assess the pattern of decile-wise distribution of aggregate household income to understand the relative share of each deciles in aggregate income of households. It is seen from table 5.23 that the share of 1st decile (poorest households) is merely 1.02 per cent in aggregate income. Share of all the lower deciles is less than 4 per cent. On the other hand 10th decile (richest households) has got a share of almost 50 per cent in the aggregate income of all households. This reveals that top 10 per cent households contributed as much as 50 per cent of the aggregate income earned by all sample households.[10] The contribution of remaining 90 per cent of households amount to 50 per cent. The households belonging to 10th income comprise of regular salaried employees and migrants. Their main source of income is regular salary and remittances.

Table 5.23 Decile -Wise Distribution of Total Monthly Income of Households

Monthly Income Deciles	Share in Total Monthly Income of Households (%)
1st	1.02
2nd	2.09
3rd	2.53
4th	3.00
5th	3.93
6th	4.92
7th	6.43
8th	8.95
9th	16.68
10th	50.45

Source: Estimated from Primary Data

[10] As per 2009-10 data of NSSO, share of 1st decile was 2.44 per cent and share of 10th decile was 45.52 per cent in case of rural households.

It appears that differences in employment status and migration determine the inequality in income. The households with regular employees and migrants have higher income and households with casual workers have lower income. Most of the migrants and employees are qualified professionals like nurses, technicians, managers etc.. and skilled workers like welders and plumbers. Therefore the better capability attained through better education have helped them to get better job and earn higher regular income. The inequality in land holding that we observed in the previous chapter is not directly contributing income inequality because of the low net income earned from cultivation. However, land holding has helped the households to earn higher income in the past and invest for the education of their children. Further, even now days households with higher land holding can take educational loans on the collateral of their lands. Therefore even though land does not generate adequate income, it is still an important asset influencing the economic status of the households.

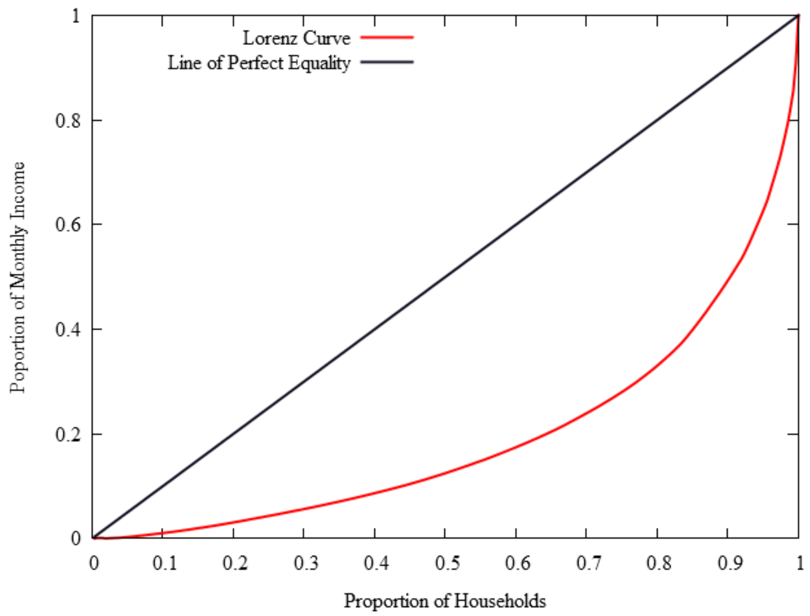
In order to understand the extent of income inequality among the sample households Gini Coefficient is estimated. The estimated value of Gini coefficient is 0.61, which indicates excessive income inequality among sample households. This value is much higher than the recent combined estimate for rural-urban areas reported by Prasad (2013). His estimate was equivalent to 0.421, which was calculated using expenditure data from 66th round of household consumption expenditure survey of NSSO. Inequality in income is theoretically expected to be higher than that of inequality in expenditure. The distribution of expenditure gets smoothened at lower and higher tales. Households with higher income save a lot and their expenditure would be considerably lower than their income. On the other hand households with extremely lower income borrow to meet expenditure and their expenditure would be higher than their income.

Table 5.24 Gini Coefficient for various Socio-economic Groups

Groups	Gini Coefficient
Cultivator	0.63
Labour	0.44
AAY	0.35
BPL	0.40
APL	0.65
Christian	0.66
Hindu	0.47
SC	0.42
OBC	0.44
FC	0.63
All	0.61

Source: Estimated from Primary Data

Figure 5.5 Lorenz Curve of Monthly Household Income



Gini coefficients for the various socio-economic classes reveal that there exists income inequality not only among the groups but also within the groups. The income inequality among cultivator households is found higher than that of labour households. This because, as we noted earlier, there are some cultivator households with migrants and regular employees and other households solely depend on agriculture. Same is reason for the inequality observed among other socio-economic groups. Inequality among Christian households is higher than that of Hindu households, because migrants more among Christian households. Similarly inequality is higher among APL households and forward castes. Most of the households with migrants and regular employees are APL families and belong to forward castes.

5.6 Conclusion

This chapter looked into the household based entitlements. Working age population forms major share of sample population. With regard to the education, members in the cultivator households have attained higher levels of education than in labour households. However, employment rate and labour force participation rates are higher for labour households. Nearly half of the sample population is employed. Gender disparity was observed in employment indicators, labour force participation rate and proportion of employed are higher among males than females. Unemployment rate of females was significantly higher than that of males. Working Members from cultivator households were mostly self employed or regularly employed, while members from labour households are mostly casual labourers. Incidence of subsidiary activity is higher among labour households due to insufficient number of working days in agriculture.

The region experienced severe underemployment. The labourers received work only during Punja season and most of them were unemployed during Virippu season. Further even during Punja season agricultural labourers received only less days of employment. Resultantly the earnings of agricultural labourers were low in the year under study. On the other hand nonagricultural labourers had comparatively more days of employment and their earnings were higher than that of agricultural labourers. Wide income disparities are observed between cultivator households and labour households. Descriptive analysis of the income data revealed that higher extent of income inequality exists among the sample households.

Appendix to Chapter V

Table 5.1A: Results of Independent Samples 't' test for Differences in Mean Monthly Income by Working Classes

Working Class	Mean Monthly Household Income	SD	If variances are	t-statistics	P- Value
Cultivator	36927.03	62055.46	Equal	5.92	0.000
Labour	10001.62	10985.46	Not equal	3.63	0.001
Mean Difference	26925.41*				
Levene's Test Statistics for Equality of Variances		F Statistics: 55.09		P- Value: 0.00	

Source: Calculations based on Primary Data

Note: * indicates the mean difference is significant at 1 per cent level.

Table 5.2A: Results of Independent Samples 't' test for Differences in Mean Monthly Income by Religious Status

Religion	Mean Monthly Household Income	SD	If variances are	t-statistics	P- Value
Hindu	10730.1	11425.80	Equal	-4.93	0.000
Christian	32974.7	60599.32	Not equal	-3.19	0.001
Mean Difference	-22244.59*				
Levene's Test Statistics for Equality of Variances		F Statistics: 51.70		P- Value: 0.00	

Source: Calculations based on Primary Data

Note: * indicates the mean difference is significant at 1 per cent level.

Table 5.3A: Results of One Way ANOVA for Differences in Mean Monthly Income by Family Status

Family Status	Mean Monthly Household Income	SD	Mean Differences from Post Hoc Tests for Multiple Comparison		P- Value
AAY	6320.8	4410.66	AAY – BPL	-3676.42	0.885
BPL	9997.2	8521.94	APL – BPL	17197.70*	0.007
APL	23518.5	45938.18	APL – AAY	7551.08***	0.060
ANOVA Results		F Statistics: 5.93		P- Value: 0.003	

Source: Calculations based on Primary Data

Note: *,*** indicates the mean difference is significant at 1 per cent and 10 per cent levels respectively.

Table 5.4A: Results of One Way ANOVA for Differences in Mean Monthly Income by Social Category

Social Category	Mean Monthly Household Income	SD	Mean Differences from Post Hoc Tests for Multiple Comparison		P- Value
SC	8557.2	8584.31	SC – OBC/OEC	25838.87*	0.000
OBC/OEC	9923.9	10421.86	FC – OBC/OEC	24472.18*	0.000
FC	34396.1	58552.88	FC – SC	1366.68	0.964
ANOVA Results		F Statistics: 16.18		P- Value: 0.000	

Source: Calculations based on Primary Data

Note: * indicates the mean difference is significant at 1 per cent level.

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Chapter 6

FOOD, CALORIE AND NUTRIENT INTAKES AND FOOD SECURITY STATUS OF HOUSEHOLDS

Contents

6.1 Introduction

The main aim of this chapter is to examine the level of food, energy and nutrient intakes of sample households with the help of data collected through a diet survey. In the previous two chapters, we have examined production based entitlements and household based entitlements and the total income thereby generated. In this chapter we try to address the question whether the differences in entitlements and income resulted in disparities in levels of food and energy intake among various socio-economic groups. An attempt is also made to understand the relative roles of own food production, public distribution system and open market to total cereal intake of various types of households. The data on food intake is converted into equivalent amount of calorie, protein and fat intake using the conversion table of Indian Council of Medical Research (ICMR) prepared by Gopalan et al. (1971) and revised and updated by Rao et al. (1989). The food, calorie, protein and fat intakes are then compared with Recommended Dietary

Allowance (RDA) of ICMR. Finally and most importantly, incidence of food insecurity measured in terms of calorie deficiency is examined by comparing the actual per capita calorie intake per day of the household with the threshold norm suggested by Food and Agricultural Organisation (FAO). Then an empirical analysis is carried out to analyse the determinants of food security status by employing Binary Probit model.

Rest of the chapter is organised as follows. Section 6.2 discusses the housing conditions of the households since they are expected to influence the food utilisation. Section 6.3 elaborates the nature of the diet survey conducted. In section 6.4 level and various sources of cereal consumption are examined. Section 6.5 analyses the average household consumption of various food items and also verify whether these consumption levels meet recommended norms. In section 6.6 we examine the level and sources of calorie and nutrient intake of the households and also the extent of calorie diversity. In this section a comparative analysis of average calorie intakes of various categories of households is also carried out. Section 6.7 offers a detailed analysis of incidence of food insecurity among households with the descriptions on the definition of food security and choice of calorie norm. Section 6.8 attempts to answer the question what determines the food security status of households with the help of econometric analysis. An empirical analysis of the determinants of dietary diversity is attempted in section 6.9. Finally section 6.10 concludes the chapter.

6.2 Housing Conditions

Housing conditions, especially the availability of drinking water, can influence the utilisation of food. Proper utilisation of available food through clean water and proper sanitation facilities can enhance nutritional status. It can be observed from table 6.1 that most of the cultivating households live in pucca house, while majority of labour households live semi pucca house.

Availability of clean drinking water is a major issue in Kuttanad because of the salt and acidic contents in the soil. Only few households have their own well. Only 21 per cent of cultivator households and 10 per cent of labour household have their own well. Majority of the households depend own public taps for drinking water. Almost 51 per cent of the households depend on the public taps for the drinking water. There are some households purchasing water from private agencies. These households are from Kavalam Pnchayath. There is no water supply in some areas of Kavalam.

Table 6.1 Housing Conditions of Households (in Percentage)

	Cultivating Households	Labour Households	All Households
Type of House			
Hut	1.4	5.9	4.8
Kutcha	0.0	12.9	9.5
Semi Pucca	5.6	48.5	37.4
Pucca	93.0	32.7	48.4
Source of Drinking Water			
Own well	21.1	5.4	9.5
Nieghbour's Well	2.8	12.9	10.3
Public Tap	50.7	50.5	50.5
Private Water Supply	21.1	29.7	27.1
Rain Water Harvest	2.8	0.5	1.1
Rain Water & Lake Water	1.4	1.0	1.1
Lighting Energy Source			
Electricity	100.0	98.0	98.5
Kerosine	0.0	2.0	1.5
Cooking Energy Source			
Firewood	0.0	18.3	13.6
Both firewood & Gas stove	100.0	81.7	86.4
Total	100	100	100

Source: Sample Survey.

These households have to make an expense of 400 to 600 rupees for purchasing drinking water in a month. Nearly 99 per cent of houses are electrified. About 86 per cent of the households use both firewood and gas for cooking and only 14 of the households solely depend on the firewood. Higher usage of gas for cooking even by labour households does not necessarily indicate higher standard of living. Firewood is not available in plenty and also costly to purchase due to fact that there is no forest area in the sample panchayaths.

6.3 Nature of Diet Survey

The data on food intake were obtained through interview method. The details about the quantities of food items prepared and consumed with in the household were collected from the housewife or the female member involved in the preparation of food. For this purpose the study has used the type 1 schedule of NSSO for the consumer expenditure survey. All the major food items given in the NSSO schedule under the categories of cereals, pulses, milk and milk products, edible oil, meat, vegetables, fruits, spices etc.. were included in the questionnaire. However, there is a chance that NSSO schedule may not include the locally available food items. To avoid this problem, a pilot survey was conducted initially to understand the various food items consumed by the households in the study region. As per findings of the pilot survey, some irrelevant food items were removed from the schedule and some locally consumed vegetables, fruits and other food items were added in the schedule. The final list of food items in the schedule consists of 100 food items. In case of cereals the source of purchase is also asked to understand the relative contributions of own production, PDS, and open market to the cereal consumption by various types of families.

For collecting the data on food intake, 30 days reference (recall) period is used for all food items as per the methodology followed by NSSO for type 1 schedule. Reference or recall period is the period of time for which data on consumption is collected. Informations on the meals, drinks and other food items consumed by the members outside home are also collected. The quantity used for recording the consumption of food items was kilograms. However consumption of some items such as eggs, lemon, banana, pineapple, coconut etc.. were recorded in numbers. At most care was taken to record the intake of all food item by the members of households both within the home and outside home.

The household consumption survey is based on certain assumptions. Firstly it is assumed that foods are distributed within the household based on the energy requirements of the households. This assumption limits the scope of survey that we cannot study the inequality in intrahousehold distribution of the survey. It is also assumed that food prepared are neither wasted nor fed to animals. Another assumption is that food prepared is not shared outside the household. Despite these limitations household consumption surveys are effective tool to assess the level of per capita consumption of food at the household level.

6.4 Level and Sources of Cereal Consumption.

Cereals contribute nearly half of the calorie intake in Kerala, 45.1 per cent in rural areas and 43.0 per cent in urban areas in 2011-12. Rice is the major food item in Kerala. Therefore firstly we examine the level and sources of cereal consumption for various groups of households with a focus on rice. Mainly there are four sources, own production, Public Distribution System

(PDS), Maveli store and open market. Maveli stores are fair price shops run by the Kerala Civil Supplies Corporation (Supplyco) as a market intervention programme of the state government. Maveli stores sell major food items such as cereals, pulses, spices at subsidised prices through.

It is seen from table 6.2 that the contribution of own food production to rice consumption is meager, even for cultivator households. Only 6 per cent of all households and 15.5 per cent of the cultivator households consume rice from own production.[1] On the other hand, public distribution system (PDS) contributes significantly to the cereal consumption of households, especially of labour households. The proportion of cultivator households purchasing rice from PDS is 66 per cent and that of labour households is 99 per cent. In case of wheat the respective proportion are 52 per cent and 94 per cent. The average quantity of monthly rice purchase from PDS by labour households is 16.33 kg per household, which is much higher that of cultivator households (8.53 kg). This is because of the fact that labour households consist of AAY and BPL families whose PDS entitlements are higher. The dependence on open market is higher for cultivator households. Almost 94 per cent of cultivator households purchase rice from open market and the mean quantity is about 22 kg. The proportion of labour households depending on open market for rice is relatively less (74%) and mean quantity of monthly purchase is also less (12.63 kg). Households also purchase from maveli stores, although the quantity of purchase is less.

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[1] Mean quantity of the consumption is found to be high as it is calculated by taking only the households consuming their own produce.

Table 6.2 Level and Sources of Monthly Cereal Consumption

	Own Production		PDS		Maveli Stores		Open Market		All
	% of Households	Mean Quantity (kg)	% of Households	Mean Quantity (kg)	% of Households	Mean Quantity (kg)	% of Households	Mean Quantity (kg)	Mean Quantity (kg)
Working Class					Rice				
Cultivator Households	15.5	14.45	66.2	8.53	26.8	6.73	94.4	22.09	30.53
Labour Households	3.5	17.71	98.5	16.33	64.4	6.39	73.8	12.63	30.14
Family Status									
AAY	0.0	0	100	25.16	62.5	6.73	37.5	5.22	31.33
BPL	1.0	10	100.0	20.97	69.3	6.82	64.4	7.47	30.61
APL	11.5	16.05	81.8	7.68	43.2	5.93	95.9	19.93	29.81
All	6.6	15.72	90.4	14.84	54.0	6.41	79.4	15.56	30.24
					Wheat				
Working Class									
Cultivator Households	0	0	52.1	2.75	14.1	2.2	74.6	3.32	4.22
Labour Households	0	0	93.6	3.32	36.6	2.02	30.2	2.31	4.55
Family Status									
AAY	0	0	100.0	3.91	41.7	2.2	12.5	2.66	5.16
BPL	0	0	98.0	3.91	38.6	2.12	23.8	2.2	5.18
APL	0	0	69.6	2.4	23.6	1.91	58.8	2.94	3.85
All	**0**	**0**	**83.1**	**3.23**	**30.9**	**2.04**	**41.9**	**2.78**	4.46

Source: Estimated from Primary Data

When we assess the consumption from various sources by family status (type of ration card), it appears that public distribution system serves the requirement of poor families. In 2014 under the Targeted Public Distribution System in Kerala there were three types of ration cards, Above Poverty line (APL), Below Poverty line (BPL) and Anthyodaya Anna Yojana (AAY).[2] The entitlements were different for different card holders. Both BPL and AAY families received fixed quantities of food grains per month at subsidized price,

2 This classification existed before the implementation of National Food Security Act (NFSA).

while APL families received food grains at higher price. The supply price of rice was Rs.8.90 for APL families, Rs. 1 for both BPL and AAY families. Similarly supply price of wheat was Rs. 6.70 for APL families and Rs. 2 for BPL and APL families. Anthyodaya Anna Yojana (AAY) was a special scheme to provide 35 kg rice per month at Rs 1 to the poorest of the poor under BPL category.

Table 6.2 shows that 100 per cent of BPL and AAY families purchase rice from PDS, while 82 per cent of APL households purchase rice from PDS. Due to the subsidised price the quantity of monthly purchase of rice by BPL and AAY families is much higher than APL families. The average quantity of monthly purchase of rice from PDS is 25.16 kg per for AAY families, 20.97 kg for BPL families and only 7.68 kg for APL families. As a result the dependence on open market for rice consumption is less for AAY and BPL families and higher for APL families. Only 38 per cent AAY families and 64 per cent BPL families purchase some amount of rice from open market. The mean quantity of their monthly purchase from open market is less than 8 kg. On the other hand almost 96 per cent of APL families purchase rice from open market and the mean quantity of their monthly purchase is 19.93 kg. All type of families purchase rice from fair price shops approximately about 6 kg in a month and the proportion is more than 60 per cent for AAY and BPL families. With regard to wheat consumption 100 per cent of AAY families and 98 per cent of BPL families on an average purchase 3.91 kg in a month from PDS, while 70 per cent of APL families purchase 2.4 kg of wheat in a month from PDS. Some AAY and BPL households purchase wheat from fair price shops and very few of them are depending on open market for wheat. But 59 per cent of the APL families purchase wheat from open market.

The important inference that can be made from table 6.2 is that there are no considerable differences in the average monthly cereal intake among various categories of household. Poor households also consume as much as the rich households. There are two reasons for this. Firstly the AAY and APL households get subsidised food grains from PDS and fair price shops, which enable them to maintain normal level of consumption. Second reason is that the rich households usually try to diversify their consumption towards non-cereal items such as fruits and meats resultantly their cereal consumption level remains at a certain level, even if income rises.

Table 6.3 Contribution of PDS to total Cereal Consumption (in Percentage to total Cereal Consumption per Household)

Background Features	Rice	Wheat	Total Cereals (Rice + Wheat)
Working Class			
Cultivator Households	30.5	62.2	31.02
Labour Households	55.6	73.5	56.87
Family Status			
AAY	81.3	77.2	80.6
BPL	70.7	76.4	72.0
APL	28.2	66.4	29.8
All	50.8	71.9	51.70

Source: Estimated from Primary Data

Table 6.3 presents evidences for contribution of public distribution system to total cereal consumption of households. Labour households met 57 per cent of total cereal consumption from PDS. Similarly about 81 per cent cereal consumption of AAY and 72 per cent of the BPL families are contributed by the PDS. These evidences suggest that PDS contributes more than 70 per cent of cereal consumption of AAY and BPL families. APL families also obtained 30 per cent of total cereals consumed from PDS; the lower share is due to lower allotment and higher issue price.

Contribution of PDS also can be analysed in terms of implicit income transfer through subsidised price. Implicit income transfer means income transferred to the households in kind (not in cash) through subsidised food grains. Income transfer through PDS to households can be calculated as Net gain accruing to the households from PDS purchase. Net gain to the households is estimated by deducting the actual expenditure incurred on the monthly PDS purchase of food grains from the total expenditure that has to be made in open market to purchase same quantity of food grains. The estimated income transfer to the households through subsidized PDS food grains is furnished in table 6.4. The income gain to the AAY families is as much as Rs. 953 per household in a month. Income gain to the BPL families is little more than Rs 800. APL families also get an income transfer not less than Rs. 200.

Table 6.4 Income Transfer through PDS (Net Gain in Rupees Per Household)

	Rice	Wheat	Sugar	Total (Rice + Wheat + Sugar)
AAY	805.33	101.83	45.52	952.69
BPL	671.05	101.89	33.95	803.20
APL	185.23	51.28	0.0	221.56
All	445.19	78.82	36.26	526.73

Source: Estimated from Primary Data

6.5 Food Intake among Sample Households

A balanced and diversified diet is always recommended by nutritional agencies since it increases the chances of nutrient adequacy. Therefore diet quality is important for maintaining good health. Further, quantity of dietary intake should be sufficient enough to meet the energy and nutrient requirements of individual members. Along with cereals, pulses and roots a well diversified diet includes nutrient dense food such as vegetables, fruits and animal source foods. The dietary diversity to a greater extent has been influenced by socio-economic factors. Most importantly an increase in income would result in the consumption of more nutritious food such as meat, vegetables and fruits.

Therefore in this section we analyse the food composition of the sample households. Further, to understand the level of food intake among various types of households, average intake of various food items per household per day is estimated. Then these per day intake of various food items by households are compared with the quantities of balanced Indian diet recommended by Indian Council of Medical Research (ICMR) in its report on "Nutrient Requirements and Recommended Dietary Allowances for Indians" published in 2009. The composition of the balanced diet is based on recommended dietary allowance (RDA) of ICMR published in the report. The present study has considered the balanced diet recommended for an adult man doing sedentary work for the reason explained below.

6.5.1 Recommended Dietary Allowance (RDA) and Balanced Diet

Recommended dietary allowance (RDA) is defined as the average daily dietary nutrient intake level sufficient to meet the nutrient requirement of nearly all (97 to 98 percent) healthy individuals in a particular life stage and gender group (ICMR, 2010). RDA includes minimum requirements plus a safety factor added to cover the variation between individuals, dietary traditions and practices. Requirements refers to the quantities of nutrients that healthy individual must obtain from the food to meet their physiological needs. Therefore RDA refers to the estimates of nutrients to be consumed daily to ensure the requirements of all individuals in a given population.

To meet these required amounts of nutrients a balanced diet is proposed by ICMR. Balanced diet is a practical prescription for the consumption of a basket of major food items such as cereals, pulses, fruits, vegetables, milk, meat etc. which is likely to provide nutrients in required amount and proper proportions. A balanced diet should provide around 50-60% of total calories from carbohydrates, preferably from complex carbohydrates, about 10-15% from proteins and 20-30% from both visible and invisible fat (NNMB, 2012). In addition to these, it also must provide other non-nutrients such as dietary fibre, antioxidants and phytochemicals which bestow positive health benefits. Though ICMR was making recommendations on safe dietary intake for Indians, the advisory committee of ICMR in 1984 seriously reviewed the matter in detail and formulated a new set of recommendations with regard to balanced diets for Indians based on the concept of 'least cost' (Nawani,1994). The committee had made the recommended diet more practical by reducing the quantities of pulses and green leafy vegetables without sacrificing the nutrient content. The subsequent reports include the balanced diet suggested for different groups belonging to different sex, age, and activity status.

6.5.2 The Consumer Unit (CU)

The food and energy requirement of a household usually vary depending up on the age and sex composition of the households. Households with more adult members would normally require more food than the households with more children because the energy requirements of adults are higher. Therefore it is necessary to adjust for age sex composition of the household while calculating the per capita food and energy intakes. For this purpose FAO uses a variable named ‘Adult Equivalent Unit (AEU)’. NSSO termed AEU as Consumer Unit (CU). Since in Indian context both NSSO and NNMB uses the term Consumer unit the present study also use the same. The household consumer unit variable takes into account the changes in age sex composition of the household and varying individual energy requirements.

The household consumer unit is a variable indicating the energy requirements of a group of household members of different sexes and ages. The household consumer unit variable is constructed as the sum of individual consumer units of all members in the household. Consumer unit of a member is estimated as a ratio of age sex group calorie requirement to the calorie requirement of male reference individual. In India reference individual is a male in the age of 20-39 doing sedentary work. Therefore the calorie requirement of male in the age of 20-39 doing sedentary work is considered as referent value. The consumer units of males and females in other age groups are expressed as the ratio of their age sex specific calorie requirements to the referent value. Therefore consumer unit can be considered as the normative rate of energy equivalence of a person belonging to specific age-sex group in relation to a 'standard' male person aged 20-39 years and doing sedentary work (Government of India [GOI], 2014). The consumer unit for the standard male person is '1'. The consumer units for other persons are estimated on the basis of their calorie requirement. The values of individual consumer unit are provided by NSSO and are presented in the table 6.5. Now the household consumer unit is taken as the aggregate of the individual consumer units of household members.[3] For instance a household comprising of men aged 42 (CU=0.95), women aged 38 (CU=0.71) and a boy aged 9 (CU=0.87) will have 2.53 consumer units (0.95+0.71+0.87). After this calculation, the average intake of food items per consumer unit per day is estimated by dividing total dietary intake per day by the consumer unit. This conversion of total food

[3] The persons who were absent in the house during the one month reference and did not consume from the home period were excluded from this calculation.

intake into per consumer unit intake facilitates the comparison across households with persons belonging to various age and sex groups.

Table 6.5 Number of Consumer Units Assigned to a Person

Age in Completed Years	Male	Female
1	0.43	0.43
1-3	0.54	0.54
4-6	0.72	0.72
7-9	0.87	0.87
10-12	1.03	0.93
13-15	0.97	0.80
16-19	1.02	0.75
20-39	1.00	0.71
40-49	0.95	0.68
50-59	0.90	0.64
60-69	0.80	0.51
70+	0.70	0.50

Source: Nutritional Intake in India 2011-12, National Sample Survey Organization, Ministry of Statistics and Programme Implementation, Government of India, 2014.

6.5.3 Average Consumption of various Food Items by the Households

The average consumption of major food items by working class and family status is provided in table 6.6. Further average consumption of major food items by income quartile groups are provided in table 6.7. Since the average food intake data is expressed in adult equivalent scale, it can be compared with the balanced diet of the adult man doing sedentary work. The results reveal that the average cereal intake per consumer unit per day of households in general is 335 grams, which is less than the recommended level of 375 grams. The average cereal intakes per day of various types of households are less than the recommended level except in case of 4th income quartile group. Average daily cereal intake of 4th income quartile group is

395.13 grams per consumer unit, which is higher than the recommended level. The average cereal intake per day of cultivator households is 368.2 grams, which close to the recommended level and much higher than that of labour households (323.4 grams). It can be noted that average per day intake of cereals of APL families is higher than that of BPL and AAY families. The cereals are energy rich foods, shortage of which would result in the lower energy intake.

Tapioca has been a major cereal substitute in Kerala, especially in the study area, though it was generally considered as an inferior food item. It can be inferred from the results that average intake of tapioca is low in general among the sample households. There are two reasons for lower consumption of tapioca. Firstly it is very costly due to higher demand from toddy shops and restaurants; 1 kg tapioca costs about 28 rupees. Second reason is that the elder members in many households suffer from diabetes and high blood pressure; therefore they reduce the consumption of calorie rich tapioca. However both cultivator households and fourth income quartile household consume as twice quantity of tapioca than their poor counterparts. In case of cultivator households when we add cereal consumption and tapioca consumption, the total amount of daily consumption of cereal and cereal substitute would cross the recommended quantity of cereal intake.

Table 6.6 Average Household Consumption of various Food items by Working Class and Family Status (grams per consumer unit per day)

Food Items	Cultivator Households	Labour Households	AAY	APL	BPL	All
Rice	312.68	275.59	269.09	292.61	278.27	285.24
Wheat	43.61	42.06	46.00	38.46	47.48	42.46
Other cereals	11.91	5.75	2.72	9.64	5.09	7.35
Total Cereals	368.2	323.4	317.81	340.71	330.84	335.05
Tapoica	17.18	8.66	5.02	13.76	8.05	10.88
Pulses	17.72	11.76	8.58	15.33	11.47	13.31
Milk and Milk Products	143.25	68.72	44.04	109.00	67.95	88.10
Meat	28.35	9.83	4.59	20.00	9.19	14.65
Fish	147.26	76.44	54.87	114.71	75.28	94.86
Egg	0.15	0.09	0.08	0.12	0.09	0.11*
Edible Oil	34.66	23.10	17.96	28.99	23.83	26.11
Roots and Tubers	38.67	27.51	24.11	33.72	27.05	30.41
Green Leafy & Other Vegetables	84.73	46.67	37.99	66.98	45.73	56.57
Fresh fruits	208.70	126.75	102.42	172.64	122.90	148.06
Dry Fruits	0.40	0.08	0.02	0.24	0.12	0.16
Sugar	30.97	25.90	26.10	27.51	27.06	27.22
Spices	30.97	20.71	16.62	26.88	20.47	23.61
Sweets and Bakery items	13.95	5.88	3.67	10.22	5.72	7.98
Miscellaneous	23.19	21.40	13.73	20.39	25.95	21.86

Source: Estimated from Primary Data
*Note: *Indicates quantity is shown in number.*

The average intake of pulses is also much less than the recommended daily intake of 32 grams per day for all type of households. In case of consumption of milk and milk products only cultivator households and 4th income quartile group have average intake higher than the required norm of 120 milliliters per day. For all other households the consumption of milk and milk products is less than the prescribed norm. The average intake of milk and Milk products by the cultivator households is 143.25 milliliters per consumer unit per day, while that of labour households is only 68.72 milliliters. Similar difference also exists in milk consumption between 1st income quartile group (73.91 grams) and 4th income quartile group (152.91 grams). Milk consists of important vitamins and minerals promoting the growth of the body, lower consumption which would affect the nutritional status of children. The average intake of protective green leafy and other vegetable by all households is less than the recommended level of 90 grams per day. The average consumption of green leafy and other vegetables of cultivator households was 84.73 grams per consumer unit per day, and that of labour households was only 46.67 grams.

Table 6.7 Average Household Intake of various Food Items of by Income Quartile Groups (grams per consumer unit per day)

Food Items	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile	All
Rice	274.81	278.42	299.49	340.41	285.24
Wheat	43.39	48.83	47.53	43.05	42.46
Other cereals	5.12	6.38	7.33	11.67	7.35
Total Cereals	323.32	333.63	354.35	395.13	335.05
Tapoica	8.12	8.69	12.50	16.76	10.88
Pulses	11.80	11.78	14.43	17.90	13.31
Milk and Milk Products	73.91	63.33	90.26	152.91	88.10
Meat	8.53	9.22	15.82	28.87	14.65
Fish	82.85	78.06	97.00	139.58	94.86
Egg*	0.09	0.10	0.11	0.15	0.11*
Edible Oil	24.28	22.15	30.60	33.37	26.11
Roots and Tubers	29.69	27.16	32.70	37.81	30.41
Green Leafy & Other Vegetables	49.85	46.64	56.73	84.62	56.57
Fresh fruits	135.76	134.57	152.05	196.30	148.06
Dry Fruits	0.11	0.10	0.31	0.23	0.16
Sugar	26.71	25.64	29.24	32.59	27.22
Spices	22.35	20.71	25.26	30.64	23.61
Sweets and Bakery items	6.24	5.26	9.49	12.76	7.98
Miscellaneous	17.88	16.82	33.28	23.01	21.86

Source: Estimated from Primary Data
*Note: *Indicates quantity is shown in number.*

It is interesting to note that the average consumption of fresh fruits by all type of households is much higher than the recommended level of 25 grams per day. The reason is that, in addition to the fruits purchased from the market household consume the fruits available in their homestead and neighbor areas. The homely grown fruit items such as Jackfruit, Mango, Papaya and Guava are consumed by households, especially poor households; resultantly the average consumption is above the prescribed norm. However the differences exist between cultivator households and labour households and also among bottom and top income classes in average consumption. The cultivator households consumed on average 208.70 grams fresh fruits per consumer unit per day, while labour households consumed 126.75 grams per consumer unit per day. Similar differences are also found between bottom income class and top income class.

Average intake of fat items is also found to be higher than the suggested level. Adding edible and oil meat items together the average consumption of fat items per household was found to be much higher than the suggested level of 32 grams per day. Fish forms the major share of fat intake, for cultivator households average fish intake was 147.26 grams consumer unit per day, but labour households consumed 76.44 grams. The consumption of meat is less when compared to fish consumption. The reason for the higher consumption of fish is that inland fish is available in plenty from lake and canals and price of inland fish is also low. Households can also catch fish from lake for own consumption. Sea fish is also available in the area that is brought from Alappuzha sea shore.

While analysing the consumption pattern it appears that households consume less of recommended quantity of cereals and more of recommended quantity non-cereal items, especially fruits and meat items. Further the rich households consume more than the poor households. There is close association between income and food intake among households as the quantity of consumption of cereal and non-cereal items are higher among 4th quartile than 1st quartile group. The consumption of non-cereal items such as fruits and meats by the cultivator households is much higher than that of labour households. Similarly the consumption of non-cereal items by the 4th income quartile households is much higher than that of 1st income quartile households. Therefore it can be concluded that there is a diversification of food consumption pattern among higher income households in favour of non-cereal items.

6.6 Energy and Nutrient Intake and Food Insecurity among Households.

In this section we make a comparative analysis of average household energy and nutrient intakes among various socio-economic groups. The aim this analysis is to examine whether the differences in entitlements and income levels resulted in different levels of energy and nutrient intake. Human beings need energy to carry out essential functions such as respiration, blood circulation, and digestion and also to involve in physical activities. Further to live a healthy life without any disease wide range of nutrients are required. The dietary intake should be sufficient enough to meet these energy and nutrient requirements. Nutrients are substances present in the food which can provide energy, promote growth and maintain normal functioning of the body. Various food items contain different kind of nutrients in different proportions. Major nutrients are protein, fat, carbohydrate, vitamins and minerals. They can be classified as macronutrients and micro nutrients. Macro nutrients such as Carbohydrate, protein, and fat provide energy in the form of calories to human body. Energy is usually measured in Kilo calories (kcal), which is defined as the heat required to raise the temperature of one kg of water by 1C from 14.5C to 15.5C (ICMR, 2010). As a result in the studies on food security the term “calorie” is often interchangeably used with the term “energy”. Micronutrients such as vitamins and minerals are essential for physiological and biochemical processes.

To measure the caloric and nutrients intakes, the quantities of various food items consumed by the households are converted into resulting amount of calories (energy), protein and fats (nutrients) intakes on the basis of a nutrition chart provided in an ICMR report titled “Nutritive Value of Indian Foods” prepared by Gopalan et al. (1971) and revised and updated by Rao et al. (1989). The report provides the calorie, protein, fat and other nutrient content of various Indian food items. After the conversion, aggregate energy and nutrients intake per day by the households are divided by the consumer units to arrive at the per consumer unit energy and nutrient intakes. This conversion facilitates the comparison of average daily calorie intake with RDA norms of ICMR for the reference individual (adult man doing sedentary work).

6.6.2 Average Household Calorie and Nutrient Intakes

Firstly let us examine the level of calorie intake of sample population in general. The average calorie and nutrient intake is in adult equivalent scales and therefore can be compared with Recommended Dietary Allowance (RDA) of ICMR for the reference individual. The RDAs for adult man doing sedentary work is 2320 calories, 60 gram protein 25 grams fat per day. As we noted earlier RDA covers minimum requirement plus a margin of safety. Therefore in case of energy intake we also use FAO’s norm of 1800 calories, which considers only minimum energy requirement for a person, to understand whether actual intake of households meet satisfactory energy requirement. The results shown in table 6.8 reveal that the average daily calorie intake of sample households in general is 2113 kcal per consumer unit, which less than the ICMR RDA norm, however higher than the minimum requirement suggested by FAO . It is to be noted that this level of calorie intake is less than the average calorie intake per consumer unit per day of rural households in Kerala reported by NSSO for the year 2011-12. With respect to protein, average daily intake is higher, which is 62.74 grams per consumer unit against the recommended level of 60 grams (table 6.9). Similarly average fat intake is 46.01 grams per consumer unit per day, which is also higher than the suggested level of 25 grams per day by ICMR. In general lower energy intake seems to be the major problem among the sample population not the lower nutrient intake. However, there are differences among various socio-economic groups.

Table 6.8 Comparison of Average Household Calorie Intake (kcal Per Consumer Unit Per Day)

Background Characteristics	Average Calorie Intake	SD	Mean Differences		P- Value
All	2113.38				
Working Class					
Cultivator	2565.90	701.55	Cultivator - Labour	611.58*	0.000
Labour	1954.31	529.16			
Religion					
Hindu	2013.47	589.16			
Christian	2367.66	685.97	Hindu- Christian	-354.18*	0.000
Family Status					
AAY	1828.33	506.75	AAY – BPL	-168.21	0.460
BPL	1996.55	562.81	APL – BPL	242.76*	0.008
APL	2239.32	675.75	APL – AAY	410.98*	0.008
Social Category					
SC	1891.32	597.51	FC-SC	517.06*	0.000
OBC/OEC	2024.32	587.75	FC-OBC/OEC	384.06*	0.000
FC	2408.38	644.01	OBC/OEC-SC	133.00	0.362

Source: Calculations based on Primary Data
*Note: *, indicates the mean difference is significant at 1 per cent level.*

A comparative analysis of the average daily unit calorie intake per consumer unit across various socio-economic groups is conducted and the observed differences are tested for significance with the help of independent samples "t" test and one way ANOVA test.[4] Among the various categories, cultivators, Christians, and forward castes maintained average calorie intake per person above the recommended level of ICMR (2320 kcal). All other categories of households have calorie intake less than the recommended level of ICMR. However their average calorie intake per day is still higher than the minimum norm of FAO, thanks to distribution policies of the government. Comparisons across categories reveal that the differences in calorie intakes exist between the categories for which income differences were observed in the previous chapter. With respect to working class, a significant difference is observed in average daily calorie intake between cultivator households and labour households. Average calorie intake of cultivator households is 2565.90 calories per consumer unit per day, which higher than that of labour households by 611 calories. Religion wise comparison reveals that the calorie intake of Christian households is higher than that of Hindu households. With regard to family status, average daily calorie intake of APL families is much higher that of BPL and AAY families. Average calorie intake of forward castes is also higher than that of backward and scheduled castes. Therefore it can be inferred that level of income significantly influence calorie intake. Calorie intake of the AAY families is the lowest.

It is seen from the table 6.9 that protein intakes of cultivator households, Christian, Forward caste and APL families on an average are higher than the RDA norm of 60 grams. On the hand labour households,

[4] To compare the mean values between two groups Independent Samples 't' test is used and if there are three groups One Way ANOVA test is carried out. Levene's Test for Equality of Variances is conducted and P-Values reported here are selected on the basis of the decision taken in respect equality of variance. Tables with complete results are reported in Appendix to this chapter.

Hindu, OBC, SC and BPL families have less protein intake than the RDA norm. Cultivator households have the highest protein intake. It is interesting to note that all kinds of households maintained average fat intake more than the RDA norm of 25 grams per person per day. As we discussed earlier, the reason for this, is higher intake of fat items especially fish. However, similar to calorie, differences exist in the level average of fat intake among economically well off families and poor families.[5] AAY families have lowest level of fat intake. The average calorie, protein, and fat intake for various income quartiles are shown in table 6.10. Both energy and nutrient intake increases along with income. Nevertheless only the average intake of calorie of fourth income quartile is higher than the RDA norm. In case of protein both third and fourth income quartiles recorded an average intake more than the RDA norm. Fat intake of all income quartiles is higher than the RDA norm.

Table 6.9 Average Household Protein and Fat Intake (Grams Per Day Per Consumer Unit)

Background Characteristics	Protein (in Grams)	Fat (in Grams)
All	62.74	46.01
Working Class		
Cultivator	83.01	62.67
Labour	56	40.60
Religion		
Hindu	57.75	43.42
Christian	76.46	53.74
Family Status		
AAY	52.75	35.04
BPL	57.01	43.44
APL	69.35	50.79
Social Category		
SC	53.15	42.77
OBC/OEC	58.80	43.26
FC	77.56	54.90

Source: Estimated from Primary Data

5 This classification of rich and poor households is made on the basis of the observed difference in income among these classes in the previous chapter.

Table 6.10 Average Household Calorie, Protein and Fat Intake by Income Quartiles (kcal or Grams Per Day Per Consumer Unit)

Monthly Income Quartiles	Calorie (kcal)	Protein (Grams)	Fat (Grams)
First	1926.73	55.14	39.87
Second	1920.08	55.01	37.21
Third	2176.65	63.76	47.93
Fourth	2524.17	80.29	57.60

Source: Estimated from Primary Data

6.6.3 Sources of Calorie and Protein intake

Table 6.11 shows the details about the sources of calorie intake and also the dietary diversity among households. The value for dietary diversity is measured as the amount of calorie derived from the intake of fruits vegetables and meat items. Higher value indicates higher dietary diversity. For all type of households cereals are the major sources of calorie intake. The households derived more than 50 per cent of calorie intake from cereals. For the sample population as a whole about 60 per cent of the calorie intake is met from cereals. The contribution of cereals to the calorie intake is higher among poor sections than rich sections. For instance share of cereals in calorie intake is almost 63 per cent for labour households, while only 55 percent for cultivator households. The share of cereals in calorie intake is highest among AAY households (66.38%). The reason is that their PDS entitlement of cereal items is higher.

Table 6.11 Percentage Share of Cereals and Non-cereals in Total Household Calorie Intake and Dietary Diversity among Households

Background Characteristics	Share of cereals in Calorie Intake (%)	Share of Non-cereals in Calorie Intake (%)	Dietary Diversity (Kcal/day/CU)*
All	61.24	38.76	289.96
Working Class			
Cultivator	55.41	44.59	462.04
Labour	63.21	36.79	232.64
Religion			
Hindu	62.88	37.12	245.02
Christian	56.90	43.10	412.48
Family Status			
AAY	66.38	33.62	197.86
BPL	63.53	36.47	228.73
APL	58.64	41.36	355.57
Social Category			
SC	64.77	35.23	189.60
OBC/OEC	62.37	37.63	262.14
FC	56.71	43.29	418.28

Source: Estimated from Primary Data
*Note: *This is calorie intake met from fruits, vegetables and meat items.*

The values of dietary diversity are higher for the richer sections and lower for the poor sections of the sample households. Amount of calorie derived from fruit, vegetables and meat items was 462 kcal for cultivator households, while it was only 290 kcal for labour households. Similarly value of dietary diversity is higher for Christian households than Hindu households, for APL households than BPL and AAY households and also for FC households than OBC and SC households. Dietary diversity is as low as 189.60 kcal among SC households. It can be concluded that dietary intake of richer households are more diversified with protein rich and fat food items, whereas as the dietary intake of poor households are relatively less diversified.

The influence of income on the dietary diversity can be understood from table 6.12. The results revel that share of cereals in calorie intake is higher for first quartile than the fourth quartile. Share of cereals in calorie intake for first quartile is 62.74 per cent. Value of dietary diversity is considerably higher for fourth quartile than for other quartiles. Calorie derived from fruits, meat and vegetable is 243.79 kcal for first quartile income groups and 427.07 for fourth quartile. This disparity indicates that higher income families consume more quantity of non cereal items and their diet is more diversified.

Table 6.12 Percentage Share of Cereals and Non-cereals in Total Household Calorie Intake and Dietary Diversity for Various Income Quartiles

Monthly Income Quartiles	Share of cereals in Calorie Intake (%)	Share of Non-cereals in Calorie Intake (%)	Dietary Diversity (kcal/day/CU)*
First	62.74	37.25	243.79
Second	63.81	36.19	227.79
Third	60.62	39.37	287.11
Fourth	57.27	42.72	427.07

Source: Estimated from Primary Data
*Note: *This is the calorie intake met from fruits, vegetables and meat items.*

Table 6.13 Percentage Break up of Protein Intake by various Food Groups

Background Characteristics	Cereals (%)	Milk & Milk Products (%)	Egg, Fish & Meat (%)	Other Food	All
All	50.19	5.91	30.92	12.98	100
Working Class					
Cultivator	40.58	7.40	38.80	13.22	100
Labour	53.52	5.42	28.25	12.90	100
Religion					
Hindu	53.07	5.43	28.38	13.12	100
Christian	42.72	7.21	37.41	12.66	100
Family Status					
AAY	59.49	4.33	22.94	13.24	100
BPL	54.48	5.44	27.45	12.63	100
APL	45.56	6.57	34.65	13.22	100
Social Category					
SC	57.26	3.67	25.66	13.41	100
OBC/OEC	51.96	6.03	29.12	12.89	100
FC	42.31	7.33	37.48	12.88	100

Source: Estimated from Primary Data

Table 6.13 reports the sources of protein intake. In general cereals contributed about 50 per cent of the protein intake and egg, fish and animal meat contributed 31 percentage. Further it can be observed from table 6.14 that the share of cereals in protein intake declines as level of income increases and that of non cereal items increases as level of income increases. For labour households cereals are major source of protein, while for cultivator households cereals are less important.

Table 6.14 Percentage Break up of Protein Intake by various Food Groups for Income Quartiles

Monthly Income Quartiles	Cereals (%)	Milk & Milk Products (%)	Egg, Fish & Meat (%)	Other Foods (%)	All (%)
First	54.17	5.51	27.65	12.66	100
Second	53.66	5.14	28.34	12.85	100
Third	49.52	5.75	30.95	13.77	100
Fourth	43.03	7.45	36.80	12.71	100

Source: Estimated from Primary Data

6.7 Incidence of Food Insecurity: Calorie Deficiency

Human beings require energy and nutrients to perform the physical activities and to ensure healthy functioning of the body. The dietary intake should be sufficient enough to meet these energy and nutrient requirements. Several international and national agencies have proposed minimum energy requirements for persons belonging to various age groups, sex and activity levels. Further, they also suggested minimum per capita energy (calorie requirement) requirement per day for a household. Resultantly it has become a common practice to verify whether per capita energy intake of a household meet these proposed norms to study the food security at household level.

Therefore in this study, to understand the extent of household level food insecurity (calorie deficiency) an attempt has been made to examine whether the calorie intake of the households meet the threshold level. This is accomplished by fixing a calorie norm and comparing the actual intake with the norm. The same exercise also has been carried out with respect to protein and fat intake. The proportion of food insecure households is sensitive to the calorie norm chosen; therefore at most care is taken select a meaningful calorie norm for the sample population in the context of Kerala.

6.7.1 Definition of Food Insecurity

Per capita household energy consumption is widely used as the direct outcome indicator of food security. Therefore to understand the extent of food insecurity an attempt is made to assess the adequacy of energy intakes in comparison with a standard norm. As we noted earlier in the review chapter, a household is considered as food secure when it provides adequate amount of nutritious food that ensures sufficient energy and nutrient intake for its members to live an active and healthy life. The adequacy of energy (calorie) intake is commonly considered as a benchmark measure of food security. A minimum per capita or per consumer unit household calorie intake is often taken as the cut-off point to determine the adequacy of energy intake. The study also follows the same method. A food secure household is defined as the one whose daily calorie intake per consumer unit is greater than or equal to the minimum recommended daily caloric requirement. If the caloric intake of a household falls below this norm, it is considered as food insecure. The calorie deficiency is also considered as direct indicator of undernourishment, therefore the food insecurity and undernourishment are often used interchangeably.

6.7.2 The Calorie Norm.

There is no commonly accepted calorie norm in India. There have been debates about the determination of calorie norm. Different norms have been used by different agencies and studies. Planning commission has been using minimum energy requirement norm of 2400 calorie per person per day for the rural area and 2100 calories for the urban area, thus they are widely known as the official norm. But the norm prescribed by the Food and Agricultural Organisation (FAO) for India is 1800 calories per capita per day. The reason for the difference is that the norm of planning commission is based on the ICMR norm, which includes minimum requirement plus a margin of safety, while FAO's norm represent only minimum requirement. Sukhatme (1977) proposed 2200 calories per capita per day as threshold level for Indian population. Panikkar (1978) used the norm of 2200 calories per capita per day, which is proposed for Kerala by Centre for Development Studies after considering the age sex composition of the population. Rather than taking previously fixed calorie norm very recently Chand and Jumrani (2013) constructed calorie norms for rural and urban population considering the household specific requirement on the basis RDA recommended by ICMR for various age sex groups.[6] The norms so worked out were 2226 kcal for rural households and 2022 kcal for urban households.

The official calorie norm of planning commission was worked in 1970s and may be outdated given the improvements in modes of production and standard of living (Suryanarayana, 2009). Further, several studies have argued

[6] They constructed the per capita household specific calorie requirement determined on the basis of recommended dietary allowance by ICMR for various age sex groups.

that there has been voluntary reduction in cereals consumption and calorie intake, especially by the upper income classes (Suryanarayana and Silva, 2007; Meenakshi and Vishwanathan, 2003; Deaton and Dreze, 2009). Resultantly a steady decline in per capita calorie intake is observed from 1983 to 2009-10. This decline in calorie intake is attributed to income growth, technological advancement, improvements in health and sanitation facilities. Higher income growth during reform period has resulted in changes in consumption pattern of richer decile groups in favour of non-calorie food and non-food items at the expense of calorie intake. Resultantly the calorie intakes of richer deciles groups have declined. Although the calorie intake of poor has increased, it is yet below the normative minimum since they opted for more nutritious diet. Consequently, calorie deficiency has increased over the last three decades both in urban and rural areas (Suryanarayana, 2009). Further, reduced activity level resulting from technological advancement and improved health and sanitation facilities have reduced the calorie or energy requirements. This is true in case of Kerala which is well known for its health facilities, basic infrastructure, higher literacy and health awareness. During the survey it was found that elderly members in the household suffer from diabetes and blood pressure issues and they voluntarily reduce the consumption of calorie rich food items.

Therefore the calorie deficiency does not mean worsening food insecurity unless it is accompanied by a similar extent of undernutrition with respect to anthropometric measures. The anthropometric measures have shown improvement in case of India. With respect to Kerala, the per capita calorie intake par day in general fall below the official calorie norm and has been lower than the national average. Only the per capita calorie intake of top three decile groups is above the calorie norm. On the other hand both the incidence of income poverty and undernutrion in Kerala is far below the national average.[7] The lower level of undernutrition in Kerala indicates the better utilisation of available food through clean water, better sanitation and health facilities. This contradicting case of lower calorie intake and better nutritional outcome points towards lower calorie or energy requirement in Kerala.

Therefore, to overcome this puzzle, the present study uses the calorie norm of 1800 kcal suggested by Food and Agricultural Organisation (FAO) for India. The reason for using this calorie norm is that FAO periodically revises its calorie norm. Further, since FAO's norm represents the minimum energy required for maintaining good health, chances of overestimation of food insecurity (undernourishment) can be avoided if there is voluntary lower intake of calories due to changes in consumption pattern or diseases and lower requirement of energy due to lower activity levels. It is worth mentioning here that calorie norm worked out by a team of researchers of Centre for Development Studies (CDS) after considering the age sex composition of Kerala's population in 1975 was 2200 calories.[8] NNMB noted that over the last four decades average calorie intake in Kerala declined by 353 kcal. Over the same period Kerala experienced higher economic growth and lower incidence of poverty. Therefore the decline in calorie intake could be due to reduction in calorie requirement on account of lower physical activity. If we

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7 In 2005-06 the proportion of undernourished women in Kerala was only 18 per cent against the national average of 35.6 and in case of men the proportion was 21.5 against the national average of 34.2 per cent. The proportion of under nourished children in terms of underweight was only 27.6 per cent against national average of 43 per cent.

8 Centre for Development Studies. (1975). *Poverty, Unemployment and Development Policy- A study of selected issues with special reference to Kerala*. New York: United Nations.

allow for the reduction in requirement the Kerala specific calorie norm would fall near to FAOs estimate.

The study also worked calorie norm as per the methodology suggested by Suryanarayana and Silva (2007). Due to the convergence pattern of calorie intake, they proposed estimates of convergence as the threshold level of food security.[9] The estimate of the convergence for per capita daily calorie intake was worked out as the averages of the fifth and sixth decile groups in rural India. Following the same method the present study has also estimated the convergence of estimate as the average of fifth and sixth decile groups for 2011-12 for rural Kerala. This estimate of convergence was worked out as 1820 calories per capita per day. This also validates the choice of FAO norm of 1800 calories. Therefore the study uses FAO's modest norm of 1800 kcal per capita per day for defining the food insecurity or undernourishment (calorie deficiency). In this study a household is considered as food insecure if it's per consumer unit daily calorie intake falls below 1800 calories.

6.7.3 Incidence of Food Insecurity

Incidence of food insecurity is measured in terms of calorie deficiency. Food insecurity in terms of Calorie deficiency was found to be nearly 37 per cent among the sample households. This implies that 63 per cent of the households are food secure. Among various socio-economic groups, the incidence of food insecurity or calorie deficiency is higher among the poorest sections like AAY families and SC families. Almost 71 per cent of AAY

[9] They have observed a convergence pattern in per capita calorie intake in India since the per capita calorie intake of richer sections has declined and that of poor sections increased both in urban and rural India.

households and 63 per cent of SC households are found calorie deficient. They could not meet the modest norm of 1800 calories per capita per day. While 48 per cent of BPL households are food insecure, only 24 per cent of APL households are food insecure.

Table 6.15 Incidence of Food Insecurity among various Groups of Households (in Percentage)

Background Characteristics	Food Insecure (Calorie Deficient)	Not Food Insecure (Not Calorie Deficient)	Total
All	36.63	63.37	100
Working Class			
Cultivator	7.04	92.96	100
Labour	47.03	52.97	100
Religion			
Hindu	42.86	57.14	100
Christian	20.78	79.22	100
Family Status			
AAY	70.83	29.17	100
BPL	47.52	52.48	100
APL	23.65	76.35	100
Social Category			
SC	62.96	37.04	100
OBC/OEC	39.42	60.58	100
FC	14.63	85.37	100

Source: Estimated from Primary Data

With respect to working class, the proportion of food insecure households is higher among labour households. The proportion of food insecure labour households is 47 per cent, while it is only 7 per cent among cultivator households. The proportion of food insecure households is higher among Hindu religion (43%) than the Christian religion (21%). Income quartile wise comparison reveals that the proportion of food insecure households is higher among second quartile (52%) and lower among third and fourth quartile (15%). It is to be noted here that incidence food insecurity is higher in the study region than the incidence of poverty in the state.

Table 6.16 Incidence of Food Insecurity by Income Quartiles (in Percentage)

Monthly Income Quartiles	Food Insecure (Calorie Deficient)	Not Food Insecure (Not Calorie Deficient)	Total
First	46.38	53.62	100
Second	51.47	48.53	100
Third	14.63	85.37	100
Fourth	14.71	85.29	100

Source: Estimated from Primary Data

It is evident that the differences observed in the entitlement bundles and income status had affected the food security status of the households. The households with lower land holding and employment status are more vulnerable to food insecurity. Labour households and other poor households have lower land holding. Further, most of the members from these households were casual labourers, who had only less days of employment. Consequently their household income was lower, which in turn deteriorated their food security status. On the other hand, cultivator households have higher land holding. Even though cultivation did not yield sufficient net income, higher asset holding helped them to improve their educational status and capabilities. Resultantly, members of cultivator households are regular and self employed and their earnings from employment are higher. Thus incidence of food insecurity is nearly absent among cultivator households.

6.8 Determinants of Food Security Status

The question that what are the factors influencing the food security status of the household is empirically examined in this section. The ability of the household to obtain adequate per capita calorie intake depends on several factors. These factors include several institutional, individual, and household specific factors. Most important of them is the total income of the household derived from various sources. Total income of the household in turn is influenced by the size of the assets, income from cultivation, employment status and earnings of the members. Household facilities such as availability of clean water, sanitation and other facilities required for utilisation of food are also important. Similarly, individual features like mother's age and education are also expected to influence food security. Moreover, socio-economic status, as it determines the PDS entitlements and transfer payments, can also influence food security at household level.

6.8.1 The Econometric Model and Empirical Considerations

The study has adopted the empirical model used by Feleke et al. (2005) with some variations. Let *Ci* be the actual per capita calorie intake of a household and γi is the threshold level per capita calorie intake (1800 kcal). Let us define $Ci^* = Ci - \gamma i$, which implies that If $Ci^* \geq 0$ the household is food secure and if $Ci^* < 0$ household food is insecure. Now the food security equation can be specified as

$$Ci^* = \sum_{j=1}^{n=k} \beta_j X_{ij} + \varepsilon i, Yi = 1[Ci^* \geq 0], \quad \text{-----------------------------------} \quad (1)$$

The notation in the parenthesis is introduced to define binary outcome. Where *Yi* is a dummy variable which assumes value '1' if $Ci^* \geq 0$ (household is food secure) and '0' if $Ci^* < 0$ (household is food insecure). Since the dependent variable is binary variable the food security model can be specified as a binary response model, where 'ϕi' is the probability of food security, which can be written as

$$\phi i = \Pr ob(Yi = 1/X_{ij}) = \Pr ob\left(\sum_{j=1}^{n=k} \beta_j X_{ij} + \varepsilon i\right) \text{ ------------------------(2)}$$

Where ϕi is the conditional probability of food security, β_j's are parameters to be estimated X_{ij} represents a group of explanatory variables and εi is stochastic error term. $\Pr ob(Yi = 1/X_{ij})$ means probability of being food secure given values of explanatory variables. It is assumed that εi is independent of X_{ij}'s and εi has a standard logistic distribution or standard normal distribution. Economists prefer to accept standard normal distribution due to its desired properties, therefore Probit model is more popular than Logit model in empirical studies. In the probit model, G is the standard normal cumulative distribution function (cdf), which is expressed as an integral:

$$G(z) = \phi(z) = \int_{-\alpha}^{z} \phi(v)dv \text{ --(3)}$$

Where $\phi(z)$ is the standard normal density

$$\phi(z) = (2\Pi)^{-1/2} \exp(-z^2/2) \text{ --(4)}$$

The main objective of binary response models is to explain the effects of the explanatory variable on the response probability, $P(Yi = 1/X_j)$. The probit model is estimated using the Maximum Likelihood Estimation (MLE) method. MLE is a large sample method; therefore the standard errors are asymptotic. So we can use *Z* statistics instead of *t* statistic to verify the significance of coefficients. It is to be noted here that for the binary response models the conventional measure of goodness of fit, R^2 cannot be used. For binary response models pseudo R^2 are used. Variety of them are available, however McFadden R^2 is commonly used. McFadden (1974) proposed the measure, 1-L_{ur}/L_{o}, where L_{ur} is the log likelihood function for the unrestricted model (estimated model) and L_o log likelihood function for the restricted model (model with only an intercept). This measure compares the predictive power of unrestricted estimated model with that of restricted model with only an intercept. If the predictive power of unrestricted model is equal to restricted model, we will have R^2 value close to zero. If the predictive power of unrestricted model is relatively higher than the restricted model, we will have fairly higher R^2 value. A pseudo R^2 value, that is higher than 0.25 is considered as fairly good. Another goodness of fit measure used for binary response models is per cent corrected predicted. It is estimated as follows. For an observation we compute estimated probability that *Yi* takes on the value '1' given the values of explanatory variables, i.e. $\Pr ob\left(\sum_{j=1}^{n=k} \beta_j X_{ij} + \varepsilon i\right)$. If $\Pr ob\left(\sum_{j=1}^{n=k} \beta_j X_{ij} + \varepsilon i\right) > 0.5$ *Yi* is predicted to be unity and if $\Pr ob\left(\sum_{j=1}^{n=k} \beta_j X_{ij} + \varepsilon i\right) \leq 0.5$ *Yi* is predicted to be zero. Then the percentage times predicted *Yi* matches actual *Yi* is considered as the per cent correctly predicted.

Then to test the multiple null hypotheses that all the slope coefficients are simultaneously equal to zero the likelihood ratio (LR) statistics is usually used. LR statistics is similar or the F statistics used in OLS method. LR statistics follows χ^2 distribution with degrees of freedom equal to the number of explanatory variables.

Since the coefficients of binary response models are not directly interpretable, studies also calculate the marginal effect at mean. Our aim is here to find effect of unit change in X variables on the probability that $Yi=1$, i.e. probability of household being food secure, $P(Yi=1/X_j)$. If X_j is roughly continuous, then

$$\Delta \hat{P}(Yi=1/X) \approx \left[g\left(\hat{\beta}_0 + X\hat{\beta} \right) \hat{\beta}_j \right] \Delta X_{j,} \quad \text{-----------------------------(5)}$$

for small changes X_j. Since $g\left(\hat{\beta}_0 + X\hat{\beta} \right)$ depends on X we must compute it at a particular value of X variables. Usually the sample averages of X variables are used to get $g\left(\hat{\beta}_0 + \overline{X}\hat{\beta} \right)$ along with estimated values of parameters. After obtaining the value for this expression, we have to find corresponding normal density function. Then this normal density value is multiplied with slope coefficient to arrive at the marginal effect or slope at mean. In case of continuous variables the marginal effect at mean would indicate the effect of one unit change in explanatory variable on the probability that Y=1. Most of the software packages now days compute slope at mean along with the other results.

If the explanatory variable is binary, for instance X_k, rather than taking average we have to assign zero and one. If X_k is a binary variable the change in the predicted probability can be estimated as it goes from C_k to C_k+1 by

$$G\left[\hat{\beta}_0 + \hat{\beta}_1 \overline{X}_1 + \ldots\ldots + \hat{\beta}_{k-1} \overline{X}_{k-1} + \hat{\beta}_k (C_k + 1) \right] - G\left(\hat{\beta}_0 + \hat{\beta}_1 \overline{X}_1 + \ldots\ldots + \hat{\beta}_{k-1} \overline{X}_{k-1} + \hat{\beta}_k C_k \right)$$

6.8.2 A Note on the Explanatory Variables and their Expected Impact.

The detailed description of variables including both dependent and independent variables with their unit of measurement is provided in table 6.17.[10] The discussion on the expected relationships (sign) of the explanatory variables here is based on the economic theory and our earlier descriptive analysis. The major continuous variables such as PDS purchase, farm income, non-farm income and land are expected to have positive impact on food security status. Among the household specific variables, years of education and employment status of head are expected to have positive impact on food security status. Dummy variables are introduced to represent the categorical variables. For representing religion we have introduced dummy variable for Christian taking Hindu as reference group. This dummy variable is expected to have positive coefficient since from earlier analysis it is found that average calorie intake of Christian families are higher than the Hindu families. For social categories, we have taken forward caste (FC) as the reference group and introduced dummy for the other two categories, scheduled castes (SC) and other backward castes (OBC), the coefficients of which will have a negative sign, their calorie intakes were found to be less than that of FC.

In case of family status APL is taken as the reference group, and dummy variables are assigned to BPL and APL, and the expected sign of their coefficient is negative. Age of mother in years represents the experience of mother in selecting and preparing quality food items, therefore this variable can positively influence food security status. Household size is normally positively related to calorie intake, because it indicates economies of scale in terms of working members. Larger household size means larger earnings.

[10] The list of variables is an exhaustive one as it includes the variables for other econometric analysis in the forthcoming sections and the next chapter.

However, if dependents are more in number, the opposite will be the case. It was already mentioned in previous chapter that the share of working age population is high among sample households (60%). Therefore a coefficient with positive sign is expected for household size. The variable consumer unit is taken as a proxy for the calorie requirement of the households and it would be inversely related to the dependent variable, as higher consumer unit means lower per capita intake.

Table 6.17 Description of Variables used for Econometric Analysis

Variable	Description
Dependent Variables	
Food Security Status	Dummy Variable for Food security Status, it takes the value '1' if daily calorie intake per consumer unit is equal to or greater than 1800 kcal; '0' if less.
Dietary Diversity	Calorie derived from fruits, vegetables and meat items, expressed in terms of consumer unit per day.
Independent Variables	
Christian	Dummy variable for Religion, = '1' if Christian; '0' otherwise. (Reference Group: Hindu)
Other backward castes (OBC)	Dummy Variable for OBC, =1 if OBC/OEC: '0' otherwise (Reference Group: Forward Caste)
Scheduled Caste (SC)	Dummy Variable for SC, =1 if SC; '0' otherwise. (Reference Group: Forward Caste)
Below Poverty Line (BPL)	Dummy Variable for BPL, =1 if BPL; '0' otherwise (reference Group: APL)
Anthyodaya Anna Yojana (AAY)	Dummy Variable for AAY, =1 if AAY; '0' otherwise (reference Group: APL)
Cultivator	Dummy Variable for Cultivator Households, =1 if Cultivator; '0' otherwise (reference Group: Labour Households)
Education of Head	Number of years of education of Household Head (Years)
Employment Status of Head	Dummy Variable for Employment Status of Head, =1 if employed; '0' otherwise.
Age of Mother	Age of Mother in Years
Household Size	Number of Household members
Consumer Unit	Consumer unite Assigned to a Household
Free Availability of Clean Water	Dummy Variable for Free Availability of Clean Water, =1 if water is freely available from own well or public tap; '0'if private purchase
Quantity of PDS Cereal Purchase	Quantity of PDS Cereal Purchase in kilograms
Regular Employment	Dummy Variable for Regular Employment, =1 if at least one member is regularly employed; '0' otherwise.
Agricultural Land Size	Size of Agricultural Land holding in acres.
Annual Farm Income	Annual Farm Income from Cultivation in Rupees
Annual Non-Farm Income	Annual Non-Farm Income from Sources Other than Cultivation in Rupees

Free availability of clean water can promote better utilisation of food and is expected to be positively associated with food security of household. In the previous chapter on employment, it was found that households with regular employment have higher income. Therefore to examine the impact of regular employment on food security, a dummy variable is introduced. The variable takes the value '1' if the household has a member with regular wage or salaried employment, otherwise '0'.

6.8.3 Empirical Results and Interpretations

The results of estimated Probit model are given in table 6.18. The results suggest that explanatory variable exert significant influence on the dependent variable, food security status. The result of the likelihood ratio test, which checks the joint significance of the regression coefficients, reveals that the some coefficients are significantly different from zero. The estimated probability value of χ^2 test is 0.000, which is less than probability value corresponding to even 1 per cent level significance. Therefore the null hypothesis that all regression coefficients are simultaneously equal to zero can be rejected and it can be concluded that at least one regression coefficient in the model is not equal to zero. The estimated value of McFadden adjusted R^2 is fairly good, which in turn indicates that the unrestricted estimated model with explanatory variable have relative higher predictive power than the restricted model with only constant. With respect to the predictive efficiency of the model, out of the total prediction the percentage of the correctly predicted cases is 84 per cent, which is considerably high. Therefore all measures of goodness of fit suggest good predictive power of the model.

Out of the 14 variables included in the model, except regular employment and agricultural land size, the coefficients of all other variables have expected sign. Among them, 8 explanatory variables are found to have significant impact of the food security status of households. The coefficients of BPL and AAY are negative, which indicate that BPL and AAY family status are inversely related with the probability of food security. Both BPL and AAY families are less likely to be food secure than APL families. The partial effects of these variables on the conditional probabilities are different in magnitude. Holding other variable constant, being a BPL family reduces the probability of being food secure by 0.51, while the magnitude is only 0.13 for AAY households. This difference is due to the fact that AAY families get about 30 Kg rice from public distribution system at subsidised price. This subsidised food grain reduces their probability of being food insecure. This is further ascertained by the coefficient of PDS. Purchase of cereals from PDS is found to have positive impact on the food security status of the households. One kg increase in the cereal purchase from PDS increases the probability of food security status by 0.0142.

Table 6.18 Probit Estimates for the Determinants Food Security Status

	Coefficients	Standard Error	z– statistics	Marginal Effect at Mean
Constant	1.83951	1.15019	1.5993	NA
Christian	0.24369	0.428263	0.5690	0.015907
OBC	-0.07034	0.464317	-0.1515	-0.084355
SC	-0.33669	0.547679	-0.6148	-0.25123
BPL	-0.98759***	0.546391	-1.8075	-0.512092
AAY	-1.52497**	0.733681	-2.0785	-0.132068
Cultivator Household	0.71075***	0.410618	1.7309	0.0518926
Employment Status of Head	0.21566	0.362465	0.5950	0.0531276
Education of Head	0.0293194	0.0420231	0.6977	0.006635
Household Size	0.39393	0.252841	1.5580	0.089161
Consumer Unit	-1.42017*	0.320926	-4.4252	-0.321432
PDS Cereals	0.062685***	0.0326927	1.9174	0.0141878
Regular Employment	-0.20266	0.297429	-0.6814	-0.047577
Agricultural Land Size	-0.35430**	0.141773	-2.4991	-0.0801918
Annual Farm Income	0.000041*	0.000010	3.7947	0.0000093
Annual Non-Farm Income	0.0000036**	0.0000018	1.9795	0.00000081
McFadden R-squared	0.452369	Adjusted R-squared		0 .35069
Likelihood ratio test: Chi-square	160.176	P-value(χ^2)		0.000
Percentage of cases 'correctly predicted'				84.0%

*Note: *, ** and *** indicate significant at 1%, 5%, and 10% levels respectively.*

Being cultivator household is positively associated with the food security status. Both farm income and non-farm income positively influence the probability of food security. However their marginal effects are meager as indicated by the coefficients. The reason for this is that calorie intake does not considerably respond increase farm and non-farm income across individual households. As income increases households try consume more of non calorie food items. It is surprising to note that size of agricultural land holding have negative impact on the probability of food security. If land size increases by one acre the probability of food security declines by 0.0802. This could be due to the fact that land is no more an important productive asset because of the lower net farm income or losses from cultivation. The consumer unit variable, which is the proxy for household calorie requirement, negatively related to the probability of food security status. This indicates that as the calorie requirement of the household increases, it is less likely to meet the calorie norm and to be food secure. One unit increase reduces the probability of being food secure by 0.32.

6.9 Determinants of Dietary Diversity.

In our previous analysis we also observed differences in the dietary diversity among various categories of households. Therefore here we try to find out what are the important determinants of dietary diversity. The econometric model for the dietary diversity is specified as

$$Di = \beta_0 + \beta_1 FI + \beta_2 NFI + Xi\lambda + \varepsilon i \quad \text{-----------------------------------(6)}$$

Where *Di* is dietary diversity score measured as the calorie (Per Consumer Unit Per day) derived from fruits, vegetables and meat items, *FI* is farm income, *NFI* is non farm income, *Xi* is a vector of household characteristics and εi is the stochastic error term. The multiple regression model is estimated using OLS method and the results are reported in table 6.19. The adjusted R^2 value is 0.53 which indicates good fit of the model as almost 53 per cent of changes in dependent variable is explained by the independent variable. About six variables significantly influence the diet diversity of the sample households. The coefficient of the dummy variable 'Christian' is found significant and this implies that dietary diversity of Christian family is significantly higher than that of Hindu family. Similarly the coefficient of AAY dummy variable is found to be significant and negative, suggesting that the diet diversity of AAY is lower than APL family. Coefficient of cultivator household is also significant and positive, which indicates that their dietary diversity is higher than that of labour households.

Size of household is negative related to diet diversity. An increase of one member in the household reduces the calorie derived from fruits, vegetables and meat items by 14 calories (kcal/CU/day). Regular employment significantly promotes the calorie diversity. Households with regularly employed members consume 50 units more calorie per consumer unit per day from no-cereal items than households without regular employment. Annual non-farm income is found to be positively associated with dietary diversity; however the magnitude of the impact is meager. Farm income does not influence on the diet diversity.

Table 6.19 Regression Estimates for the Determinants of Diet Diversity

	Coefficients	Standard Error	t – statistics	P-value
Constant	237.729*	49.3713	4.8151	0.00001
Christian	84.2705*	27.8036	3.0309	0.00269
OBC	30.2591	34.204	0.8847	0.37718
SC	-8.63085	37.2228	-0.2319	0.81683
BPL	-23.205	14.3494	-1.6171	0.10709
AAY	-44.1796**	21.8995	-2.0174	0.04471
Cultivator Household	118.595*	31.1722	3.8045	0.00018
Employment Status of Head	3.24093	14.8928	0.2176	0.82790
Education of Head	1.64394	2.55719	0.6429	0.52089
Household Size	-14.214*	5.40906	-2.6278	0.00912
Regular Employment	50.1976**	22.2782	2.2532	0.02510
Agricultural Land Size	-5.43675	8.46593	-0.6422	0.52133
Annual Farm Income	0.000603083	0.000441669	1.3655	0.17332
Annual Non-Farm Income	0.00016685*	4.80294e-05	3.4740	0.00060
R-squared	0.5619	Adjusted R-squared		0.537
F-Statistics	23.967	P-value(F)		0.000

*Note: *, ** and *** indicate significant at 1%, 5%, and 10 levels respectively.*

6.10 Conclusion

This chapter attempted to assess the level and sources of food, energy and nutrient intakes of sample households. Data collected through a diet survey reveal that public distribution system significantly contributes to the cereal consumption of households, especially of poor households such as labour households, AAY and BPL families. Resultantly there is considerable implicit income transfer to these poor households through the distribution of subsidised food items. However, the average consumption of cereals by all households was found to be less than the Recommended Dietary Allowance (RDA) of ICMR except in case of fourth quartile group. Similarly the average intakes of other food items such as Pulses and vegetables were also less than the recommended level. In case of Milk and Milk Products only cultivator households and fourth income quartiles have higher level of consumption than the RDA norm. On the other hand average consumptions of fresh fruits and fat items were much higher than the recommended levels due to the contribution of own consumption.

The average daily calorie intake of households in general was found less than the ICMR norm, but working class wise analysis reveals that calorie intake of cultivator households was higher than the norm and that of labour households was less than the norm. Similarly protein intake of cultivator households was higher than the norm and that of labour households was less than the norm. On the other hand fat intake was found higher than the ICMR norms for all type of households. Incidence of food insecurity is measured in terms calorie deficiency considering the FAOs calorie norm and results suggest that 37 percent of sample households, 7 percent of cultivator households and 47 per cent of labour households were food insecure. Econometric analysis of the determinants of food security status reveals that almost 8 variables exert significant impact. The variables such as annual farm income, annual non farm income, cultivator class and PDS cereals are positively related with the food security status, while variables like BPL status, AAY status, consumer unit and agricultural land size are inversely related with the food security status.

Appendix to Chapter VI

Table 6.1A: Results of Independent Samples 't' test for Differences in Average Household Calorie Intake by Working Classes.

Working Class	Average Calorie Intake (Kcal/CU/Day)	SD	If variances are	*t*-statistics	P- Value
Cultivator	2565.90	701.55	Equal	7.66	0.000
Labour	1954.31	529.16	Not equal	6.70	0.000
Mean Difference	611.58*				
Levene's Test Statistics for Equality of Variances		F Statistics: 7.57		P- Value: 0.006	

Source: Calculations based on Primary Data

Note: * indicates the mean difference is significant at 1 per cent level.

Table 6.2A: Results of Independent Samples 't' test for Differences in Average Household Calorie Intake by Religious Status

Religion	Average Calorie Intake (Kcal/CU/Day)	SD	If variances are	*t*-statistics	P- Value
Hindu	2013.47	589.16	Equal	-4.26	0.000
Christian	2367.66	685.97	Not equal	-3.98	0.000
Mean Difference	-354.18*				
Levene's Test Statistics for Equality of Variances		F Statistics: 7.54		P- Value: 0.006	

Source: Calculations based on Primary Data

Note: * indicates the mean difference is significant at 1 per cent level.

Table 6.3A: Results of One Way ANOVA for Differences in Average Household Calorie Intake by Family Status

Family Status	Average Calorie Intake (Kcal/CU/Day)	SD	Mean Differences from Post Hoc Tests for Multiple Comparison		P- Value
AAY	1828.33	506.75	AAY – BPL	-168.21	0.460
BPL	1996.55	562.81	APL – BPL	242.76*	0.008
APL	2239.32	675.75	APL – AAY	410.98*	0.008
ANOVA Results		F Statistics: 7.31		P- Value: 0 .001	

Source: Calculations based on Primary Data

Note: * indicates the mean difference is significant at 1 per cent level.

Table 6.4A: Results of One Way ANOVA for Differences in Average Household Calorie Intake by Social Category

Social Category	Average Calorie Intake (Kcal/CU/Day)	SD	Mean Differences from Post Hoc Tests for Multiple Comparison		P- Value
SC	1891.32	597.51	SC – OBC/OEC	517.06*	0.000
OBC/OEC	2024.32	587.75	FC – OBC/OEC	384.06*	0.000
FC	2408.38	644.01	FC – SC	133.00	0.362
ANOVA Results		F Statistics: 14.76		P- Value: 0.000	

Source: Calculations based on Primary Data
Note: * indicates the mean difference is significant at 1 per cent level.

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Chapter 7

NUTRITIONAL STATUS OF ADULTS AND CHILDREN

Contents

7.1 Introduction

Nutritional status of adults and children are often emphasized as the indirect outcome indicators of food security. These outcome indicators are influenced not only by level of food intake, but also by several non-food factors such as sanitary arrangements, health services, basic education and awareness etc... As a result, in the analytical framework of household food security, nutritional status is generally held as the end outcome of all economic, institutional, social and physical factors affecting the various components food security such as food availability, access to food, and dietary intake. However, to a certain extent nutritional status depends on how effectively households utilise the available food through clean water, sanitation and health care practices.

Resultantly it is now widely recognised that indicators of nutritional status may essentially reflect not only the sufficiency of energy and nutrient intakes but also the quality of factors affecting utilisation of food such as household facilities for storing and preparing food, health and sanitation facilities and health care practices. Therefore in the studies on household level food security, nutritional status is extensively used to assess utilisation component of food security. Nonetheless, such an assessment is not much easier since the interaction between food utilisation and nutritional status is complex one. Nutritional status also depends on the functioning of the immune system, health and hygiene practices. For instance, Prevalence of diseases would adversely affect the capacity of an individual to absorb available food.

Despite all these complexities, an analysis of nutritional status of adults and children in the sample population would help us to understand how effectively they are able to convert food intake into better nutritional outcome with the help of other inputs already mentioned. Severe extent of undernutrition would indicate inadequacy of a balanced diet or lack of proper physical environment at household level including clean water, sanitation and health facilities. Therefore with an aim to understand the prevalence of undernutrition in the sample population, nutritional status of adults and children are estimated in this chapter. Rest of the chapter is organised as follows. Second section provides a brief discussion on the anthropometric measures of nutritional status. Third section presents the estimates of nutritional status of the adults and prevalence of undernutrition among them. Fourth section provides the estimates of the nutritional status of children and evidences for the undernutrion among children. The fifth section offers an empirical analysis of the determinants of undernutrition among children. Final section concludes the chapter.

7.2 Anthropometric Measure of Nutritional Status

Anthropometric measurements are widely used to determine the nutritional status of an individual as well as the prevalence of undernutrition in a given population. Anthropometry refers to the proportions of human body calculated on the basis of height and weight for a given age-sex specific group (WFP, 2005). Even though there are several other outcome measures such as clinical signs of malnutrition, biochemical indicators etc.., the anthropometric measures are considered as appropriate indicators of undernutrition since body measurements are sensitive to minor levels of malnutrition (Radhakrishna and Ravi, 2004). The Different kinds of measures are proposed for adults and children. For children below 5 years anthropometric measures such as stunting (Height for age) wasting (weight for height) and under weight (weight for age) are most commonly used and for adults Body Mass Index (BMI) is the main indicator. Since children are most vulnerable group to the decline in entitlements and dietary intake, their nutritional status is more likely to reflect incidence of undernutrition. Therefore, their nutritional status is considered as effective indicator of nutritional well being of the population under study.

In case of children the practice is that the actual height or weight of a child is compared with median of healthy reference population. The difference between anthropometric score of a child and median of reference population is calculated with the help of 'Z' score. If the Z score of a child is less than -2, then the child is considered as moderately under nourished or if it is less than -3, then the child is considered as severely under nourished. World Health Organization (WHO) provides such median and standard deviation values of reference population for children below five years. However for adults, there are no similar growth reference standards, therefore BMI is used.

Before we begin with the estimation and interpretation exercises, one issue is worth mentioning here is the difference between consumption adequacy estimates and the estimates of nutritional indicators observed in the previous studies which have resorted to household surveys for collecting data.

In the previous chapter we have examined the adequacy of food and calorie consumption at the household level. While this approach in general assesses the adequacy of food and calorie intake at the household level, anthropometric measures assess nutritional outcome at the individual level. Further, apart from food intakes and other factors previously mentioned, the factors such as food losses, intra-household distribution of food and individual health and activity levels also influence the nutritional outcomes (Haen et al., 2011). Another issue is that anthropometric measures do not indicate which nutrient the individual might be lacking. Therefore it would not be a surprise, if our estimates of food consumption presented in the previous chapter and estimates of nutritional outcomes to be presented in this chapter differ since they are essentially estimating different concepts. However to some extent these estimates may complement each other. To calculate the anthropometric measures of the nutritional status the study has collected informations on the height and weight of household members following the instructions provided in the 'Manual for Measuring and Interpreting Malnutrition and Mortality' published by World Food Programme (WFP, 2005).[1]

7.3 Nutritional Status of Adults

The most commonly accepted anthropometric measure of nutritional status of adults is Body Mass Index (BMI). BMI is usually defined as weight in Kilograms divided by height in meters squired (kg/m2). A cut off point of 18.5 is used to define thinness or under nutrition and BMI of 25 or above indicates over weight. These cut off points are common for both sexes. A

[1] The height of children below 5 years is measured using a measuring cable and weight is measured using electronic scale. The informations of adult members away from home are collected from the housewife if she is quite certain; otherwise these members are excluded from the calculation of nutritional status.

person with BMI score in the range of 18.5 to 24.9 is considered as normal. A person having BMI less than 18.5 is considered as underweight and undernourished. BMI value less than 16 indicates severe thinness, between 16 and 16.9 indicates moderate thinness and 17 to 18.4 indicate mild undernutrition. On the other hand BMI value greater than 30 indicates obesity, and values in the range 25 to 29.9 would mean the person is in pre-obese stage.

Table 7.1: Nutritional Status of Adults (Mean Body Mass Index (BMI), and percentage with specific BMI levels)

		Cultivator Households	Labour Households	All
Mean BMI		23.66	22.55	22.82
Normal	BMI 18.5-24.9	62.80	73.80	71.08
Underweight/Thin	Total Underweight (BMI<18.4)	5.49	7.80	7.23
	Severe Thinness (BMI<16)	0.61	3.20	2.56
	Moderate Thinness (BMI 16-16.99)	1.83	2.20	2.11
	Mild Thinness (BMI 17.00-18.49)	3.05	2.40	2.56
Over Weight/ Obese	Total Overweight (BMI>24.99)	31.71	18.40	21.69
	Pre- Obese (BMI 25-29.9)	28.05	17.00	19.73
	Obese (BMI $\geq$ 30.0)	3.66	1.40	1.96
Total		100	100	100

Source: Estimated from Primary Data

The estimated mean BMI values of adults and prevalence of undernutrition is shown in table 7.1. The overall mean value of BMI of adults (age>15) in the sample population is found as 22.82, which falls into the range of normal category. The mean value of BMI of adults from cultivator households is a little higher than that of adults from labour households. The results reveal that prevalence of undernutrition is only marginal among the adults in the sample population. Almost 71 per cent of the adults are having normal weight relative to their height. The proportion of underweight persons among adults is only about 7 per cent and only 3 per cent of adults suffer from severe thinness. However incidence overweight is somewhat higher. The proportion of overweight adults is 22 per cent, among them 20 per cent are in pre-obese stage and only 2 per cent are obese. All these evidences suggest that despite relatively lower level of dietary intake, the undernutrition among the adults in the sample population is significantly lower. However lower undernutrion among adults must be interpreted with some caution since adults have access to larger sources of food and energy intake especially outside home. Therefore it would be better to examine the nutritional status of children before making any conclusion about the utilisation component.

Nutritional status of adults by gender and socio-economic groups is reported in table 7.2. Some gender difference in the incidence of undernutrition can be observed, as proportion of undernourished is only 4 per cent among male population and 11 per cent among female population. No much difference observed in the incidence of undernutrition of adults among various socio-economic classes except in case of forward castes, for whom incidence of undernutrion is lower (4%).

Table 7.2: Nutritional Status of Adults by Gender and Socio-economic Groups

	Underweight	Normal	Over Weight
Gender			
Male	4.02	71.84	24.14
Female	10.86	70.61	18.53
Religion			
Hindu	6.96	70.25	22.78
Christian	5.79	73.16	21.58
Family Status			
AAY	6.45	72.58	20.97
BPL	6.88	71.66	21.46
APL	5.92	70.42	23.66
Social Category			
SC	7.80	73.05	19.15
OBC/OEC	7.76	69.55	22.69
FC	4.26	72.34	23.40

Source: Estimated from Primary Data

7.4 Nutritional Status of Children

Nutritional status of children is perhaps the most useful indicator of undernutrition since children respond rapidly to dietary changes and temporary shocks to household income. To determine the nutritional status of a child, we have to compare child's health status with a standard norm for well nourished children. The present study uses the internationally accepted WHO child growth standards that are derived on the basis of multi centre growth study. To generate new curves for assessing growth and development of children WHO carried out Multicentre Growth Reference Study (MGRS) between 1997 and 2003 among 8440 healthy breastfed infants (birth to 24 months) and young children (18 to 71 months) from various cities such as Brazil, Ghana, India, Norway, Oman and

USA.[2] The report prepared on the basis of this study now presents new WHO growth standards to calculate the anthropometric measures of children. There are three measures for children, stunting (Height for age) wasting (weight for height) and under weight (weight for age). Children who are too short for their age are considered as stunted. Stunting is an indicator of chronic or long term undernutrition as it reflects cumulative nutritional deprivation from birth onwards. Wasting means children are underweight relative to their height. Wasting is an indicator of acute undernutrion in short term since weight is sensitive acute food shortages in the immediate past. Children with low weight relative to their age are treated as underweight. Underweight is a summary indicator of both chronic and acute undernutrition, therefore both stunted and wasted children would fall into underweight category.

The three anthropometric indicators of children are expressed in terms of ‘Z’ score. The ‘Z’ score is calculated by taking the difference between the value for a child and the median value of the reference population for the same age or height, divided by the standard deviation of the reference population. The median and standard deviation of reference population are gathered from report of WHO (2006) on ‘Child Growth Standards’. If the calculated value is less than -2, it would indicate moderate undernutrition. A value less that -3 would indicate severe undernutrition.

The proportion of underweight children is reported in table 7.3. It can be observed that about 64 per cent children have adequate weight required for their age, while remaining 39 per cent are undernourished. About 29 per cent children are moderately undernourished and 10 per cent are severely undernourished. They do not have sufficient weight required for their age as

[2] The study was undertaken in response to the findings of a comprehensive review of NCHS/WHO growth reference, which was used since 1970s. It was found the these growth references did not adequately represent early childhood growth.

per WHO standards. The proportion of underweight children is more in labour households than in cultivator households. Underweight is the result of both long run and short run food deficiencies. The proportion of underweight children is slightly more than the proportion of food insecure households (37%). However, the proportion of underweight children in the study area is still less than the proportion at national level.

Table 7.3 Incidence of Underweight (Weight for Age) among Children (in Percentage)

	Adequate	Moderately Undernourished (Percentage Below -2 SD)	Severely Undernourished (Percentage Below -3 SD)
Cultivator Households	64.20	25.41	10.39
Labour Households	56.86	33.08	10.06
All Households	60.53	29.24	10.22

Source: Estimated from Primary Data

Stunting (height for age) shows incidence chronic undernutrition. The results reported in table 7.4 shows that 64 per cent of children have adequate height for their age, the rest 36 per cent are undernourished in terms of height for age. These 36 per cent children are chronically undernourished having physical growth impairments. Among them, 24 percent are moderately undernourished and 12 per cent are severely undernourished. Stunting implies growth retardation resulting from poverty, low socio-economic level and diseases. It appears that both the stagnation of agriculture and employment distress have resulted in long term nutritional deprivation of children not that of adults.

Table 7.4 Incidence of Stunting (Height for Age) among Children

	Adequate	Moderately Undernourished (Percentage Below -2 SD)	Severely Undernourished (Percentage Below -3 SD)
Cultivator Households	64.71	23.53	11.76
Labour Households	63.08	24.60	12.3
All Households	63.51	24.40	12.09

Source: Estimated from Primary Data

Table 7.5 Incidence of Wasting (Weight for Height) among Children

	Adequate	Moderately Undernourished (Percentage Below -2 SD)	Severely Undernourished (Percentage Below -3 SD)
Cultivator Households	80.3	17	2.7
Labour Households	74.54	20.2	5.26
All Households	77.42	18.6	3.98

Source: Estimated from Primary Data

The short term acute undernutrition measured in terms of wasting is relatively low among children in the study area. Almost 77 per cent of children have required weight for their height, while 19 per cent are moderately undernourished and 4 per cent are severely undernourished. The lower incidence of wasting indicates that there is no temporary shortfall in food intake among children even if family have suffered decline in total income. This is because both public distribution system and fair price shops distribute food at subsidised prices. The lower incidence of wasting is partly due to the fact that heights of the children are low, resultantly required weight for this height would be low, resulting in lower incidence of wasting.

What emerges from the analysis of the estimates of nutritional status of children is that, the brunt of income shortfalls and lower food intake are borne by the children. The co-existence of lower incidence of undernutrition among adults and higher incidence of undernutrition among children points towards the higher level of inequality in intra household distribution of food. Intra household distribution of food is in favour of adults, especially the distribution of fat items, which is reflected in the overweight of adults and underweight of children. Children were not provided sufficient fat items vegetables which promotes their growth. The reason for this is that children are not usually in a position to demand good diet. Another reason is that low employment status and earnings of women reduces their voice with respect to intra household distribution of food and also their capacity to feed children properly. Further, during the period of flood and employment crisis in the region, children may not be served adequate nutritious food.

The difference between undernutrition among adults and children is partly because of the differences in the estimation method as well. Body Mass Index for adults are estimated in absolute terms considering their own weight required for their height without any comparison to the reference population. Therefore a person with low height needs to have only low weight to get a normal BMI. On the other hand the nutritional status of children is estimated in relative terms comparing their height and weights to the median heights and weights of a reference population. Since the reference population consists of children from various regions with diverse ethnic and cultural background, the ranges of reference heights and weights may not be appropriate for the children in the area under study. Therefore differences are usually observed between the undernutrition of adults and children.

Nonetheless the utilisation food is comparatively better since the undernutrition of adults is less than 10 per cent and undernutrition of children in terms three measures is less than 40 per cent. These facts points towards the better utilisation and absorption of available food in the study region. The public provisioning of drinking water and health facilities coupled with better physical environment at household level has helped them to maintain better nutritional outcome. Another aspect is that the mechanisation has made activity level in the area light in nature except for construction and loading workers, resultantly adult population is able absorb and metabolise even the lower level of food intake and maintain good health status. However relatively higher incidence of undernutrition among children reveals that they were not given adequate diet and care.

7.5 Determinants of Nutritional Status of Children

Several factors are believed to influence the nutritional status of children. To identify the determinants of undernutrition among children, Probit model is estimated using maximum likelihood method. The dependent variable is a binary dummy variable, which is assigned the value one if child undernourished and zero otherwise. The probability of undernutrition can be specified as

$$\phi i = \Pr ob(Yi = 1/X_{ij}) = \Pr ob\left(\sum_{j=1}^{n=k} \beta_j X_{ij} + \varepsilon i\right)$$

Where ϕi is the conditional probability of undernutrion, β_j's are parameters to be estimated X_{ij} represents a group of explanatory variables and εi is stochastic error term. $\Pr ob(Yi = 1/X_{ij})$ means probability of being undernourished given values of explanatory variables. The descriptions of various explanatory variable included in the model are given table 7.6. Assuming a standard normal distribution Probit model is employed to estimate the above functional relationship. The empirical considerations of the probit model and various measures to check the overall fitness of the model are discussed in the previous chapter. The Probit model is estimated separately for wasting, underweight and stunting and the results are reported in table 7.7.

Among the three anthropometric measures, estimated results seem to be appealing only for wasting. For other two measures the results are not significant. Wasting reflects the short term severe undernutrition that may happen due to temporary decline in income and dietary intake of households. Results of the probit model for wasting reveal that some explanatory variables have significant impact on the nutritional status of children in terms of weight required for height. Thought the value of adjusted R^2 is low, the result of the likelihood ratio test, which checks the joint significance of the regression coefficients, reveals that the some coefficients are significantly different from zero. Further the percentage of cases correctly predicted is 80 per cent, which in turn reflect good predictive power of the model.

Table 7.6 Description of Variables used for Econometric Analysis

Variable	Description
Dependent Variables	
Underweight	Dummy Variable for underweight, it takes the value '1' if child is underweight '0' if not.
Stunting	Dummy Variable for stunting, it takes the value '1' if child is stunted '0' if not.
Wasting	Dummy Variable for wasting, it takes the value '1' if child is wasted '0' if not.
Independent Variables	
Education of Mother	Number of years of education of Mother (Years)
Employment Status of Mother	Dummy Variable for Employment Status of Mother, =1 if employed; '0' otherwise.
Food Security Status	Dummy Variable for Food Security Status of Household, =1 if household is food secure, '0' otherwise.
Other backward castes (OBC)	Dummy Variable for OBC, =1 if OBC/OEC: '0' otherwise (Reference Group: Forward Caste)
Scheduled Caste (SC)	Dummy Variable for SC, =1 if SC; '0' otherwise.
Below Poverty Line (BPL)	Dummy Variable for BPL, =1 if BPL; '0' otherwise (reference Group: APL)
Anthyodaya Anna Yojana (AAY)	Dummy Variable for AAY, =1 if AAY; '0' otherwise (reference Group: APL)
Free Availability of Clean Water	Dummy Variable for Free Availability of Clean Water, =1 if water is freely available from own well or public tap; '0'if private purchase
Quantity of PDS Cereal Purchase	Quantity of PDS Cereal Purchase in kilograms
Regular Employment	Dummy Variable for Regular Employment, =1 if at least one member is regularly employed; '0' otherwise.
Annual Farm Income	Annual Farm Income from Cultivation in Rupees
Annual Non-Farm Income	Annual Non-Farm Income from Sources Other than Cultivation in Rupees

Among the various explanatory variables education of mother is found to have significant negative impact on incidence of wasting. Probability of wasting decreases as the total years of education of mother increases. However employment status of mother does not affect the nutritional of the children. The negative coefficient of food security status is significant which reveals that incidence of wasting is lower among food secure households. This suggest that household being food secure reduces the chances of acute short term undernutrition. It can be observed that being from Scheduled Caste family as well as BPL family increases the risk of undernutrion. It is interesting to note that cereal consumption from PDS is negatively associated with the short term undernutrion of children. This implies that PDS cereal consumption reduces the probability of under nutrition in the short term. Contrary to our expectation the coefficients of both farm income and non-farm income have got positive sign, indicating the direct relationship with incidence of wasting. However extremely lower coefficients suggest that their impact is almost negligible.

The estimated results of models for underweight and stunting are not significant. Overall explanatory power is not good enough for both the models. Adjusted R^2 values are lower and percentages of cases correctly predicted are less than 80 per cent. In case of underweight, purchase of Cereals from PDS is negatively related to the probability of undernutrion of children. The coefficients of all other explanatory variables are not significant, suggesting that they have no impact on underweight. With respect to stunting, none of the coefficients are significant. Therefore it can be concluded that the selected explanatory variables influence only short term undernutrition. Long term undernutrition is not affected by the explanatory variables.

Table 7.7 Probit Estimates for the Determinants of Undernutrition among Children

	Wasting (Weight for Height)- Marginal Effect at Mean	**Underweight (Weight for Age)-** Marginal Effect at Mean	**Stunting (Height for Age)-** Marginal Effect at Mean
Constant	NA	NA	NA
Education of Mother	-0.0311024 (-1.7634)***	-0.0281011 (-0.8282)	0.0187527 (0.5562)
Employment Status of Mother	-0.0454093 (-0.7560)	-0.182513 (-1.3862)	-0.0697364 (-0.5508)
Food Security Status of Household	-0.125611 (-1.8528)***	0.251096 (1.5792)	0.105874 (0.7035)
Dietary Diversity	-0.000586 (-1.3761)	-0.000698237 (-0.9591)	-0.000534689 (-0.9334)
OBC	0.0628906 (0.7627)	0.220029 (1.2394)	0.109724 (0.6321)
SC	0.457514 (2.0224)**	0.303812 (1.2564)	0.14402 (0.6167)
BPL	0.541757 (2.1107)**	0.229959 (1.2036)	-0.169738 (-0.8744)
Free Availability of Clean Water	-0.029610 (-0.4397)	0.00576012 (0.0379)	0.125695 (0.9261)
Regular Employment	-0.126854 (-1.1068)	0.250927 (1.1095)	0.288211 (1.4986)
PDS Cereals	-0.0264516 (-2.2634)**	-0.0224825 (1.9182)*	-0.00247792 (-0.2003)
Annual Non-Farm Income	0.000000755 (2.4890)**	-0.00000020 (-0.4183)	-0.0000003314 (-0.6950)
Annual Farm Income	0.00000417 (2.5385)**	-0.000000922 (-0.2453)	-0.0000003031 (-0.0877)
McFadden R-squared	0.247499	0.107018	0.078001
Adjusted R-squared	0.112597	0.058376	0.01763
Likelihood ratio test: Chi-square	13.4923	6.92452	1.6345
P-value(χ^2)	0.001175	0.0313588	0.441644
Percentage of cases 'correctly predicted'	80.0%	62.5%	65.0%

Note: Figures in the Parenthesis are z-values

, ** and * indicate significant at 1%, 5%, and 10% levels respectively.*

7.6 Conclusion

An analysis of nutritional status of adults and children is attempted in this chapter. The results indicate that incidence of undernutrition among adults is only marginal. However incidence of undernutrition among children is higher. Almost 36 per cent of children suffer from chronic undernutrition having low height for their age (stunting). Nonetheless, Incidence of short term undernutrition is found lower among children (wasting). The brunt of income shortfalls and lower food intake are observed to be borne by the children. Econometric analysis of the determinants of nutritional status of children indicate that none of the explanatory variable influence the long term undernutrition, however short term undernutrition is influenced by some important variables such as education of mother, food security of the household, PDS cereal intake, annual farm income and annual nonfarm income.

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Chapter 8

SUMMARY AND CONCLUSIONS

Contents

8.1 Introduction

Agriculture is widely recognised as a nutrition-relevant sector by international aid agencies and the policy makers, since it has the potential to enhance food security of the households through various channels. The pathways between agriculture and household food security have been theoretically established in the literature. Further, many developing countries have successfully exploited these pathways to reduce food insecurity and undernutrition. Unfortunately the Indian experience has been totally disappointing, even though agriculture possess huge potential to influence nutrition as it employs majority of the population. India seems to be lagging behind in exploiting the pathways between agriculture and household food security because of several impediments. Nonetheless, no serious empirical enquiry is yet carried out to recognise these impediments.

Therefore the present study has been an attempt to empirically investigate the linkages between agriculture and household food security in the context of Kuttanad. The present study has used Sen's entitlement approach as analytical framework for examining the linkages. The main focus of the study is understanding how the deterioration of entitlement bundle affects the food security of the households and nutritional status of the members. For this, various kinds of entitlements and their impact on food security and nutritional status are analysed. The empirical analysis is based on the primary data collected from 273 households selected from four sample panchayaths in Kuttanad, Southern Kerala.

8.2 Summary of Major Findings

The study area, Kuttanad is a unique region located in the Southern part of Kerala with several topographical peculiarities. It is a wetland region lying below mean sea level, and usually remains submerged under water during the periods of heavy rain, especially during Virippu that coincides with southwest monsoon. Saline water intrusion through the Vembanad lake during summer makes the cultivation in the region much riskier. There is also higher incidence of pests and weeds. Unlike the other regions in the state, these conditions raise serious challenges not only to the farmers but also to the labourers in the region. Flood during Virippu season is the major negative shock affecting the access to food in the study region. During Virippu most of the farmers in the region have not cultivated, which in turn curtailed their total farm income. Resultantly labourers hardly received any employment during Virippu, which has adversely affected their earnings. Therefore, the recurring flood during Virippu season endangers the stability of access to food in the region by curtailing the income of farmers and labourers. The most vulnerable group is labour households and AAY families which are found more insecure than the cultivator households.

The first pathway identified in the literature is the role of agriculture as a source of food for own consumption. This is studied by analysing the production based entitlements. For this, ownership of agricultural land, pattern of production and the contribution of own rice productions to total consumption are examined. It is found that there exists excessive inequality in the ownership of agricultural lands among the sample households. Among the total sample households, 52 per cent possess their own agricultural land and remaining 48 per cent households are deprived of agricultural land. Class wise analysis showed that most of the landless households are labour households belonging to BPL or AAY families. Almost 93 per cent of cultivator households own agricultural land, while only 37 per cent labour households own agricultural land and rest 63 per cent are landless. Further, mean size of owned agricultural land of cultivator household is 4.18 acres, which is significantly higher than that of labour households (0.44 acres). Similarly the average land holding of Christian families is higher than that of Hindu families and average land holding of forward caste families are higher that of scheduled and backward caste families.

The study estimated Gini coefficient to understand the extent of inequality in land holding. The estimated value of Gini coefficient is 0.77, which implies excessive inequality in agricultural land holding among households. Inequality of this magnitude reflects the failure of land reforms to distribute lands to the actual tillers of the soil. The land reform measures could not be effectively implemented due to the faulty conceptualisation of tenancy, delays and loopholes in legislations and large scale illegal land transfers. What really happened was merely a transfer of lands from traditional landlords to a new land owning classes.

Most of the farmers (66%) in the study area are marginal farmers who own less than 2.5 acres of land. Since the wetlands are more suitable for paddy cultivation, almost all farmers cultivated paddy in the agricultural year of 2013-14. There are two seasons for rice cultivation in Kuttanad, Virippu (May to September) and Punja (November to March). However, cultivation was nearly absent in Virippu season. During Punja season almost 98.83 per cent of land holding households cultivated, while only about 20 per cent cultivated during Virippu season due to flood and other risks. This implies that almost 80 percent of cultivators have carried out only single cropping. The farmers preferred single cropping because those who ventured to cultivate during Virippu season in the past suffered huge losses.

It should be noted here in the analytical context of the study that Kuttanad has been experiencing cyclical food insecurity during Virippu season. The negative shock in the form of flood during south west monsoon (May to August) in the region result in livelihood crisis and food insecurity. This cyclical or seasonal livelihood insecurity occurs annually in the region in a predictable pattern. During this period not only cultivation but also the entire economic activities are affected, and resultantly the region remain economically inactive for at least two or three months. This seasonal insecurity perils the livelihood of households especially that of labour households who solely depend on wage labour. Casual labourers could not find employment not only in agriculture but also in non-farm sectors.

Cost of Paddy cultivation in the region is higher than that of other regions in the state due to the multi-phased cultivation process, higher wage cost and large scale application of pesticides and chemical fertilisers. Labour cost forms major share of total cost. The mean per acre cost of paddy cultivation during Punja was Rs. 24528. On the other hand productivity was found to be low, average output per acre was 19.94 quintal for the year and 20.6 quintal for Punja. All famers sold almost 99 per cent of their total output to government procurement mechanism at a price of Rs. 18 per kilograms.

They did not keep output at home for own consumption because of the difficulties faced in transportation and processing.

Another role of agriculture is related to the revenue from the sale of produces, which is evaluated via trade based entitlements. The average per acre revenue earned by farmers was just enough to cover the cost of cultivation without leasing and some amount of normal profit. Average Per acre revenue in Punja season was Rs. 36662. If a farmer lease in land for cultivation, he has to pay on an average about Rs. 12,000 as rent, therefore he may not be able cover even the cost of production. Because of this, incidence of leasing is very low in the region. Analysis of profitability of paddy cultivation showed that about 82.4 per cent households earned profit from paddy cultivation, while about 17.6 per cent households suffered loss and the average per acre net farm income is only Rs. 11377 in the year of 2013-14. The reasons for lower net farm income are single cropping, higher cost of production, lower productivity and absence of proper institutional intervention. It was found that 38.8 per cent of cultivating households are indebted because they could not repay the loan in time due to the delay in payment of procurement bill.

It is now evident that there are several impediments to exploit the role of agriculture as a source for own food consumption. First impediment is the dispossession of productive asset, mainly land among the households. Nearly half of the households and more than 60 per cent of labour households do not own agricultural land. These landless households cannot produce food for own consumption. Second impediment is the commercialisation of agriculture. Even if households produce food, they prefer to sell produces to government procurement mechanism rather than keeping at home for own consumption. The food grains are also produced for market not for own consumption.

Therefore it can be concluded that commercial agriculture is prevailing in the study area, not the subsistence farming. There are also infrastructural and cost constraints for processing paddy. There is no adequate number of flour mills in the study area. Further, households have to bear additional cost for transportation, storage and processing.

The linkages related to marketed surplus are of two types. First one is the minimum support price provided by the government for procuring the rice. Second one is the revenue earned from marketed surplus. The empirical results of the study revealed that even though the government provides minimum support price, the net farm incomes earned by the farmers are inadequate to spend on nutrition relevant activities. The major constraints to obtain higher net farm income are single cropping, risks associated with cultivation process (flood, pests, weeds, saline water etc...) increasing cost of cultivation and stagnation in production and productivity. The transfer payments in the form of input subsidies are also inadequate as it forms only meager portion of total cost.

An examination of the demographic features revealed that working age population constitutes about 61 per cent of sample population, therefore it can be concluded that sample households enjoy demographic dividend. Though literacy rate is nearly 100 per cent, considerable differences are found between the educational attainments of cultivator households and labour households. The proportions of graduates and post graduates are higher among cultivator households. The cultivator households are able to finance the higher studies of their children through their past saving or education loans, while labour households are not in a position to send their children for higher studies due to financial and wealth constraints.

The results related to activity status of the sample population showed that almost 48 per cent of the population is employed in some economic activity, 5 per cent is unemployed and 47 per cent is out of labour force. It is understood that members from labour households are more likely to enter labour market to earn additional income for their family. Resultantly labour force participation rate and employment rates are higher among labour households. A gender wise comparison indicates that labour force participation rate among male is 60 per cent, while among female it is only about 45 per cent. Unemployment rate was unusually high among women as about 22 per cent, while among men it was merely 1 per cent.

With regard to the category of employment, working members from cultivator households are mostly self employed or regularly employed, while members form labour households are mostly casual labourers. Nearly 48 per cent of workers from cultivator households are self employed as employers and 35 per cent are regular salaried employees. On the other hand almost 83 per cent of workers from labour households are causal labourers.

An assessment of employment of situation in the region unfolds severe employment crisis experienced by casual labourers in terms of number of days employed. In spite of the higher wage rate in the region, casual labourers received only few working days. The labourers received work only during Punja season and most of them (75%) were unemployed during Virippu season. Further even during Punja season, agricultural labourers received only less days of employment. In the agricultural year of 2013-14 agricultural workers had work only for about 41 days. On the other hand, non-agricultural workers had relatively more days of work about 72 days. Further, the wage rate of non-agricultural workers was higher than that of agricultural workers. The wage rate of male workers was higher than that of female workers. The disparities in working days and wage rates resulted in lower earnings of agricultural labourers. In general, average annual earning of non-agricultural casual worker was Rs. 24661, while it was only Rs. 18446 for agricultural casual worker. Male nonagricultural casual worker earned almost about Rs. 65791 in the year, on the other hand male agricultural casual worker earned only about Rs. 22481.

With regard to the livelihood outcome, wide disparities are observed between cultivator households and labour households. The differences in asset holdings and employment status have resulted in inequality in income. The cultivator households with higher land holdings have invested their earnings in the past in business and education of their children. Most of the young members from cultivator households have completed higher or professional education and they are regular salaried employees. Further, some of them have migrated to Gulf and Non Gulf countries as professionals. As a result, the average monthly income of cultivator households (Rs. 36927) is significantly higher than the average monthly income of labour households (Rs. 10002). Therefore it can be concluded that differences in entitlements have resulted in inequality in income. In order to understand the extent of income inequality among the sample households Gini Coefficient is estimated. The estimated value of Gini coefficient is 0.61, which indicates excessive income inequality among the sample households.

The study also addressed the question whether the differences in entitlements and income resulted in disparities in levels of food and energy intake among various socio-economic groups. For this purpose a diet survey was conducted to collect data on food intake using the methodology of NSSO. Then the quantities of food intakes are converted into equivalent amount of calorie, protein and fat intakes using the conversion table of ICMR and they are compared with Recommended Dietary Allowance (RDA) of ICMR. It is found that public distribution system significantly contributes to the cereal consumption of households, especially of poor households such as labour households, AAY and BPL families. The results suggest that PDS contributes more than 70 per cent of cereal consumption of AAY and BPL families and 50 per cent of the labour households. The monthly average consumptions of cereal items from PDS by these households were found to be much higher than that of richer categories. Resultantly there is considerable implicit income transfer to these poor households through the distribution of subsidised food items. Implicit income transfer in a month through PDS was about Rs. 953 to AAY families and Rs. 803 to BPL families. Further, the dependence of these poor households on open market for cereal consumption is much lower.

However, the average consumption of cereals by all households was found to be less than the Recommended Dietary Allowance (RDA) of ICMR except in case of fourth quartile group. Similarly the average intakes of other food items such as Pulses and vegetables were also less than the recommended level. In case of Milk and Milk Products only cultivator households and fourth income quartiles have higher level of consumption than the RDA norm. On the other hand average consumptions of fresh fruits and fat items were much higher than the recommended levels due to the contribution of own consumption.

The average daily calorie intake of households in general was 2113 kcal per consumer unit, which is less than the ICMR norm of 2320 kcal. But working class wise analysis reveals that calorie intake of cultivator households (2565 kcal) was higher than the norm and that of labour households (1954 kcal) was less than the norm. The calorie intake of Christian, APL and FC families were higher than the norm, while the calorie intake of Hindu, AAY and BPL families were also less than the ICMR norm and calorie intake of AAY families was found to be the lowest (1828 kcal). Similarly protein intakes of cultivator households, Christian, APL and FC families on an average are higher than the RDA norm of 60 grams. On the hand labour households, Hindu, AAY, BPL, SC families have less protein intake than the RDA norm. All kinds of households maintained average fat intake more than the RDA norm of 25 grams per person per day.

The study measured incidence of food insecurity is in terms calorie deficiency taking the FAOs calorie norm of 1800 kcal per capita per day. The results suggest that 37 percent of sample households, 7 percent of cultivator households and 47 per cent of labour households were food insecure. Incidence of food insecurity is higher among the poorest sections like AAY families, BPL families and SC families. Almost 71 per cent of AAY households, 48 per cent of BPL households and 63 per cent of SC households are found insecure. Incidence of food insecurity is lower among economically well off households such as APL, FC and Christian households.

It is evident that the differences observed in the entitlement bundles and income status had affected the food security status of the households. The households with lower land holding and lower employment status are more vulnerable to food insecurity. On the other hand, incidence of food insecurity is quite marginal among households with higher land holding and better employment status. Therefore, strengthening the entitlement bundle of poor households is crucial for reducing food insecurity in the region.

Econometric analysis of the determinants of food security status is carried out. A Binary Probit model is estimated using the Maximum Likelihood Estimation (MLE) method, taking food security status as dependent variable and several household specific variables as explanatory variables. The empirical results reveal that explanatory variables exert significant influence on the food security status of the households. Almost 8 explanatory variables exert significant impact on the food security status. Purchase of cereals from PDS is found to have positive impact on the food security status of the households. The provision of subsidised food grains through PDS promotes food security. The coefficients of BPL and AAY status are negative, which in turn suggests that both BPL and AAY families are less likely to be food secure than APL families. Being cultivator household is positively associated with the food security status. Both farm income and non-farm income positively influence the probability of food security. However their marginal effects are meager as indicated by the coefficients. The consumer unit variable that indicates household calorie requirement is negatively related to the probability of food security status.

An analysis of nutritional status of adults and children is also attempted. For adults Body Mass Index (BMI) is estimated, and the results indicate that incidence of undernutrition among adults is only marginal (7%). Almost 71 per cent of the adults are having normal weights relative to their heights. However, proportion of overweight adults is 22 per cent, among them 20 per cent are in pre-obese stage and only 2 per cent are obese. For children, three anthropometric measures such as stunting (Height for age) wasting (weight for height) and under weight (weight for age) are estimated. Stunting is generally considered as an indicator of chronic undernutrition and wasting indicates short term acute undernutrion. It is found that incidence of undernutrition among children is higher. Almost 36 per cent of children suffer from chronic undernutrition having low height for their age (stunting). Nonetheless, Incidence of short term undernutrition is found lower among children (wasting). The higher incidence of undernutrition among children suggests that the brunt of income shortfalls and lower food intake are borne by the children. Econometric analysis of the determinants of nutritional status of children indicates that none of the explanatory variable influences the long term undernutrition. However, variables such as education of mother, food security of the household, and PDS cereal intake are inversely related to short term undernutrition of children.

8.3 Policy Implications

The following policy implications can be drawn from the findings of the study.

- The findings of the study suggest that agriculture based strategies alone cannot solve issue of food insecurity and undernutrition since there are impediments in realising the linkages between agriculture and food security.
- These strategies must be supported by distributive policies and institutional interventions in the areas of health, education, employment and nutrition.
- Since there is higher extent of land inequality among the households and problem of landlessness is common among labour households, the most warranted distributive policy to be implemented is second set of land reform measures. This should be aimed at ensuring equitable distribution of agricultural lands.
- To control the destructive effect of flood on cultivation process, the government should construct permanent bunds to prevent the flow of water into the fields from lake and canals.

- The government should enhance fertilsers subsidy because current subsidy amount is not sufficient to meet the expenditure on fertilsers.
- It is understood from the discussions with farmers during the survey that heavy applications of chemical pesticides and fertilsers have adversely affected the fertility of the soil. Therefore it is suggested to encourage usage of bio pesticides and fertilsers for the cultivation in the region.
- Delay in the settlement of procurement bill should be avoided because it increases the interest rate burden of the farmers who have taken agricultural loans.
- Proper compensation should be provided to farmers without much delay when there is crop failure.
- Financial supports can be provided to the students from labour households for higher and professional studies. This will enhance their capability which in turn will facilitate migration and upward mobility.
- To resolve underemployment issue, special self employment schemes related to the tourism sector in the region can be introduced for casual labourers.
- It was found during the survey that old aged members go for work due to the livelihood crisis in the region to support their family. Therefore adequate amount of pension should be provided to the aged to promote their well being.
- Special nutritional intervention and health care programmes for children are to be implemented through Anganwadis to reduce undernutrition.

8.4 Conclusion

The study concludes that there are impediments in realising the linkages between agriculture and household food security. These impediments appear to be regional specific and are embodied in the production conditions, employment situation, wealth distribution, infrastructure, and the structure of labour and product markets. Understanding the nature of these impediments and their impact on food security is crucial for formulating policies to moderate food insecurity and undernutrition. The study has identified several impediments in Kuttanad related to asset distribution, production process and employment, all of which need to be addressed via legitimate policies. Enhancement of the entitlement bundle of the households through distributive and development policies should be given priority. There are also issues within the household like unequal intrahousehold distribution of food, which need to be addressed through nutritional awareness programmes. Therefore a holistic approach, integrating all segments of development policy, is much desirable rather than solely depending on agriculture for reducing incidence of food insecurity and undernutrition.

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Appendix 1

INTERVIEW SCHEDULE

Identification of the sample household-

Panchayath & Ward No........................... House No...........................

Name & address of Head...

....

Block 1 Household Characteristics

1.	Family Status:	1.AAY	☐	2.BPL	☐
		3.APL	☐		
2.	Nature of Family:	Joint	☐	Nuclear	☐
3.	Religion & Caste:	....			
4.	Social category	1-SC	☐	2-ST	☐
		3-OEC	☐	4-OBC	☐
		5-FC	☐		
5.	Housing:	1.Own	☐	2. Rental	☐
6.	If rental specify monthly rent				
7.	Type of House:	1.Hut	☐	2. Kutcha	☐
		3. Semi Pucca	☐		
		4. Pucca	☐		
8.	Source of drinking water:	1. Own well	☐	2. Nieghbour's well	☐
		3. Public well	☐	4. Public Tap	☐
		5. Canal	☐	6. Others specify	
9.	Lighting energy source:	1. Electricity	☐	2. Kerosene	☐
		3. Candle ☐		4.Others-	
10.	Cooking energy source	1.firewood	☐	2.Smokeless Choola	☐
		3. Kerosene Stove	☐	4. Gas stove	☐
		5. Electric Heater	☐		
		6. Others	☐	Specify.	

Block II Demographic Features and Usual Principal Activity of members

Sl No	Name	Relation to Head	Marital Status	Sex	Age (years)	Education	Usual Principal Activity for last 365 days							
							Activity Status	Occupation Description	Category of work	Industry	No of days Employed		Wage /Salary	Annual Income from Employment
											V	P		
1														
2														
3														
4														
5														
6														
7														

Block III Details on Usual Subsidiary Activity of members

Sl No	Name	Usual Subsidiary Economic Activity for last 365 days							
		Activity Status	Occupation Description	Category of work	Industry	No of days Employed		Wage /Salary	Annual Income from Employment
						V	P		

Block IV Land Holding, Cultivation, Revenue and Cost.

1. Total Land Holding-Possessed (cents): homestead Agricultural
2. Out of Agricultural land - Owned Leased in Leased out
3. Cultivable land Cropped Punja Virippu
4. If land is cultivated give details about the crop, yield and revenue

Season		Virippu		Punja	
Cultivated crops					
Area under each crop					`
Total Yield					
Qty Sold	Open mkt				
	Govt Procurement				
Revenue					
Income from assets and other sources					

5. Details on cost of cultivation

Item	Labour Cost	Machinery Cost	Input cost
Ploughing			
Dewatering			
Bund construction			
Sowing			Seed-
Weeding & Puddling			
Pesticide application			Pesticide-
Fertiliser Application			Fertiliser-
Harvesting			

Block V Memberships, Transfer payments and Agricultural Loan.

1. Specify the memberships of your family members and transfer payments from govt

Sl no	Name	Member of Padashekharam Committee	Beneficiary of any govt Schemes	Amount of Fertiliser and Pesticide Subsidy
1				
2				
3				
4				

2. If you have taken loan, give the details

Sl No	Source of borrowing	Amount borrowed	Repayment status	If not repaid fully amount of indebtedness	Monthly Interest Payments	Propose of borrowing
1						
2						
3						

Block V Consumption of cereals, cereal substitutes, pulses, Milk and Milk products, Sugar and Salt during the last *30* days ended on ....

Item	Quantity and Source of consumption		
	Quantity@	Source Code	Value (Rs.)
Cereals			
Rice – Home grown			
Rice – PDS			
Rice – Open Market			
Rice – Maveli Store			
Rice – Other Sources			
Chira or beaten rice-avil			
Rice Powder			
other rice products			
Wheat/ atta – PDS			
Wheat/ atta – Open Market			
Wheat/ atta – Maveli / Other Sources			
Maida			
Suji, rawa			
Sewai, noodles			
Bread (bakery)			
Other wheat products			
Maize & products			
Ragi & its products			
Other cereals			
Cereals: sub-total.			
Cereal substitutes: tapioca, etc.			
Pulses & Pulse products			
Arhar, red gram –Pigeon pea			
Gram: split- Chickpeas split-			
Gram: whole- Chickpeas(brown/kabuli)			
Moong – Green Gram			
Masur-Red Lentil-orange Dhal			
Urd-black gram(lenthil)			
Green Peas			
cow pea- or beans			
other pulses			
Besan- Chickpeas powder			

Soyabeen-			
other pulse products			
Milk and Milk products			
Milk: liquid (litre)			
Baby food			
Milk: condensed/ powder			
Curd			
Ghee			
Butter			
Ice-cream			
other milk products			
Sugar and salt			
Salt			
sugar – PDS			
sugar - other sources			
Honey			

@Unit is kg unless otherwise specified.

Block VI Consumption of edible oil, egg, fish and meat, vegetables, Fruits, Spices and others during the last *30 days* ended on ....

Edible oil			
coconut oil			
refined oil [sunflower, soyabean, saffola, etc.]			
edible oil: others			
Egg, fish & meat			
eggs (no.)			
fish, prawn			
goat meat/mutton			
beef/ buffalo meat			
Pork			
Chicken			
others: birds, crab, oyster,			
Vegetables			
Potato			
Onion			
Tomato			
Brinjal			
Carrot			

Radish			
leafy vegetables			
green chillies			
lady's finger			
Vellari			
Kakeri			
Cauliflower			
Cabbage			
gourd pumpkin			
beans,			
barbati (Payar)			
lemon (no.)			
Green Banana			
Drum stick			
Better gourd-kaypa			
Bottle gourd-cheranga,padavala			
Other vegitables			
Fresh fruits			
banana (no.)			
Jackfruit			
Watermelon			
pineapple (no.)			
coconut (no.)			
green coconut (no.)			
Guava-adaapazham			
orange, musambi (no.)			
Papaya/ Kharbooza			
Mango			
Urumapazham			
Berries			
Apple			
Grapes			
other fresh fruits			
Dry fruits			
Dry coconut: copra			
Groundnut			
Dates			
Cashewnut			

other nuts-			
raisin, kishmish, monacca, etc.			
other dry fruits			
Spices			
ginger (gm)			
garlic (gm)			
jeerakam (gm)			
dhania (gm)coriander, powder			
turmeric (gm)			
black pepper (gm)			
dry chillies or powder(gm)			
tamarind (gm) –			
curry powder (gm)			
oilseeds (gm)			
other spices (gm)			
Beverages			
tea: cups (no.)			
tea: leaf (gm)			
coffee: cups (no.)			
coffee: powder (gm)			
mineral water (litre)			
cold beverages: bottled/canned (litre)			
fruit juice and shake (litre)			
toddy (litre)			
other beverages: cocoa, chocolate, etc.			
Served processed food			
cooked meals purchased (no.)			
cooked meals received free in workplace[K] (no.)			
cooked meals received as assistance (no.)			
cooked snacks purchased [samosa, puri, paratha, burger, chowmein, idli, dosa, vada, chops, pakoras, pao bhaji, etc.]			
other served processed food			
packaged processed food			
prepared sweets, cake, pastry			

biscuits, chocolates, etc.			
papad, bhujia, namkeen, mixture, chanachur			
chips (gm)			
pickles (gm)			
sauce, jam, jelly (gm)			
other packaged processed food			

@Unit is kg unless otherwise specified. κ Do not include cooked meals received from other households.

Block VIII: Measurement of Nutritional Status

Sl No	Name	Sex	Age (years)	If Adult-1 If Child-2	Weight	Height
1						
2						
3						
4						
5						
6						
7						

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Appendix 2

LIST OF PUBLICATIONS

Paper Publications

1. Mohammed Kasim C. (2012). Food security and Nutrition in Kerala: An Exploratory Approach. *Journal of Rural Development*, *31*(4), 513-534. ISSN 0970-3357.
2. Lagesh M.A, Mohammed Kasim C & Sunil Paul. (2014). Commodity Futures Indices and Traditional Asset Markets in India: DCC Evidence for Portfolio Diversification Benefits. *Global Business Review*, *15*(4) 777-793. ISSN 0972 1509.
3. Muhammed Shameer K. & Mohammed Kasim C. (2017). Determinants of Wage Rate of Inter-State Migrant Workers in Kerala. *Labour and Development*, *24*(2), 121-145. ISSN 0973–0419.
4. Mohammed Kasim C. & S**.** Harikumar. (2018). Public Distribution System (PDS) and Food Security: A Brief Survey of Literature. *Indian Journal of Economics and Development*, *6*(7), 121-145, ISSN 0973–0419.

Paper Presentations

1. Presented a paper titled “An Overview of Food Policies during Post Liberalisation: Implications for Kerala” in the UGC sponsored National Seminar on the topic ‘Indian Economy since reforms: Development issues and challenges’, organised by Little Flower College- Guruvayoor, Thrissur, Kerala, on 6th and 7th August 2014.
2. Presented a paper titled “Is Kerala Really Food Insecure? A Fresh Approach” in the UGC sponsored National Seminar on the topic ‘Kerala Economy, situating the present and hair splitting the future” organised by, MES College, Kalladi- Mannarkad, Kerala, on 16th and 17th December 2014.
3. Presented a paper titled “Profitability of Agriculture and Farmers’ Indebtedness in Wayanad: A Study across various Crops” in the National Seminar on the topic ‘Development Experience of Kerala: Issues and The way forward’ organised by, Government College, Malappuram, Kerala, from 29th February to 1st March, 2016.

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