

**Transformation of Coastal Wetland Agriculture and Livelihoods
in Kerala, India**

By

Manjunatha R. Ranga

A Thesis
Submitted to the Faculty of Graduate Studies
in Partial Fulfillment of the Requirements
For the Degree of

Master of Natural Resource Management

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Abstract

Wetland agricultural systems are characterized by diverse livelihood strategies. In the context of wetland agricultural systems in Kerala, India, livelihood strategies are also experiencing significant change. The thesis attempts to describe the historical and current resource use and the livelihood strategies of wetland agriculture landowners and labourers (male and female) and to describe the drivers of change in those livelihoods. The objectives are: 1) to describe historical and current resource use and livelihood activities of wetland agriculture landowners and labourers, and 2) to analyze and explain the transformation from traditional rice-shrimp rotational cropping system to a monoculture of shrimp.

These objectives were addressed primarily through semi-structured interviews, focus group discussions, participant observation and other participatory methods with wetland agriculture farmers. The focus of the research was in Khuzupilly, on the island of Vypin in the Cochin area of Kerala, India. Traditionally, the people of Khuzupilly practiced a low-intensity rice-shrimp rotational cropping system on Cochin estuary and lagoon (locally known as “Backwaters”). Rice (salt-resistant Pokkali rice variety) is cultivated for six months of the year (May to October), and shrimp is cultivated in the same agricultural fields in the subsequent six months (November to April). The fields were naturally “seeded” with shrimp by opening sluice gates that allowed juvenile shrimp to enter through tidal action from natural canals. The research group consisted of two communities: one community that practices traditional rice-shrimp rotational cropping system (Puthen Padam) and the other community that practices monoculture of shrimp, which formerly practiced

rice-shrimp rotational cropping system (31 Block). The bulk of the interviews were conducted with pokkali landowners, male and female labourers, land leasers, shrimp landowners and government officials.

Interviews and focus group discussions suggested that pokkali rice cultivation is on the decline and monoculture shrimp farms are on the rise. The statements from the pokkali labourers strongly suggest that shrimp aquaculture has induced pressures on the age-old rice-fish/shrimp system. Pokkali labourers who cannot afford to invest in monoculture business are against conversion to monoculture. Dependence on one livelihood for many years has decreased diversity in choosing livelihood options and increased vulnerability. The minimal interaction of government, coupled with the failure of Samajams (agricultural associations) to address the problems faced during pokkali rice cultivation, has created a change in the society.

In Kerala, various forces of change are impacting the livelihood strategies of wetland agriculture labourers. In the study area the traditional rice fields are being transformed into monoculture shrimp farms due to economic pressures. Due to the growth of globalized markets for high value shrimp species, such as *Penaeus indicus* and *Penaeus monodon*, this has resulted in pressures on the traditional system. Many landowners have either converted to shrimp aquaculture, or are considering converting. In the two study communities, the shrimp landowners cultivate shrimp as year round monoculture without license from the state government, and they operate alongside the other community that practices licensed seasonal shrimp farming. This study highlights the livelihood strategies of pokkali landowners and labourers, their income and investments, the problems associated with rice-shrimp farming and the

coping strategies due to change in farming practices. It also highlights the factors that were responsible for the transformation to shrimp monoculture and its implications for environment, economy and and community.

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List of Frequently used Terms and Acronyms

ADAK: Agency for Development of Aquaculture

Backwaters: The real term for Cochin estuary and the lagoon including the part known as Vembanadu Lake.

BFDA: Brackishwater Fish Farmers Development Agencies

Bund: a dike or earthen wall constructed as a boundary for aquaculture or pokkali rice.

Buyers: Buyers are commission agents who own shrimp peeling sheds. They fix the price of shrimp to leasers.

Coir: A coarse fibre extracted from the fibrous outer shell (husk) of a coconut, used for making rope

Count: The number of shrimps per pound (peeled shrimp).

CDS: Center for Development Studies

Dewatering: In the present study, dewatering refers to preparing land for rice cultivation and the process include removing the salt content of the soil by making mounds (half meter in height) so that the toxic content and salts are washed away by rain. This process requires a minimum of three to four weeks.

DFID: Department for International Development

EEC: Exclusive Economic Zone

Estuary: An enclosed or semi-enclosed coastal body of water having an open or intermittently open connection to marine waters and fresh input from land runoff which measurably reduces salinity. Water levels vary in response to ocean tides and river flows.

Filtration: See shrimp filtration.

Gazani lands: Gazani lands are used for cultivation of salt-resistant varieties of rice during the monsoon. Different terms are used in different states in India (e.g., Pokkali lands in Kerala).

Intensive shrimp farming: Intensive shrimp farming introduces small enclosures (0.1 to 1.5 hectares), high stocking densities (more than 300,000 post larvae per hectare).

Kalakkidutham (gleaning rights): is the social arrangement, an informal institution, by which the land owning classes grant free access to the local working classes for fishing from the pokkali fields for a limited period of the year.

KAU: Kerala Agriculture University

Krishibhavan: Refers to agriculture office.

KSKTU: Kerala State Karshaka Thollali Union

Leasers: The middlemen who buy land on lease for shrimp farming (traditional and monoculture), from landowners.

LDF: Left Democratic Front

NABARD: National Bank of Agriculture and rural development

Paddy: The term paddy refers to rice itself. It is a Malaysian term 'padi', a noun meaning growing rice, the rice especially in the husk, whether gathered or still in the field.

Padu: A locally developed resource management system found among Kerala and Sri Lankan coastal fishermen.

Padashekaram: a collective organization of farmers. The cost for cultivating rice is borne by individual farmers, while the padashekaram undertake collective investments like construction of bunds, sluice gates, cleaning of inlets and maintenance of sluice gates.

Panchayat: Panchayat refers to a council of elected members taking decisions on issues key to a village's social, cultural and economic life. Thus, a panchayat is a village's body of elected representatives.

Peeling sheds: Shrimp brought from the pokkali fields are pre processed in the peeling sheds, i.e., shrimps are cleaned and their shells are removed.

Pokkali: Pokkali fields are used for cultivation of shrimp and salt-resistant varieties of rice.

PLDA: Pokkali Land Development Agency

PPP: Peoples' Planning Program

PRA: Participatory Rural Appraisal

Prawns: It is often used as a general term for large shrimp in India, although a true prawn has a thinner body and longer legs than a shrimp, and an average market length of three inches or four inches.

Puthen Padam: A community as well as a farmer organization of primary producers that practice traditional rice-shrimp rotational cropping system in Khuzupilly

Pulaya: Women belong to Pulaya caste, people from this caste are engaged in fishing, dike preparation, planting, replanting and harvesting.

Retting: A process that removes gums and stem tissue from soft fibers in the processing of natural fibers. It is carried out in water through the action of certain groups of bacteria and fungi.

RRS: Rice Research Station

Samajam: is an organization of farmers working under a padashekaram

Shrimp peeling: indicates the primary processing of shrimp before sending it to the exporting companies

Shrimp filtration: Shrimp filtration is the term that indicates a process where pokkali fields are connected to rivers and estuaries through natural canals. Water (with shrimp fry) flows to the pokkali fields through sluice gates during high tide. Shrimp is thus naturally stocked, cultured and harvested after three to four months in a traditional way.

Sluice gate: is required to regulate the flow of water during high and low tides.

UDF: United Democratic Front

Wards: Every panchayat union has been divided into panchayat union wards at the rate of one ward for every 5000 people.

Wetland agriculture: In the present case, this refers to rotational rice-shrimp cropping system, i.e. six months of rice farming and six months of shrimp cultivation by the influence of tidal action.

WCED: World Commission on Environment and Development

WWF: World Wildlife Fund

Chapter One – Introduction



Plate 1: Pokkali rice field (Photo by M. Ranga)



Plate 2: Monoculture shrimp farm (Photo by M. Ranga)

Coastal and marine resources in South Asia are crucial to sustaining coastal economies and, if properly managed, can serve as a sustainable source of national income through appropriate levels of harvesting. In many of the coastal regions of South Asia, where livelihoods are closely tied to the resource base, fishing communities have historically developed a diverse assortment of livelihood strategies and institutional arrangements that reflect the diversity of ecosystems in which they exist (Bailey and Pomeroy 1996, Kurien 1998, Allison and Ellis 2001). The importance of diversity with respect to both livelihood strategies and institutions is apparent in the small-scale fishery of Kerala estuaries (Lobe and Berkes 2004).

Tropical estuaries and wetlands are known for their biological diversity and considered to be one of the most productive, yet complex ecosystems of the world. These ecosystems offer a diversified portfolio of natural resources and deliver many useful ecological services. In Cochin, estuaries and brackish water wetland ecosystems (locally referred to as “Backwaters”) were believed to be economically insignificant and hence left to the domain of local inhabitants (Thomson 2002). Estuarine communities were engaged in various activities, *viz.*, agriculture, extensive or improved extensive prawn farming, coir-fibre processing, lime shell collection and processing and many more small scale activities based on raw materials derived from estuaries (*ibid*). They have also been engaged in traditional prawn farming in paddy (rice) fields or even leased out their farms to agents for aquaculture soon after the crop was harvested. Relatively poor people in villages resorted to coir making, sand mining, ferrying passengers to other places and other minor produces obtained free from the estuarine environment (Thomson 2004).

The importance of diversity with respect to both livelihood strategies and institutions is apparent in the wetland agriculture of the Backwaters of Kerala. For most of the rural farmers, rice is the most important single crop for their livelihood. Traditionally, rice was grown for six months of the year (May to October), and shrimp was cultivated for the subsequent six months in the same agriculture fields (November to April). This practice, known as rice-shrimp rotational cropping, has supplemented animal protein in the diets of the poor, local population. Such integration proved to be the most economical utilization of land and family labour, and also provides other benefits such as reducing insect pest pressure and increasing the organic content of the soil.

Recent experiences in coastal areas of Kerala reveal that there has been a shift in practice; the age-old rice-shrimp rotational cropping¹ system is being replaced by intensification of shrimp culture. The basic assumption is that such shifts can have implications for rural livelihoods, the local economy, gender relations, local institutions and power hierarchies. One of the negative outcomes of such changes could be that agricultural labourers, especially rural women, who have certain resource rights in paddy fields, and who depend on rice-fish/shrimp culture, will be losing their livelihoods. Although profitable for the investors in the short-term period, this shift in cropping and the resulting intensification could have serious socio-economic, livelihood and environmental implications.

¹In this case, rotational cropping means, cultivating rice for six months of the year (May-Oct), and shrimp for the remaining six months of the year (Nov-April).

1.1 Rice-shrimp farming in Kerala: shift to monoculture of shrimp

Livelihoods based on wetland agriculture activities are often diverse and have emerged from specific ecological contexts. Communities in Kerala have adopted diverse institutional arrangements and they possess a wealth of knowledge on ecosystem functions. Within wetland agriculture activities, the rice-shrimp rotational cropping system has been receiving great attention in the recent years for many of these reasons. “Almost all of the brackish water lands in Kerala are privately owned and some interest is being shown now to improve production through scientific farming by stocking desired species, generally *Penaeus indicus* and *Penaeus monodon*, and supplementary feeding, with regular exchange of water from the canals. Experimentally, higher production rates have been shown in the traditional system” (Alagarswami 1994). The major problem in changing the traditional system into monoculture of shrimp is the land use policy of prohibiting agricultural lands for other uses, except for the present licensing system for using the ‘Pokkali’ fields for shrimp filtration, ownership pattern and leasing of lands.

These changes are not unique to Kerala; in the last few decades, there has been a tremendous demand in the local and international markets for shrimp. Increase in demand for high value species has made farmers rethink their farming practices. A section of farmers came forward to respond to the need. They started converting their paddy fields to monoculture of shrimp by abandoning rice cultivation, and the farming practice changed from traditional to semi-intensive, ignoring the ecological implications to the traditional rice fields. Workers and landowners have formed separate unions, which have led to some serious conflicts between them.

Multinational corporations have played a similar role to the World Bank in expanding shrimp industry in Asia (Siregar 2004). A large number of private companies and multinational corporations have started investing in shrimp farms in India. In the last few years, more than 80,000 hectares of land have been converted to shrimp farming. Shrimp farming advocates regard aquaculture as a potential savior of developing countries because it is a short-duration crop that provides a high investment return and enjoys an expanding market (Singh 1996).

Observing the high price of shrimp, many landowners leased out their lands to shrimp leasers. Pokkali farmers, who were relatively poor and technically unskilled, opted to give up their shrimp production rights and lease their lands to leasers (middlemen). Similar trends have been observed in other states such as, Andhra Pradesh and Tamil Nadu (Bhatta and Bhatt 1998), and also in other parts of the world. The reason farmers opted to lease out their land was: average net income from traditional rice farming was estimated to be 4,800/ha Rupees (\$ 1 US = Rupees 45). If the land is leased for natural shrimp production after rice, the net income goes up by Rupees 4,600/ha (i.e. to a total net income of 9,400/ha Rupees). The income from leasing land for traditional shrimp cultivation varies from 5,000 to 10,000 Rupees. According to Kurup and Ranjeeth (2002), production from monoculture varies from 95 to 1,297 kg/ha of shrimp, whereas production from polyculture systems indicate 70 to 500 kg of shrimp and 200 to 1200 kg/ha of fish. Thus, there is a substantial economic gain for farmers in leasing land for shrimp. This additional income is obtained whether leasers get their shrimp crop or not, and thus, it is risk free for the Pokkali farmers. Naturally, land leasing for natural-shrimp production came as an

economic boon to *gazani* farmers in Karnataka. Farmers' incomes will be even higher (Rupees 20,000/ha), if the land is leased out for commercial shrimp-production (Bhatta and Bhatt 1998).

According to Bhatta and Bhatt, discussions with *gazani* farmers indicated that they encountered several barriers -- capital, technical and organizational -- to undertake shrimp production on their own. Because of these barriers, farmers seemed to be content with the current arrangement that they have with leasers, even though there is an economic potential for raising their incomes two or three times by managing their own shrimp production. In the process, most benefits of this 'blue revolution' are going to a small group of shrimp leasers.

1.2 Purpose of the research

This research is part of a Shastri Indo-Canadian Institute (SICI) project (#46039), "The role of public and private sector cooperation in the management of estuaries in South India" (Dr. Kaleekal Thomson, Cochin University, PI, and Dr. Fikret Berkes, University of Manitoba). The goal of this larger Shastri project

...is to empower local self-governments to undertake resource management and environmental governance in estuaries with the cooperation of various stakeholders. The process of decentralized planning and the statutory relevance attributed to the local bodies in the management of natural resources raises a major challenge to the process of evolving this new social order of governance. ...Local participation of communities in the use of resources will definitely improve their resource entitlements and will reduce rural poverty.

The purpose of this study was to describe how people change their livelihood strategies in the face of the shift from traditional rice-shrimp farming to monoculture of shrimp in the coastal agro-ecological zone of Cochin, India. The development of

research objectives came mainly from the background research that was done prior to the time in the field. Objectives were maintained in a flexible way that allowed me to redefine and recast while in the field. The site was also chosen in consultation with farmers and key informants. In addition to this, a significant amount of time was spent with key informants and research partners to hone the objectives with the reality of study communities.

This research focused primarily on livelihood security and the impact of transformation from traditional rice-shrimp rotational cropping system to monoculture of shrimp on the coastal communities. It started with describing livelihood activities associated with the wetland agriculture, followed by documenting and understanding the local system (traditional rice-shrimp farming) in terms of livelihoods, coping strategies of landowners and workers, gender relations, rural economy and also the historical and current resource use in the study communities. In order to begin the process on livelihoods of wetland agriculture landowners and labourers, we first have to define the scale of the research. Identifying the communities with whom we would work required a lot of preparation and groundwork: participant observation of wetland agricultural activities, informal discussions with traditional rice-shrimp landowners, male and female labourers, shrimp landowners, leasers and processing the information into a working definition of communities. The focus shifted towards analyzing the factors that were responsible for transformation to monoculture of shrimp, role of leasers both in traditional and monoculture systems, investment and returns of leasers, shrimp filtration and

operation, globalization and adversities of monoculture, and the impact of the agricultural shift on the environment and socio-economic system.

1.2.1 Problem statement and objectives

Due to an increase in demand for shrimp in domestic and international markets, coupled with economic pressures such as low prices for pokkali rice and the high cost of labour, the age-old rice-shrimp rotational cropping system is disappearing at an alarming rate. Many landowners have either converted to monoculture of shrimp, or are considering converting due to the above-mentioned factors. The focus of this research was to describe how people change their livelihood strategies in the face of the shift from traditional rice-shrimp farming to monoculture of shrimp. To address the problem statement, there are two objectives:

Objective 1

To describe historical and current resource use and livelihood activities of wetland agriculture farmers.

Objective 2

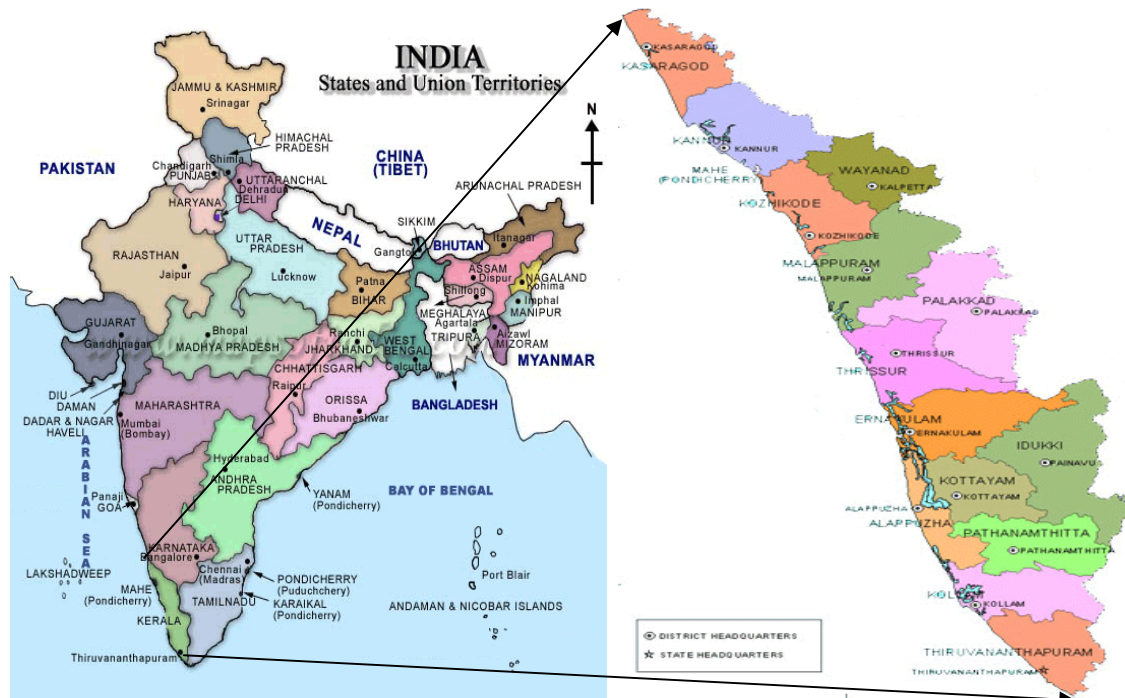
To analyze and explain the transformation from traditional rice-shrimp rotational cropping system to monoculture of shrimp.

1.3 Study area and the setting

Kerala is one of the smallest states in India, covering merely 1.3 percent of the total area of the country (Georgina 2004). Located at the southwestern tip of India, it is 100 km across at its widest point and has over 600 km of coastline (Figure 1). Sandwiched between the Western Ghats on the east, and the Arabian Sea on the west, Kerala is recognized as one of the most beautiful states in India. A tropical paradise

of waving palms and wide sandy beaches, this thin strip of coastal territory slopes down from the mountainous ghats in a cascade of lush green vegetation. Sought after for its spices, sandalwood and timber, international traders, such as Italians, Arabs, English, Syrians, Moors, Chinese, Jews, Danes, Dutch, French, Portuguese and the Phoenicians had visited for centuries in search of its valuable trade goods. The descendents of a few of them, principally the Jews and Muslims, are still present in the region (Georgina 2004). Kerala is a land of genuine religious secularism. This cross-cultural history is partially reflected in the unique social-cultural make-up of Kerala, which is the only Indian maritime state, where Muslims, Christians and Hindu fishing communities are represented among the 220 densely populated fishing villages that dot its coast – home to upwards of 700,000 people (Kurien 2000; Lobe and Berkes 2004).

Figure 1: Location of Kerala in India



Ruled predominantly by the democratically elected communist party since 1957, the state, with its markedly anti-capitalist stance, has not grown economically, maintains high unemployment rates and runs high budget deficits (Kanpur 1998; Lobe and Berkes 2004). Kerala's progressive economy is mainly agriculture. Extensive rubber plantations and cashew industries are valuable foreign exchange earners. Kerala's government also introduced land reforms and the Peoples Planning Program (PPP), which has resulted in a relatively high standard of living in the state. Attempts towards decentralization of planning and policy making are in initial stages in Kerala, introduction of Peoples Planning Program in local administrative units (panchayats) is one the major steps towards decentralization. Women's self-help organization units (Kudumbashree units) have shown that transfer of responsibility and power could improve the situation especially in agriculture and other sectors.

1.3.1 Khuzupilly, Vypin Island - Cochin estuary

Khuzupilly (pronounced as Khurupilly) is a small village situated on the northern part of Vypin Island of Ernakulam district. Before the formation of Khuzupilly panchayat, the village was a part of Pallipuram panchayat (located on the extreme tip of Vypin Island, (Figure 2). The panchayat was formed in 1962. The landmass of the panchayat amounts to 7.73 sq km. and is surrounded by the Arabian Sea along the west coast and Cochin estuary along the east. It is accessible by bus. There are two ways to reach Khuzupilly: one from Vypin Island, which is a 40 minutes ride, and the other from Ernakulam. In Kerala, we can see a subtle difference between a village and city, and most of the villages are well developed and connected

through well-constructed roads. Local people often consider rural areas as “ruban” to indicate a combination of rural and urban.

The idea of forming Khuzupilly panchayat was initiated in 1913, and the first formal election was held in 1963. The population of Khuzupilly panchayat is estimated to be 11,419, with 5,550 men and 5,869 women (Krishibhavan 2004). The panchayat controls all the main canals and small canals. The three main canals in the village are: Ramavarma canal, Iambilly canal, and Danava canal (see Figure 2).

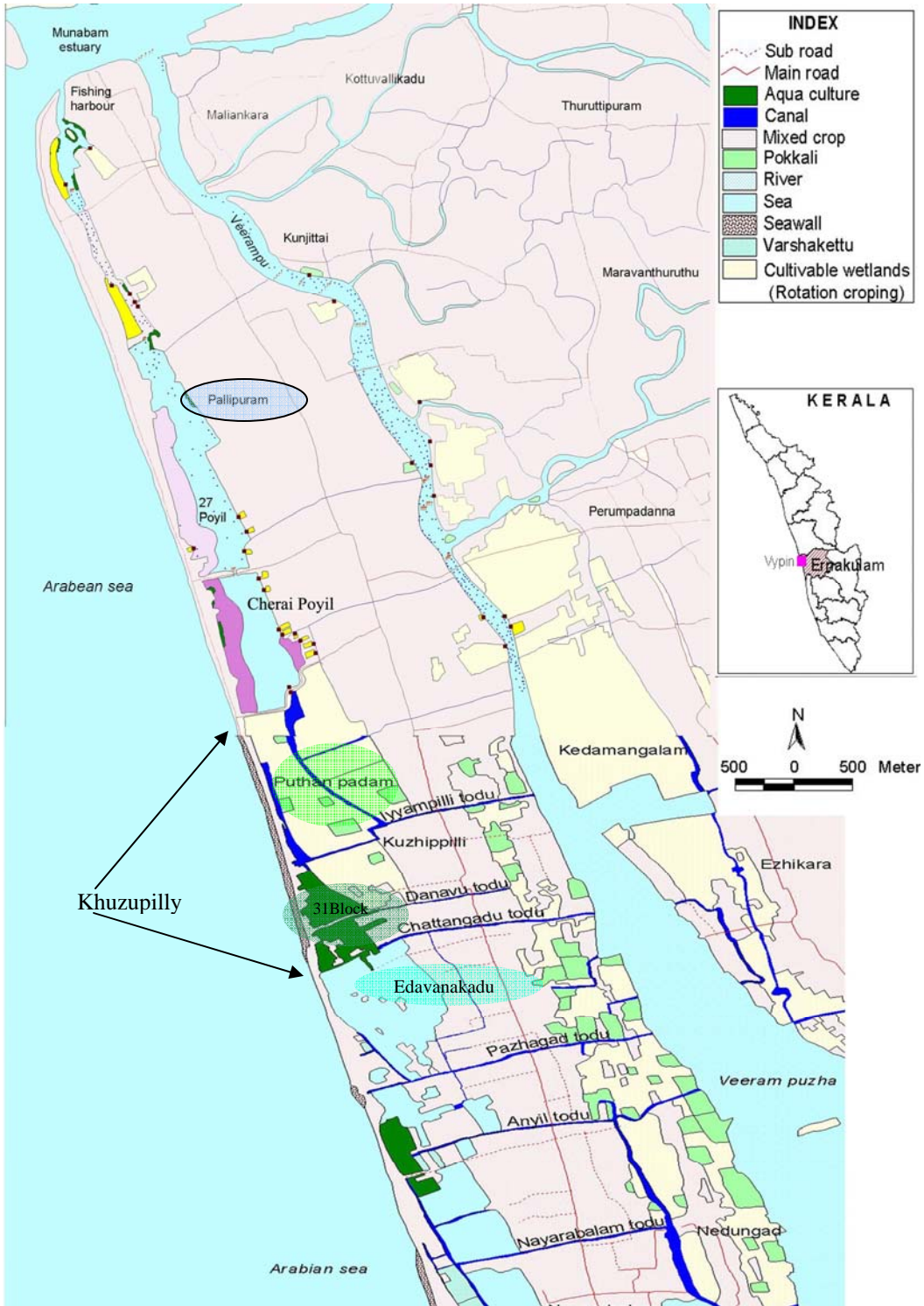


Figure 2: Location of study communities in Khuzupilly on Vypin Island

The northern boundary of the panchayat is connected to Ramavarma canal and the southern side is demarcated by Danava canal. These three canals are linked to

various other small canals from which the farmers draw water to their respective fields through tidal action. All the pokkali rice fields and monoculture shrimp farms are connected to canals through sluice gates that regulate the flow of water. The main occupation and livelihood activity of the people of Khuzupilly was traditional rice-shrimp rotational cropping, followed by monoculture of shrimp and mixed cropping. The pokkali fields in the southwest portion of the village are converted to monoculture of shrimp – a major concern surrounding the wetland agriculture in Khuzupilly. In addition to increases in salinity, discharge of waste from shrimp processing units and houses and contamination of the estuary by virus (discharge from monoculture shrimp farms) have resulted in lower yields in rice cultivation – also a major concern for farmers who depend on the traditional rice-shrimp rotational cropping system.

1.4 The communities/farmer organizations: Puthen Padam and 31 Block

The study was carried out with the people of Puthen Padam and 31 Block, two communities of different castes and religions living on the western part of Khuzupilly, on Vypin Island in Ernakulam district of Kerala state, India. The village is home to Hindus, Christians and Muslims. The Hindu caste groups are involved in traditional rice-shrimp rotational cropping system, whereas Muslims dominate the monoculture shrimp farms, followed by Christians who are mainly involved in non-agricultural activities (see Appendix 2, Table A for religious affiliation related to traditional and monoculture of shrimp).

The first study community, Puthen Padam manages the largest proportion of pokkali fields, i.e., 58 per cent of the total land available for pokkali cultivation.

There are approximately 810 farmers (112 landowners) associated with this community that covers an area of 204 hectares. The main occupation of wetland farmers is rice-shrimp rotational cropping, followed by mixed cropping and poultry farming. Their livelihoods and income depend largely on seasonal shrimp filtration and from shrimp processing units. The livelihood details are presented in Chapter 4.

The other study community was 31 Block, which was once a part of Puthen Padam. Due to economic pressures and various other reasons, 31 Block separated from Puthen Padam and formed their own organization. The main occupation of farmers in this organization is shrimp monoculture (i.e., cultivating shrimp throughout the year). The total area occupied by 31 Block is approximately 28 ha that constitutes 9 per cent of the total pokkali lands. Around 50 to 60 people work during pond preparation and harvesting activities. The 31 Block organization receives a license for the first six months of the year to cultivate shrimp. During the subsequent six months, shrimp is cultivated without a license from the state government. The process and implications of monoculture of shrimp on rural livelihoods, gender, and economy, are presented in Chapter 5.

The initial approach to the study of change was exploratory. To do so, I consulted key informants and organized focus groups on different topics (i.e., village history, livelihood change) to encourage the villagers' feedback and inputs. The study mainly draws on qualitative data and to a lesser extent on quantitative data (i.e., "structured interviews" to get general information on individuals such as gender, age, and their main livelihood activity). The research methods essentially consisted of Participatory Rural Appraisal tools (e.g., interviews of key informants, participant

observation, direct participation, group discussion and a timeline exercise) – see Chapter 3. The livelihoods change details were gathered from the following: households and key informants semi-structured interviews and data gathered from governments.

1.5 Organization of the thesis

This thesis is organized into six Chapters. Following this introductory Chapter, a review of literature on sustainable livelihoods outlines the main lessons that are important in the context of this study (Chapter 2). In Chapter 3, I outline the research methods, discuss some of the guiding principles for the methodology chosen before examining the research process through its inception, approaches, method and tools used in the field, site selection, my time in the field, and the process of analysis that took place following the five month field season. I provide a critical description of specific field methods employed and present the village study area of Khuzupilly, Kerala, India and its current livelihoods. This Chapter concludes by identifying some of the challenges and limitations faced in the field and during data analysis.

Chapter 4 begins with the descriptive component of the thesis and presents the livelihood activities associated with wetland agriculture. This Chapter coincides with the first identified objective and focuses on the livelihoods surrounding wetland agriculture, processes involved in rice-shrimp rotational cropping system, problems associated with rice-shrimp system, livelihoods and income of the landowners and labourers, their coping strategies, and concludes with the role of women in wetland agriculture. In Chapter 5, I explore the factors that were responsible for the transformation from traditional rice-shrimp rotational cropping system to

monoculture of shrimp. This Chapter includes a brief description of 31 Block, the role of leasers (both in traditional and monoculture systems), investment and returns (from buyers), and an overview of shrimp cultivation and its operation. This Chapter concludes with a critical description of negative impacts of monoculture on the environment and local socio-economic systems.

Finally, Chapter 6 revisits the objectives and summarizes some of the valuable insights gleaned from the findings. I conclude by suggesting some policy recommendations in regards to promoting sustainable development.

Chapter Two – The Complexities of Resource Management



Plate 3: Author harvesting pokkali rice (Photo by Jayesh)



Plate 4: Pokkali labourers involved in post harvest operations (Photo by M. Ranga)

This Chapter examines the basic issues concerned with sustainable livelihoods. My focus is on the ways in which human beings relate to components of their environment in the activities of subsistence procurement. I start this Chapter by defining sustainability and development and then shift focus to sustainable livelihoods and a sustainable livelihood analytical framework. I illustrate this concept with an example.

2.1 Concept of sustainable development

According to the World Commission on Environment and Development (WCED) “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED 1987; p. 43). Development has been taken to mean different things at different times, in different places, and by different people in different professions and organizations (Chambers 1997). Sachs (1992) proclaims, "The idea of Development stands today like a ruin in the intellectual landscape. Its shadow obscures our vision." Chambers (1997) notes, in regards to Sustainability: *to be good, conditions and change must be sustainable - economically, socially, institutionally, and environmentally*. Sustainability is a key indicator of success. The concept of sustainability originated in the context of renewable resources such as forest or fisheries, and has subsequently been adopted as a broad slogan by the environmental movement (Lele 1981). In other words, Helmore and Singh (2001), define sustainability as the management and use of natural resources to ensure that these resources will remain intact for future generations.

2.1.1 Sustainable rural livelihoods

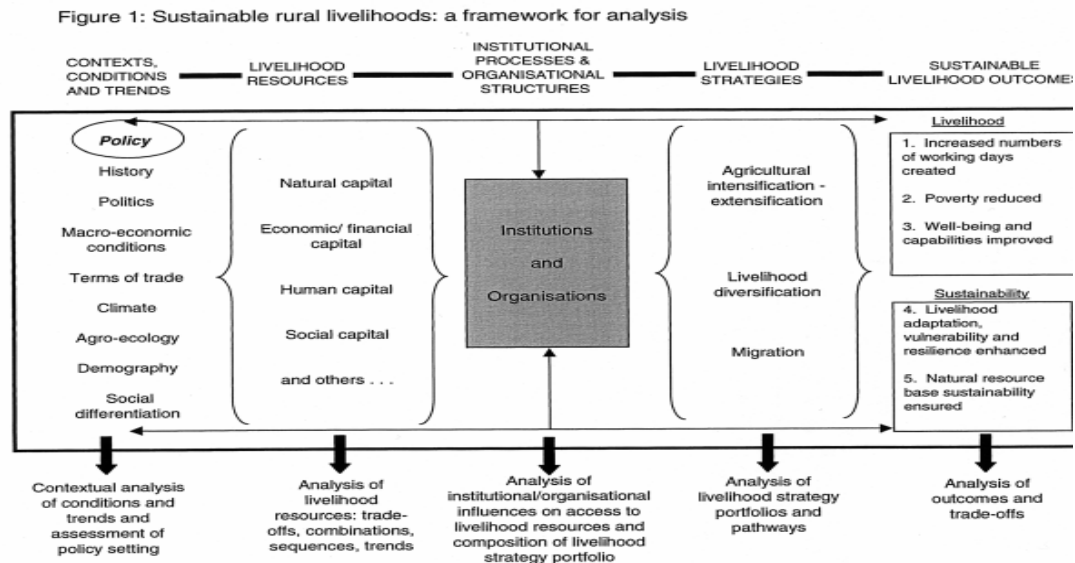
As Creswell et al. (1997) (cited in Scoones 1998) point out: "definitions of sustainable livelihoods are often unclear, inconsistent and relatively narrow. Without clarification there is a risk of simply adding to a conceptual muddle..." This paper will attempt to present a clear and precise operational definition. Defined by Chambers and Conway (1992), a livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks, and maintain or enhance its capabilities and assets both now and in the future while not undermining the natural resource base (ibid). This was further supported by Allison and Ellis (2001), according to them a livelihood comprises (natural, physical, human, financial and social capital), the activities and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household. The concept of a livelihood seeks to bring together the critical factors that affect the vulnerability or strength of individual or family survival strategies. According to Scoones (1998), the term 'sustainable livelihood' relates to a wide set of issues, which encompasses much of the broader debate about the relationships between poverty and environment.

A sustainable livelihoods approach naturally reveals the multi-sectoral character of real life, so that development work is better able to address actual problems, as they exist at the village level (Helmore and Singh 2001). They also argue that sustainable livelihoods are an integrative framework, an opportunity to

promote the cross-sectoral and cross-thematic approach that should be the hallmark of development.

2.1.2 Sustainable livelihood analytical framework

Figure 3: The International Development Studies (IDS) sustainable rural livelihood framework



Source: Adapted from Scoones 1998.

The sustainable development framework as defined by the Department for International Development (DFID 2001) consists of five key components: vulnerability context, livelihood assets, institutions and processes, livelihood strategies and livelihood outcomes. The effects of diversity (or change) on rural livelihoods are addressed under the context of vulnerability, which is further divided into three areas: shocks, trends and seasonality. As Scoones (1998) points out, the framework can be applied at a range of different levels -- from individuals, to household cluster, to extended kin grouping, to village, region or even nation -- with sustainable livelihood assessed at different levels. The specification of the scale of analysis is therefore critical, as in an analysis of the interaction between levels in

terms of net livelihood effects, both positive and negative. The sustainability framework of DFID can be disaggregated to focus different sub-components. Five key elements (Scoones 1998) of the definition can be recognized, each related to wider literature with, in some cases, established ways of assessing outcomes. The first three focus on livelihoods, linking concerns over work and employment with poverty reduction with broader issues of adequacy, security well-being, and employment. The last two elements add to the sustainability dimension, looking, in turn, at the resilience of livelihoods and the natural resource base on which, in part, they depend.

A. Creation of working days: This relates to the ability of a particular combination of livelihood strategies to create gainful employment for a certain portion of the year. This may be on- or off-farm, part of a wage labour system or subsistence production. As Bebbington (1999) argues, it is important to have a wide conception of the resources that people need to access in the process of composing a livelihood, perhaps especially in a context where people's livelihoods shift from being directly based on natural resources, to livelihoods based on a range of assets, income source and product and labour market. An astute observation made by Panini (2001), in reference to a traditional fishing system called *padu*, is that principles of equitable access to the fisheries of the lake and collective responsibility of these fisheries were woven into their traditional system of fishing. Sen (1975: 5) notes three aspects of employment -- income (a wage for the employed), production (employment providing a consumable output) and recognition (where employment provides recognition for being engaged in something worthwhile). In terms of the

income/production aspects, various target levels have been suggested, but 200 days a year appears to be widely used as a minimum level to create a livelihood (Lipton 1991; 1993 cited in Scoones 1998). Overall, the number of livelihoods created will be dependent on the proportion of the population available for work.

B. Poverty reduction: The poverty level is a key criterion in the assessment of livelihoods (Scoones 1998). The concept of poverty is multidimensional. It covers not only levels of income and consumption, but also health and education, vulnerability and risk; and marginalization and exclusion of the poor from mainstream society (Dev 2002). Poor people (Chambers 1983) have to struggle against five interlocking disadvantages which trap them in *deprivation; poverty* itself, *physical weakness, isolation, vulnerability* and *powerlessness*. Resource-dependent communities (Bailey and Pomeroy 1996) face unique challenges to social and economic stability because of their reliance on a particular natural resource for income and employment. Such communities are often characterized as economically impoverished and politically marginal. We should also note that poverty lines are, in terms of consumption, not income. Bhalla (2002) estimated that there is a high degree of uncertainty and controversy about the evolution of poverty in India. The performance of India in terms of income and non-income indicators has not been satisfactory. The pace of reduction in poverty has been, however, slow compared to many other countries particularly in South and Southeast Asia. According to Chambers (1983) contingencies that force poverty to ratchet are of five main types: social conventions; disasters; physical incapacity; unproductive expenditure; and exploitation. He further

explains that poverty is to be understood primarily in terms of economic forces, social relations, property rights, and power. Their stance can be illustrated by C. T. Kurien (Kurien 1978). In his book *Poverty, Planning and Social Transformation*, he views poverty as deprivation, but not only deprivation. It is deprivation for the many and affluence for the few. He regards poverty as:

The social-economic phenomenon whereby the resources available to a society are used to satisfy the wants of the few while the many do not have even their basic needs met. This conceptualization features the point of view that poverty is essentially a social phenomenon and only secondarily a material or physical phenomenon. (1978, p. 8. cited in Chambers, 1983)

Indeed, the notion of livelihood in some sense cuts across what has been perceived as two opposed views on the nature of poverty (Baluch 1996; Moser 1998 cited in Bebbington 1999). At one pole are those approaches to poverty that aim to measure it objectively in terms of expenditure, income or some other quantitatively defined indicator. At the other pole, are the approaches that aim to see poverty through the eyes of the poor, arguing that it is as much a subjective experience as it is an objective state, and that participatory research methods offer the best means for assessing poverty and capturing what people themselves identify as its principle dimensions and indicators (Chambers 1989; Chambers and Conway 1992, cited in Bebbington 1999). Income, expenditure and the experienced quality of life are all implicit in the notion of livelihood.

C. Well-being and capabilities: The notion of 'well-being' (Chambers 1995; 1997, cited in Scoones 1998) and 'capability' (Sen 1984; 1987) provides a wider definitional

scope for the livelihood concept. Sen sees the capabilities as 'what people can do or be with their entitlements,' a concept which encompasses far more than the human capital which allows people to do things with the intrinsically valued elements of 'capability' or 'well-being'. A key feature of the sustainable livelihoods approach is the recognition that the root of all human development and economic growth is livelihoods -- not jobs *per se*, but the wide, infinitely diverse range of activities people engage in to make their living (Helmores and Singh 2001). They also point out that livelihoods consist of assets and entitlements. In Sen's words, the entitlements represent "the set of alternative commodity bundles that a person can command in a society using the totality of rights and opportunities that he or she faces" (Sen 1984 p.497, cited in Leach et al. (1999)). He moves one step further by saying that "scarcity is the characteristic of people not *having* enough..., it is not the characteristic of there not being enough. While the latter can be the cause of the former, it is one of many causes."

Given these concerns Chambers (1997) perceives that the challenge is to see what well-being, capability and entitlement might mean for all people in their relations with themselves, with others, and with the environment. It is argued that the overarching end is well-being, supported by capabilities and livelihood. Equity and sustainability as principles qualify livelihoods to become livelihood *security*, and well-being to become *responsible* well-being (ibid).

Considering along the same line, Leach et al. (1999) agree that entitlements, in turn, enhance people's *capabilities*, which are *what people can do or be with their entitlements*. For example, common use of fuel resources derived from rights over

trees gives warmth or the ability to cook, and so contributes to the well-being. Another interesting comment they make is what are entitlements at one time may, in turn, represent endowments at another time period, from which a new set of entitlements may be derived.

Berkes (2003) accepts that one of the characteristics of small-scale fisheries is the importance of social context of the fishery, such as kinship and other social relations in fishing communities, norms, networks and trust relationships (so-called social capital) tend to be important, as are reciprocal relations, values and local institutions. This statement is well supported by Leach et al. (1999) who consider that certain social actors may not be able to mobilize some endowments (rights and resources that social actors have, e.g., capital, labour) that are necessary to make effective use of others (e.g., land). Another factor to be considered with entitlement is 'equity', as suggested by Meinzen-Dick et al. (1997) for an equal, or identical distributions of resources (per person? per household? per hectare of land owned?) may not be seen as equitable or fair. They further prove their point that definitions of equity differ from one place to another, one time to another. But identifying the norms of equity is needed in both research and in setting policies.

Finally, Chambers (1997) stated that, the *objective of development is well-being for all and livelihood security is basic to well being. Capabilities are means to livelihood and well-being.* Everyone's livelihood, however meager, is made up of these three components -- activities, assets and entitlements together with the short-term coping mechanisms and long-term adaptive strategies that the person employs in

times of crises so that in adjusting to hardship, loss and change, he or she can maintain a livelihood (Helmore and Singh 2001).

D. Livelihood adaptation, vulnerability and resilience: The ability of a livelihood (Scoones 1998) to be able to cope with and recover from stresses and shocks is central to the definition of sustainable livelihood. Such resilience in the face of stresses and shocks is key to both livelihood adaptation and coping (Davis 1996, cited in Scoones 1998). Holling (2001) states that sustainability is the capacity to create, test, and maintain adaptive capability. Poor people are often forced to live precariously, with no cushion against the adverse effects of the vulnerability context; their livelihoods are, for all intents and purposes, unsustainable (DFID 2001). The appropriate approach, according to Roe (1998) is to embrace the complexity and resulting uncertainty, and analyze different subsets of interactions, each of which seem relevant from a number of fundamentally different operational and philosophical perspectives.

An alternative view (Holling 2000; Gunderson and Holling 2001, cited in Holling 2001) suggests that the complexity of living systems of people and nature emerges not from a random association of a large number of interacting factors, but rather from a smaller number of controlling process. These systems are self-organized and a small set of critical processes create and maintain this self-organization. The livelihood outcome approach, according to Gunderson and Holling (2001), is to embrace uncertainty and unpredictability, surprise, and structural change as inevitable in systems of people and nature.

Resilience of a system has been defined in two different ways by Holling and Meffe (1995) in the ecological literature as equilibrium and ecosystem resilience. High ecological resilience would mean that the system had a great ability to resist external disturbances and persist, even beyond the point where it is adaptive and creative (Holling 2001). Such resistance to change can be interpreted as resilience (Holling 1973), depending on the situation and one's perspective (Levin 1998). He also argues that the key to resilience in any complex adaptive system is in the maintenance of heterogeneity, the essential variable that enables adaptation. On the contrary, Holling and Meffe (1996) observe that, when the range of natural variation in a system is reduced, the system loses its resilience. This is a system which is faced with external perturbations, either of a natural origin (storm, floods, and fires) or human-induced (social or institutional).

Finally, livelihoods must be able to cope with, and recover from, shocks and stresses. Helmore and Singh (2001) support the fact that livelihood must be flexible enough, and the people involved in them resilient and resourceful enough to employ effective mechanisms for surviving in times of crises. The adaptive strategies in shaping livelihood security that Sinclair and Ham (2000) discovered in western Himalayas, India were increasing or decreasing market integration, the increased reliance on employment and wage labour, the building up and drawing down on inventories, the reliance on common property resources, the development of maintenance of social ties leading to reciprocal labour and commodity relations, and the formation of community groups. All these were intimately tied to agricultural livelihoods. Those who are unable to cope (temporary adjustment in the face of

change) or adapt (longer term shifts in livelihood strategies) are inevitably vulnerable and unlikely to achieve sustainable livelihoods (Scoones 1998).

E. Natural resource base sustainability: Most rural livelihoods are reliant on the natural resource base at least to some extent. Following Conway, Holling and others, natural resource base sustainability refers to the ability of a system to maintain productivity when subject to disturbing forces, whether a 'stress' (a small, regular, predictable disturbance with an effect) or a 'shock' (a large infrequent, unpredictable disturbance with immediate impact). This implies avoiding depleting stocks of natural resources to a level which results in an effectively permanent decline in the rate at which the natural resource base yields useful products and services for livelihoods (Conway 1985; Holling 1993 cited in Scoones 1998). Authors point out that the sustainability of the production of a particular ecosystem service can refer simply to whether the biological potential of the ecosystem to sustain the yield of that service (such as food production) is being maintained. The resulting stability in household income (both in cash and in kind) translates into relative stability at the community level as well. How, when, and where to invest in such insurance requires assessing not just mean levels of stocks and flows of ecosystem services, but also their dynamics or, more specifically, their variability and stability.

Coastal fishing communities in Southeast Asia are resource dependent, but not in the pathological sense of the term (Bailey and Pomeroy 1996). The complexity of tropical coastal resources systems significantly reduces vulnerability to sudden economic changes and to community instability. Tropical fisheries resources are

highly resilient to increasing fishing pressure. Household economies in most coastal communities in Southeast Asia similarly are based on a wide range of income sources that are widely distributed both temporally and spatially. Considering the context in India, ecosystems services as Gadgil and Guha (1995 p. 143) point out that, India must get down to applying the scientific methodology across the length and breadth of the country in enhancing ecological services, not necessarily in leaps and bounds, but in slow, steady increments.

Finally, measuring natural resource base sustainability is notoriously difficult, as it is critical to link indicators of resource depletion or accumulation (e.g., soil fertility levels, vegetation cover etc.) to both the temporal dynamics of system resilience (i.e., the ability to recover from disturbance) and livelihood needs (i.e., an assessment of whether natural resource change results in effectively permanent declines in useful products or services) (Scoones 1998). So it is difficult to design management that can deal with resilience or threshold. In addition, there are no accurate assessments of the probability of perturbations and the time frame over which such events occur is too long (Berkes 2003).

Chapter Three – Methods



Plate 5: A woman harvesting pokkali rice (Photo by M. Ranga)



Plate 6: A focus group discussion with pokkali landowners (Photo by M. Ranga)

3.1 Introduction

In this Chapter, I investigate the ways to operationalize the theoretical concepts and appreciate the importance of a researcher and the field work. I consider first, the principles guiding the research and the activities that were carried out prior to the field work. Then the focus shifts towards more specific aspects of the research, i.e., approaches, methods, and tools used in the field. To perceive the reality of the research and its facets, different aspects of the field work are examined in detail during the different processes of: choosing the site, field experience in study area, and collection and verification of data in the village and around Cochin estuary. I conclude by reflecting on the limitations faced in the field and while collecting data; and, last but not the least, the challenges faced during data analysis.

3.1.1 Guiding principles

This research was founded on the belief that wetland agriculture farmers' knowledge provides critical insights into, and perspective on, the livelihood systems of these farmers' wetland settings. The methods used in the field research were participatory and combined qualitative and quantitative data collection. The major assumption underlying participatory approaches is that local people are knowledgeable about matters that affect their lives and livelihood strategies. Based on these assumptions, I used Participatory Rural Appraisal (PRA) tools. Therefore, a research methodology that was both exploratory and iterative was selected. Though, the Methods Chapter focuses on the field research components, I feel it is imperative

to explore the processes that I undertook before and after the field research along with the normal field research methods.

3.1.2 Prior to the field work

Prior to the field research, I read literature based on sustainable livelihoods which were relevant to my project objectives. I prepared an extensive literature review in consultation with the project advisor, Dr. Berkes. I established contacts with the Principal Investigator of the project, Dr. Thomson at CUSAT, and other professors at Centre for Development Studies (CDS). The actual study site was not yet decided, but the study area was narrowed down to Cochin estuary, according to the Shastri Applied Research Institute (SHARP) proposal. All these connections were made through electronic mails which gave me a basic idea of the persons with whom I would be working. I also received a letter of invitation from CUSAT, which is a partner organization for this research.

The period of preparation before the field work gave me ample time to know and understand more about Kerala and also to reflect on the literature associated with wetland agriculture in Kerala and other parts of the world. I left for the field with many thoughts and ideas like “Will I be able to complete the project successfully? Are my objectives adequate to meet the project requirements? Do they need recasting and refining?” However, I was sure of the theme of my research and the learning that I had done prior to my departure.

3.2 Approaches and tools used in the field

The monsoon was at its peak when I arrived in Ernakulam, and I was welcomed by none other than the Rain god. It was with the help of George, a research scholar from Cochin University, that I was able to find a guesthouse in Fort Cochin. Connecting with partners and other professors at CUSAT began on the first day of my arrival and was followed by locating a translator and a community in which to work. The details of choosing the site and field experiences are presented, followed by actual research methods that were employed in the field.

3.2.1 Connecting with partners

The examination of livelihood activities and the analysis of transformation from traditional rice-shrimp rotational cropping system to monoculture of shrimp as outlined in the objectives was conducted during a five-month period, from August to December, 2004. The task of connecting with partners started upon the day of my arrival in Ernakulam. It included connecting with research partners at CUSAT, who were part of this SHARP project, professors who were familiar with pokkali rice-shrimp cultivation, and the department staff at CUSAT. Dr. Thomson was always there to guide me, personally and academically, as he had a sound knowledge of the entire Cochin estuary. We had a series of discussions in honing my research objectives and methodologies during the five-month research season. His assistance in facilitating the research and finding a translator who had experienced Khuzupilly's culture was much appreciated. It would have been difficult to conduct this research without the help of George, a research student at Cochin University. His enthusiasm

was contagious, and his network of friends and officials was really commendable. I soon realized that he would be a good friend as well as an impeccable research partner. George, Rose (another research student at CUSAT) and Jayesh (my translator/research partner) accompanied me in all the focus groups discussions; they played a major part in organizing the meetings and taking the minutes of the meeting. These contacts proved priceless as the research progressed and I am highly indebted for their service and guidance throughout the field work.

3.2.2 Village case study

The socio-ecological system under study was a village. The village, Khuzupilly (Ernakulam district, Kerala) is known for its socio-cultural, physical and administrative (institutional) characteristics. The analysis was at the village and individual levels to enable the focus on livelihood systems and to account for socio-economic changes in the village. The study was focused in only one village because I wanted to understand how a community responds in terms of shock and stress. I had to choose a community that practices the traditional rice-shrimp rotational cropping system and another community that follows monoculture of shrimp. The study mainly focused on the dynamics of livelihood systems and how traditional rice-shrimp labourers react to the drivers of change in farming practices, causes of transformation from traditional system to monoculture and coping strategies of the landowners and labourers. Although, the study did not focus on international drivers due to time constraints, it is apparent that economic pressures in pokkali rice cultivation and

increased shrimp prices in domestic and international markets played a significant role in the study community.

3.3 Choosing the site

As mentioned earlier, Khuzupilly village on Vypin Island was my study area and the two study communities were Puthen Padam and 31 Block. Khuzupilly was selected after visits to Kumbalangi, Chellanam and Narakkal villages of Ernakulam district where there was significant activity surrounding wetland agriculture. We (George and I) visited these villages keeping the objectives and criteria in mind. After visiting all the villages, the status of each village and their activities were discussed in detail with Dr. Thomson, Dr. Berkes (through emails) and George. The criteria that I was looking for to consider a village as my research community are presented in the following section.

3.3.1 Criteria

The Cochin estuary of Kerala, where the research was conducted, is one of the largest brackish water (locally referred as “Backwaters”) bodies in India that supports a multitude of livelihoods and a wealth of biodiversity. It stretches to over 24,000 ha in area and contributes to about 50 percent of the total area of the estuaries in the state (Thomson 2002). The Cochin estuary lies within the administrative boundaries of Ernakulam, Allepy and Kottayam districts. One of the traditional livelihoods supported by this ecosystem is wetland agriculture, i.e., rice-shrimp rotational cropping system. Wetland pokkali rice fields are spread on the banks of Cochin estuary over 25 panchayats, three municipalities and a corporation (Thomson 2003).

Cochin estuary is characterized by numerous types of livelihood activities and, according to Government of Kerala statistics, supports a population of almost 62,000 people (Anon 1993).

According to my objectives, the basic idea was to look for a village where farmers practice the traditional rice-shrimp rotational cropping system and monoculture of shrimp. The other related factors that were considered before choosing Khuzupilly were closeness to the estuary (because of higher productivity), size of the communities (to understand how many landowners and labourers are dependent on traditional and monoculture systems), impacts from monoculture shrimp farms on livelihoods of traditional farmers (labourers), number of farmers (landowners) who practice traditional rice-shrimp farming, institutional arrangements in the village to manage wetland resources, hierarchy of the farming structure, and gender relations. Khuzupilly met most of my criteria and, surprisingly, it was the largest brackish water area on Vypin Island. Of the total five farmer organizations/communities present in the village, I chose to work with two communities: (1) Puthen Padam, and (2) 31 Block. Puthen Padam was the single-largest community in the village, and it represented an apex association of 20 other organizations (sub Samajams) that joined at various points of time. The landowners and labourers in Puthen Padam practiced traditional rice-shrimp cropping system and it was their main livelihood activity.

31 Block represented another community, where monoculture of shrimp was the main occupation of shrimp landowners. This community practices shrimp cultivation throughout the year. They are issued a license for six months of the year

(as per the law), and for the subsequent six months, shrimp is cultivated without a license. When we discovered that 31 Block community practices monoculture of shrimp without a license, and the way it is affecting the environment and socio-economic status of other communities, we settled on this small community of shrimp landowners as a study group.

Based on these factors, we chose Khuzupilly as our study site. There were 800 farmers (110 landowners and the rest were male and female labourers) in the Puthen Padam community with an area of 204 ha, who depended on rice-shrimp rotational cropping system. In the other community, i.e., 31 Block, there were 50 labourers and seven to eight shrimp landowners with an area of 28 ha. The research focused on pokkali landowners, male and female labourers (who work both in rice fields and shrimp peeling sheds), leasers (leasers both in traditional and monoculture shrimp farms), shrimp landowners, and local administrative and government officials. Puthen Padam was selected for a number of reasons, but the most significant was the existence of local institutional arrangement and an apex federation of organizations. 31 Block was selected mainly because of their unlicensed activity and the amount of damage they are causing to the ecosystem and rural economy.

3.3.2 Finding secondary data

Once the objectives were decided, I traveled along with my translator Jayesh and George to Khuzupilly to learn the geography of the area. Jayesh introduced me to the panchayat president. We explained the purpose and objectives of our project, and he happily permitted us to work in the village. Then we met the Krishibhavan officer;

she was very co-operative and understanding, and surprisingly, she spoke English, which was of great help to me. In the very first meeting, she briefed us about the management structure of wetland agriculture in Khuzupilly. She also provided some valuable insights on pokkali rice cultivation and shrimp filtration and how the system works there. We also collected information on the number of landowners and labourers present in the respective communities, their land holdings, and the total land available for pokkali cultivation (Appendix 2, Table B). One interesting observation was that the majority of the staff members in panchayat and Krishibhavan offices were women. It is surprising to even imagine that in a male-dominated society, but Kerala stands out from the rest of the states in India in this regard.

After collecting secondary data from panchayat and Krishibhavan, we headed towards Paravoor to meet the Pokkali Land Development Agency (PLDA) secretary. This is the nodal agency for pokkali development in the three districts of Kerala: Ernakulam, Allepy and Trissur. The data collected from PLDA included pokkali rice development schemes and total pokkali land available in Ernakulam and other two districts.

3.3.3 Field assistant/translator

I was looking for a translator who could work as my research partner. It is a daunting task to find a translator, but Dr. Thomson made it easier by introducing me to Jayesh. Finally, Jayesh was hired for the duration of the project to facilitate the research in the study community and to provide translation from Malayalam to English. He was more of a research partner than a translator, because he had worked

in Khuzupilly before and he knew the socio-economic and political status of the village. He was well connected to Panchayat president, Krishibhavan officials, landowners and labourers in the study community. In the first few days, I spent time explaining to him the purpose and objectives of the research, the hurdles that we may face and the theoretical underpinnings of the research. As the days passed, Jayesh grew in confidence, and he started giving new ideas to conduct interviews and focus group discussions. After every interview, we would sit and discuss, share a meal or a coffee, thinking about how to improve subsequent interviews.

3.4 Field experience in Khuzupilly

One issue you do not have to worry about in Kerala is accommodations and travel. The rural/urban nature of village environment and well connected roads make choosing your place of living easy. I lived in Fort Cochin (20 minutes boat ride from Ernakulam), a place that attracts tourists from all over the world. You can see more westerners than locals in the area from October to January. Frequent buses and ferries to Ernakulam and other parts of the city helped to reduce the time spent traveling and waiting for travel. This is how I used to commute: a five-minute ferry from Fort Cochin to Vypin Island, and a forty-minute bus ride from Vypin to Khuzupilly. There are at least 100 buses to Khuzupilly every day. I must have looked out of place when I first visited this village. The people in the village quickly sensed that I was not from Kerala because of the outfits, looks, language and behavior. Though I was from south India (Karnataka), my looks and paraphernalia made them aware that I was not from Kerala, and I was there to do something - they were unsure whether I was there to study pokkali rice cultivation or to collect income tax. It took a while for the people

of Khuzupilly to accept me and to know the purpose of our (Jayesh and I) work there. Many of the pokkali farmers were comfortable talking to us about the ongoing situation in the village; it was the shrimp landowners who always mistook us for income officials. My broken Malayalam proved beneficial so that I could understand some of what villagers were talking about.

3.4.1 Spending time in Khuzupilly

I was a bit nervous to start the field work, because people used to stare at me. The presence of Jayesh lessened my concerns as he knew most of the farmers and administrative officials in the village and he accompanied me throughout the field work. The villagers named us - *pokkali kudithu padikirudu* (guys working on pokkali rice). The first month was spent in understanding the system, the livelihoods of the people, socio-economic status of the village, and power hierarchy, reasons for transformation and observing the activities of the farmers. In the weeks that followed, I decided to begin my first round of interviews with pokkali landowners, shrimp landowners, male and female labourers. I remember very well that the first formal interview was with a pokkali landowner and he welcomed us with banana chips, plantains (one of the crops in mixed cropping) and tea. As the days passed, many issues unfolded. Pokkali landowners and labourers showed more confidence and in fact they started directing us whom to interview and what to ask. It was difficult to answer questions like “What will I get from this, is there any help from your side, Are you trying to improve the situation?” People took time to accept that we were there to understand and document the system, and it was hard to make them believe that I was

there just to observe, participate, document and conduct interviews on rice-shrimp rotational cropping system and monoculture of shrimp.

All the interviews were conducted at the individual level, at landowners' and labourers' residences or in the field. Every time we took a break to have tea at a nearby hotel, we met landowners, labourers, leasers and panchayat officials. We had several informal interviews; tea shops were the best way to identify key informants. Our purpose was to understand the dynamics of the system and the changes that were happening in Khuzupilly. A separate questionnaire was prepared from the guide questions based on the context and current situation (Appendix 1). It happened mainly through asking questions in different ways or asking follow-up questions promoted by responses. The purpose of our visit and interviews were well explained in advance by Jayesh. It is hard to evaluate to what extent they trusted us or to what extent people changed their responses. One labourer was reluctant to let his wife give an interview; he was skeptical of what we were doing in the village. He said, "It's a waste of time talking to you people", however, not everyone had the same attitude. Most of the labourers were busy, and arranging their participation and focus group discussions proved to be a real challenge. It was difficult to invite people to attend focus group discussions, because time was a big constraint. Not every landowner or worker was available at the same time, and last but not least, the invitees wanted to know what would be the outcome of the meeting in advance.

3.4.2 Gender

Though this study did not focus on gender, we collected some information on gender and other related issues. Women in Khuzupilly play a major role in rice-shrimp rotational cropping system and also in monoculture of shrimp. In total, twenty (n=20) women were interviewed who worked in rice fields and shrimp peeling sheds. They represented 20% of the total interviewees in the village. Most of the women were interviewed in the presence of their husbands. Men would tend to speak more in spite of informing them about the purpose of the interview. This is a common situation in a male-dominated society, where women have less say in family's decision making. The communities here are patriarchal as in the rest of India and it is noticeable through their relationship, behavior and culture. From direct observation, I noticed that women have jobs year round, whereas men typically have the role of 'sitting'. Women work in rice fields during transplanting process as well as in harvesting. They also work in shrimp peeling sheds that have work available year round. It is clear from the participant observation that women fare well when it comes to livelihood issues. I mean to say, their livelihood is more secure and stronger than others in the village.

3.5 Tools and approaches

The study mainly draws on qualitative data and, to a lesser extent, on quantitative data. Creswell (1994) suggests that the qualitative approach to research attempts to understand meaning in a particular social problem or issue by using words and the detailed views of informants to construct a holistic picture of social interaction in a natural setting. The major assumption underlying participatory approaches is that,

local people are knowledgeable about matters which affect their lives. There are a number of assumptions involved in qualitative research (*ibid*), including:

- The primary focus of qualitative research is on process rather than outcomes.
- Interest is in understanding and meaning, e.g., how people make sense of their lives, experiences, and their structures of the world.
- The researcher is the primary instrument in data collection and analysis.
- It involves field work, where the researcher observes conditions and behaviours in their natural setting.
- Qualitative research is descriptive, where meaning and understanding are gained through words and other visual sources.
- Qualitative research involves an “inductive” process where conclusions, concepts and hypotheses are built from details.

According to Creswell (1994), this approach to research thus involves the purposeful selection of participants; documents or visual materials that will best satisfy the objectives of the research. Miles and Huberman (cited in Creswell 1994) suggest that, when conducting qualitative studies, researchers should also consider additional parameters such as: the **setting** - where the research will take place; the **actors** - who will be interviewed or observed; the **events** - what the actors will be observed doing or interviewing about; the **process** – the evolving nature of events undertaken by the actors within the setting. The study’s methodological approach will attempt to address these parameters during the various phases of research.

I want to briefly highlight the importance of participatory research approach and put forward some useful techniques appropriate in the context of rural India.

Sustainable rural livelihoods, especially in the villages of India, represent particular challenges to many outside researchers who attempt to have an empirical enquiry in a short period in a particular area. This is also due to complex interrelationships between assets, access and activities, making it difficult to decide what factors to include or exclude from investigation (Ellis 2000). For example, when we try to analyze the income sources, it causes multiple problems, because in most cases, economic sources are not straightforward, but involve diverse, seasonally dispersed sources, and self-employment activities of the whole family in which personal income and business cash flow is inextricably woven together. It is always important to know the actual rather than the hypothesized activities of agrarian farmers, how these are changing over time, and also how the poor farmers' livelihood strategies differ from others in the society (*ibid*).

The study is based on information collected inside and outside the study area. Qualitative methods include those of Participatory Rural Appraisal and are outlined in Table 1. Details of wetland agriculture relating to the first objective were gathered through a variety of methods. The information collected in Khuzupilly is based on participant observation (walking, watching farmers' day-to-day activities, participating in harvesting activities, attending grama sabha meetings, spending time at shrimp peeling sheds), semi-structured interviews, structured interviews, focus group discussions, key informant discussions, participatory mapping, informal discussions and photographs. Data was collected from both individual and village perspectives. I spent a significant amount of time watching the rice-shrimp rotational cropping activities in the study community. In addition, I used semi-structured

interviews, focus groups and key informants to gather some of the important issues associated with rice-shrimp rotational cropping system and monoculture of shrimp. I conducted two surveys: one survey to highlight some of the livelihood activities of landowners and labourers, to understand the process of rice-shrimp rotational cropping system and monoculture of shrimp, harvesting procedures, post harvest and the history of wetland agriculture; the second survey with leasers and monoculture landowners to determine the process of monoculture, flow of shrimp from leasers to exporting companies, post harvest (primary processing in shrimp peeling sheds) and pricing of shrimp. Interviews with university professors at CUSAT and CDS and Krishibhavan officials provided some of the necessary context for this research.

Table 1: Summary of the qualitative research methods

Methods	Activity
<i>Participant and direct Observation</i>	Observation of wetland agriculture activities, transplanting, caring, weeding, harvesting, threshing, processing, storing of pokkali rice, construction of sluice gates, stocking shrimp, processing, sorting, marketing and Samajam meetings. First, it helped to build trust and relationships with pokkali farmers, labourers (male and female), leasers, shrimp landowners and their families. Second, it enabled me to understand the dynamics of the community and the system, and to evaluate and refine questions for semi-structured interviews with the help of project partners.
<i>Semi-structured interviews (SSI) and structured interviews (SI)</i>	A total of 66 (SSI) and 30 (SI) were conducted during the five-month research period. The interviews were conducted from a list of guide questions prepared prior to the field work. The questions were recast and refined with the help of Jayesh, project partners and the Principal Investigator after an initial understanding of the context had been perceived and understood through informal interviews, discussions and participant observation. See Appendix 1 for guide questions.
<i>Focus group discussions</i>	A total of three focus group sessions (33 people attended) were carried out in consultation with project partners and Principal Investigator. All three meetings were conducted separately to avoid conflicts and misunderstandings. The questions were prepared from the responses promoted by semi-structured interviews and based on participant observation. The issues included: decline in pokkali rice cultivation, current livelihood strategies, coping/adapting strategies, problems associated with monoculture shrimp farms, shortage of labour, efficiency of farmer organizations (Samajams) and their history.
<i>Participatory mapping</i>	Mapping was undertaken in group meetings. All the participants were asked to map the resources of village on a sheet of paper. This exercise was carried out to understand a villager's basic knowledge of the local resources. Maps were prepared based on the drawings, cross-checked and verified by the participants and key informants.
<i>Key informants</i>	Key informant interviews were used to probe further into the responses promoted from the semi-structured interviews. The format of the interviews was semi-structured and the questions were prepared from the guide questions. Interviews included PLDA secretary, Zonal Fisheries Department officials, ADAK officials and worker's trade union president.
<i>Informal interviews</i>	Informal interviews were conducted throughout the research. During initial stages of the project, i.e., during site selection, informal interviews were employed to understand the dynamics of the community and the system. The interviews were carried out personally and with the help of a translator and research partner. This tool was used to enrich data emerging from semi-structured interview. The questions were mostly from the guide questions (see Appendix 1).
<i>Timeline</i>	Timeline construction was used in order to learn the status of rice-shrimp rotational cropping in chronological order. The average age of farmers involved in involved in the seasonal rice farming was around 55, and were well aware of the events that occurred during the past 50 years.

3.5.1 Selecting respondents

Early discussions with key informants and the other community members revealed the current situation of rice-shrimp rotational cropping system in the study area. Participant observation was an invaluable tool that helped to understand the

dynamics of the system surrounding wetland agriculture. I spent a few days trying to understand the system, targeting key informants to conduct semi-structured and structured interviews. These members included pokkali landowners, male and female workers (both traditional and monoculture), leasers, shrimp landowners, government officials. In Puthen Padam, potential respondents were selected based on the following criteria: informal discussions, their land holdings, number of years they spent in traditional farming systems and last but not the least, landowners affected by monoculture of shrimp. Male and female labourers were selected based on participant observations, informal discussion, and their livelihood activities. The panchayat president was helpful in providing a list of workers that actively participated in transplanting and harvesting activities in the rice fields, which made our job easier in identifying potential respondents.

It was hard to select shrimp landowners in 31 Block community, because they were reluctant to participate in interviews. They always mistook us for income tax officials. It was the talk of the village that “two income tax officials (Jayesh and I) have come in disguise of doing a research on shrimp aquaculture.” It was through informal discussions with the leasers that we targeted potential shrimp landowners. Identifying leasers was an easy job. Every time we visited a tea shop we met leasers who were discussing shrimp cultivation. Jayesh was quick to “latch on to them”; his communication skills in Malayalam were worth praising. Additional interviews were conducted with village elders in an effort to document villagers’ perspectives on the history of the rice-shrimp rotational cropping system.

3.5.2 Participant observation

This is the most important tool I used throughout the research process along with direct observation. It provided me with a basic understanding of the dynamics of wetland agriculture in the study area. I spent a significant amount of time observing pokkali workers on an average of three to four consecutive days (in a week) and their activities (transplanting process, operation of sluice gates, dewatering process and post harvesting process) in the rice fields. Each and every process was observed with curiosity, and notes were taken on the site. Participant observation was perhaps most critical in understanding the livelihood strategy of agriculture landowners and labourers, and the dynamics of wetland agriculture. Spending time with villagers and families was one of the significant ways to observe day to day life, problems, socio-economic status, and the politics of the village. I slowly became acquainted with landowners, tea shops, hotels, panchayat officials, krishibhavan employees, not to mention the youngsters, who were anxious to know why we were there. As in the Methods for the first and second objective, informal discussions, key informant interviews and participant and direct observation formed the basis for the semi-structured and structured interviews that were to follow.

3.5.3 Semi-structured and structured interviews

Details of the livelihood activities of wetland agriculture farmers relating to the first objective were gathered through a variety of questions. Semi-structured interviews gave more opportunity for the researcher to explore new aspects, as many issues unfolded during the interviews. Interviews were a flexible component of the

research, which helped in discovering the way people express their own ideas, sentiments, emotions and realities. Semi-structured interviews were conducted with individuals and key informants. A written questionnaire was not used; the goal was to have more flexibility than with structured interviews. It is useful, for instance, to discover the way people express ideas in their own words. The interview is left open-ended in order to explore new ideas and topics which arise during the interview. However, the interviewer should still be able to orient the discussion to key topics and questions. During the interviews all questions were asked in Malayalam and the responses were simultaneously translated to English. The questions were translated from English to Malayalam well in advance by Jayesh. We always tried to orient the discussion towards the key topics, because the questions were open-ended and there was always a chance to deviate from the topic. A separate questionnaire was prepared from the guide question schedule depending on the informants.

The interviews at the individual level focused on different themes: (1) livelihood data, (2) problems associated with traditional farming, (3) diversification in coping/adapting strategies, (4) local institutional arrangements, (5) socio-economic issues, (6) gender related issues and (7) problems associated with monoculture shrimp farms (See Appendix 1 for actual questions asked). New themes emerged as the research progressed and I always made sure that my translator understood what I wanted to know from the villagers. Much of the information was gathered at the same time so that semi-structured interviews with landowners and labourers would move from livelihood issues to farmer organizations and co-operatives. In total, 66 semi-structured interviews were conducted. Interviews generally lasted for one to one-and-

a-half hours and most of the interviews were held in the homes of farmers, in common areas in the village, or along the rice fields. The interviewees ranged from labourers to government officials. The majority of the interviews were conducted in Puthen Padam, as it represented the single largest community. Some of the key informants were interviewed more than once throughout the research; they included pokkali workers, Samajam leaders, and trade union leaders.

As mentioned in Table 2, a total of 96 interviews (66 semi-structured and 30 structured) were then carried out in the two communities. This included pokkali landowners from Puthen Padam (n=21), male (n=25) and female (n=21) labourers (who worked in traditional rice fields and monoculture farms), leasers (n=9) (leasers both in the traditional fields and monoculture farms), shrimp landowners (n=9) and government officials (n=9) (see Table 2 for additional information). Interviews with university professors at CUSAT and Centre for Development Studies (CDS), Trivendrum, export company agents, and fisheries and agriculture department officials provided some of the necessary historical context and current developments relating to the research.

Table 2: Interviews and focus group numbers

	Respondents	# of Interviews (n)	Number of individuals participating in the focus groups	Additional Comments
Landowners (Rice-shrimp rotational system)	PL	21	Focus Group #1 (N=10)	SSIs with 10% of PL SIs with 9% of PL
Landowners Shrimp (Monoculture)	ML	9		SSIs with 95% of shrimp landowners in 31 Block
Leasers	LR	9		Leasers are the ones who lease land from landowners (leasers both in traditional and monoculture farms).
Rice + Shrimp workers (Male)	MW	25	Focus Group #2 (N=10)	SSIs with 9% of MW SIs with 6 % of MW
Rice + Shrimp workers (Female)	FW	20	Focus Group #3 (N=13)	SSIs with 5% of FW SIs with 5% of FW
Government Officials (State and Panchayat)		9		Fisheries department officials, panchayat president, krishibhavan officials, PLDA, ADAK, etc.
Other Officials (University and Trade Union)		3		University staffs and union leaders
Total		96	33	

Key	
PL	Pokkali landowner
ML	Monoculture landowner
LR	Leaser
MW	Male worker
FW	Female worker
GO	Government officials
OO	Other officials

The purpose of the interviews was to gain a better understanding of the dynamics of wetland agriculture as it related to the first objective, and to understand the factors that were responsible for transformation from traditional rice-shrimp cropping to monoculture of shrimp (second objective). As mentioned earlier, questions were largely based on the lead questions (see a separate set of questionnaires in Appendix 1). Not all respondents were asked each question. A field notebook was kept with notes taken during the interviews and subsequently cross-checked with the translator to identify gaps and misunderstandings. It was a real challenge working through the translator, because it is difficult to expect exact responses as expressed by the interviewee.

The purpose of the structured interviews was to get general information on the individuals such as age, occupation, main livelihood activity, sources of income, professions engaged in different seasons. The structured interviews were conducted with participants from Puthen Padam community only. Each interview lasted for 10 to 15 minutes and participants were selected based on the criteria mentioned above. (See selecting respondents). (See Appendix 1 for interview guide).

3.5.4 Focus group discussions, participatory mapping and timeline exercise

Focus group discussion was another important component of the participatory research. The purpose of focus groups was to explore the issues that emerged from the semi-structured interviews, which were dealt with in detail to understand the dynamics of the system. Separate focus group sessions were conducted with pokkali landowners and male and female labourers to avoid conflicts. All the participants

were informed about the agenda for the discussions a week prior to the meeting. Questions were prepared in consultation with the project partner, CUSAT research partners, questions were also based on the responses obtained from the semi-structured interviews. Every meeting was arranged according to villager's convenience. All meetings started around 4 pm in the afternoon. Each focus group discussion lasted for two to two-and-a-half hours. Participatory mapping and a timeline exercise followed focus group discussions.

Three focus group discussions were organized and each session comprised of 7 to 15 participants (in total 33 people attended the sessions). Of all the people that attended focus group discussions, 22 of them were from the total group of 96 people interviewed. All participants were from Puthen Padam community. The 31 Block members were not invited because they refused to co-operate with us. Some of the participants in focus groups also participated in the semi-structured and structured interviews. The goals of the focus groups were to verify the current situation in rice-shrimp rotational cropping system, ask villagers what best can be done to solve the current issue, and to conduct a brief survey of participants to obtain details on demographics, occupational diversity, coping strategies, harvesting incentives and management issues. These meetings took place in Grama sabha house (place where meetings are held in the village). Permission to conduct these meetings was taken from panchayat president. The participants were served with tea and biscuits to thank them for their participation.

Participatory mapping and a timeline exercise proved valuable in understanding the context of agricultural resources in the village. They were well

aware of the fact that monoculture shrimp farms were affecting the sustainability of rice fields as well as their livelihoods. The participants were asked to draw the resource map of the village either on the ground or on a sheet of paper. The mapping exercise lasted for 15 to 20 minutes. The purpose of the mapping exercise was to understand the knowledge of villagers and to assess the resource capital of the village/community. It also helped them reflect on the available resources and how this shift (transformation to monoculture) impacted the village.

The timeline construction exercise indicated the decline of rice-shrimp rotational cropping system over the past decade. The purpose of the timeline exercise which lasted 20 minutes, was to understand the historical context and change in farming practices chronologically. As one of the participants put it, “There will be no pokkali rice in the next five years, the land will be either left fallow or will be converted to monoculture of shrimp.” Table 2 provides additional comments on the number of interviewees with whom we spoke. In addition to the interviews with pokkali landowners, male and female labourers, shrimp landowners and leasers, we also interviewed university staff and trade union leaders. Added to that, a number of informal discussions and conversations were held with individuals in Trivendrum, Kottayam and Allepy in the midst of the research, as well as with project partners throughout the research.

3.6 Collecting and verifying data

There were many ways to verify the data through the field work. After each interview, Jayesh and I jotted down important points, which prompted us to refine the questions for further interviews. We never hesitated to ask the same questions twice if

we were not convinced of the first response. Findings from the field research were cross checked with key informants from the study community (pokkali landowners and Krishi- bhavan officers), with Dr. Thomson, PI, project partners from CUSAT (George and Rose), Siby Kuriyakose from Gramavikas Society and through the collection of literature from these persons, CDS, Trivendrum and other sources (PLDA and ADAK documents, Krishibhavan data, and a report produced by Dr. Thomson and Jayesh on the evolution of farmer organizations in Khuzupilly). At the end of the project, a presentation outlining the preliminary findings was prepared for the project director, Dr. Knowles, who was there to assess the progress of SHARP projects in Kerala. A brief progress report based on the project findings was prepared prior to the project advisor's arrival. Field visits with the project advisor followed by a presentation at CUSAT marked the end of the field work.

3.6.1 Leaving Khuzupilly

Before leaving an important question was how to best communicate the findings of the research to the villagers. Earlier, we had mentioned that a brief report on focus group discussions would be presented to all the participants. I also had promised the Krishibhavan officer and interested landowners that a report would be submitted upon the completion of the project. Before leaving the field, the data collected through interviews and discussions was verified with the villagers, panchayat president and Krishibhavan officer. The final report will be disseminated to the Puthen Padam community and to the Krishibhavan office after the approval from project advisor.

3.6.2 Collecting data in and around Cochin

Quantitative data regarding wetland agriculture in the form of statistics, records, and maps were collected from appropriate government offices (State Fisheries Department, Nyarakkal Agriculture Office, Agency for Aquaculture Development (ADAK), and a detailed report on “Development of Pokkali Paddy Cultivation in Kerala” was collected from PLDA, Paravoor). I also visited the Centre for Development Studies in Trivendrum where I collected some valuable literature on the socio-economic status of shrimp farming in India and Kerala. I had several discussions with professors who have worked on wetland agriculture in Kerala. I also visited some local universities, including the famous Kerala Agriculture University, where they are experimenting with a new variety of pokkali rice.

3.7 Returning from the field

I was really confused as where to start the process because I had tonnes of data collected from the interviews, group discussion sessions and various other sources. The first few days were spent in assessing, where to start, what to do and how to do it. I was also faced with the task of explaining my findings to everyone I met (in the classroom, at cafeteria, etc.). In order to understand my findings and to get a clear picture of the research, I started reading my field notes over and over. I worked on organizing Chapters with headings and subheadings. I always kept it flexible; the outline kept expanding as many issues unfolded on reading the transcribed notes and comments. Data were analyzed using Microsoft excel using a spreadsheet to sort the data. The quotes were grouped and sorted in Microsoft Word.

The results were verified with the project advisor before I began working on the remaining Chapters. Analysing data away from the field always gives perspective to find gaps and those gaps were filled through correspondence with Jayesh and George.

3.8 Dealing with limitations and methods in the field

In addition to the problems mentioned in the previous sections, several factors posed challenges during the research period in Kerala. Some of the limitations were related to: (1) language, (2) time and (3) other barriers.

3.8.1 Language barrier

One of the most significant limitations of the research was language. In Kerala, Malayalam is the language widely spoken and it is the most difficult language to learn in India. It is quite different from the rest of the languages in South India. Though, I hail from Bangalore, Malayalam was an alien language to me. My fluency in the other South Indian languages, especially Tamil (spoken in Tamil Nadu, neighboring state of Kerala and Karnataka) helped to grasp some of the words in Malayalam. Initially, I struggled to understand what people were trying to say. The book “Learn Malayalam in 30 days” did help a bit, but I prefer to learn languages naturally rather than going through books. It was a big relief when Jayesh became my translator; his Malayalam was exceptional and praiseworthy.

As the days progressed, I started understanding the gist of the language; in fact I started speaking broken-to-good Malayalam. Few informal discussions with the key informants in Malayalam language increased my confidence level. I was also able

to understand what the villager's spoke, which made Jayesh's job easier of not explaining every word. Sometimes it proved challenging as villagers thought I was fluent in Malayalam, resulting in one-way conversations. Working with Jayesh was challenging, but I was extremely fortunate to work with him as my translator. The way he organized the focus group sessions were quite impressive; he was a competent research partner, always giving new ideas and insights into the research issues. I made every effort to involve him in refining my questions and establishing relationships in the study communities and with the government officials. Working with a research partner (Jayesh) proved valuable as the days progressed; his ability to understand the research objectives helped increase the ability to obtain relevant data from our interviews.

3.8.2 Time constraint

Time is everything, time is money, and having said that, time always seemed to present limitations while conducting field work. Time was a crucial factor in choosing the study site, establishing relationships, getting familiarized with the culture, obtaining permission, setting up interviews, finding a translator, accessing office records, understanding the system, etc. I realized that I could end up doing research in the community for months/years and still need more time to understand the dynamics of the community. All the individuals were scattered and a considerable amount of time was spent in traveling in and around the village. It was easier to interview a man than a woman as they worked in rice fields and shrimp peeling units.

Interviews were halted during festivals and religious activities as villagers were indulged in celebrations.

Interviewing shrimp landowners was a daunting task, because their houses are not in Khuzupilly. They live in a neighboring village called Edavanakadu and it was difficult to find them during the day time. The first round of interviews took a significant amount of time as Jayesh and I were getting used to the conditions and trying to understand the system. On a few occasions the interviews lasted for longer than expected, because the questions were not related to the research topic but were important to understand the system and dynamics of change.

3.8.3 Other challenges/limitations

- Issues of power and conflict always pose a serious challenge to any community- based research. The villagers took some time to accept us into their system. It was easier to work with pokkali landowners and labourers than with shrimp landowners and leasers. The divide between the licensed and unlicensed shrimp farming was clear and the conflicts between the unlicensed shrimp landowners and the rest of the village presented great difficulty as I tried to obtain a better understanding of the issues and conflicts. The conflicts were mainly due to the conversion of traditional rice-shrimp rotational cropping to monoculture of shrimp. I soon realized that working on conflicts was beyond the scope of my time and research in the community, but it would be a great topic for further research.

- My findings and conclusions are based on the methods mentioned earlier in this Chapter and also on the responses, opinions and perspectives from the participants in the study area. My findings and conclusions are primarily dependent on the information collected from the two communities. Although the target group of shrimp landowners in 31 Block community was smaller, every effort was made to collect additional information about monoculture shrimp farms and their impacts on rural livelihoods and economy from other sources when necessary. Responses in semi-structured interviews became redundant after four to five interviews, often hinting towards validation of the information collected.

Chapter Four – Farm Family Livelihoods in Wetland Agriculture



Plate 7: A typical pokkali rice field (Photo by M. Ranga)



Plate 8: Pokkali workers getting their part of harvest (Photo by M. Ranga)

4.1 Introduction

An outstanding feature of Kerala's coastal zone is the presence of the large number of perennial or temporary estuaries or lagoons, popularly known as the "Backwaters", locally called "kayals". Thirty backwaters occur along 590 km long coastline of Kerala covering an estimated area of around 24,000 ha (Thomson 2002). An important characteristic feature of backwaters is their biological diversity, which refers to the various species of living organisms, plants and animals, presence of various ecosystem services, and genetic diversity. Such diverse combination of living organisms and ecological services constitute the natural resource base and livelihood of local communities. In Khuzupilly, the traditional rice-shrimp rotational cropping system was the main livelihood activity undertaken by pokkali landowners and labourers. According to the elders, this system has been in practice for 500 hundred years. Due to some external forces (for example, globalization), the system is going through a series of changes which will be explored in this Chapter. Before moving to the findings from the research and the discussion of these changes, it is useful to explore the basic idea of change, especially in the sustainable livelihoods framework.

4.2 Sustainable livelihoods and change

The sustainable development framework as defined by the Department for International Development (DFID 2001) consists of five key components: vulnerability context, livelihood assets, institutions and processes, livelihood strategies and livelihood outcomes. The effects of diversity or (change) on rural livelihoods are addressed under the context of vulnerability, which is further divided into three areas: shocks, trends and seasonality. As Scoones (1998) points out, the

framework can be applied at a range of different levels from individuals, to household cluster, to extended kin grouping, to village, region or even nation, with sustainable livelihood assessed at different levels. One of the critical elements of a sustainable livelihood is the ability to buffer change (Chambers and Conway 1992; Scoones 1998; Allison and Ellis 2001). In the study area on Vypin Island it is clear that what was once traditional pokkali rice-shrimp rotational cropping system is being transformed into a monoculture of shrimp. The decision to transform from traditional farming practices to a monoculture of shrimp was influenced by increase in market prices and demand for shrimp in international markets. This led to change in farming practices as well as the livelihood strategies of traditional landowners and labourers. These changes and their resultant effect on livelihoods (status), problems with rotational cropping (stress) and coping strategies are presented following details on the traditional rice-shrimp rotational cropping mechanism.

An important characteristic of the western coastal zone of the Indian peninsula has been the presence of organic rice farming in the saline wetlands. This mode of rice farming known as pokkali rice cultivation has been the major source of livelihood of the coastal communities in Kerala. In the study area, livelihoods are closely tied to wetland agricultural resources. A number of fishing castes and poor agrarian communities were the major organizers of livelihood activities. Their agricultural methods were labour intensive and traditional, and the scale of production was sufficient to meet the needs of the local rural economy. One of the important modes of their resource use was through the presence and timely interventions of local and informal institutions in the allocation, governance and control over local

resources among various stakeholders. These institutions allowed the system to work in a sustainable way so that the benefits were shared equally by the resource users. Even though this traditional use of resources proved sustainable and equitable, very little surplus was left behind for stakeholders to invest in commercial purposes. This created a kind of imbroglio situation in which rural communities were in a dilemma whether to save the resources for their own good or to invest for future developments. Whenever there was a demand for economic expansion of the resources, local communities could not effectively involve or dominate the decision-making processes. As a result of this, there was more opportunity for the modern (outside) stakeholders to invest, though they were not necessarily the traditional user groups, to invest in local agricultural activities.

Local communities felt they were gradually marginalized from the mainstream economy. This led to livelihood insecurities among the communities. There was also large scale mobilization of people to towns and cities in search of jobs. Some farmers, with the aid of modern stakeholders, considered this as an opportunity to invest in other activities that provide more benefits than traditional rice-shrimp farming. Economic pressures followed by increase in market prices and demand for shrimp in international markets opened the gates towards globalization. Shrimp that was once used as fertilizer for palm trees in the 1970s became a valuable commodity when people realized the value of frozen shrimp in the international market².

² According to John Kurien from CDS, Trivendrum, Kerala, shrimps were considered as pink gold, when people realized the value of frozen shrimps in the international markets.

The landowners started focusing on shrimp filtration, and more and more people started investing in shrimp farming activities. Khuzupilly, a small village on Vypin Island was open to international markets. Globalization had stepped in; gradually traditional practices gave way to modern aquaculture, farming systems started changing from traditional rice-shrimp farming to monoculture of shrimp. They were not aware of the future consequences this change would hold. All they wanted was 'quick money' in less time, because shrimp farming is a profitable business. Little did they know about the implications of such a shift on the rural economy and local livelihoods. One of the major negative outcomes of this transformation is on the agricultural labourers; especially, the rural women who work in paddy fields. They are dependent on rice and fish/shrimp culture for their livelihoods and its downfall is causing them to lose their livelihoods. Although a money maker for the investors in the short-term period, monoculture of shrimp will have serious environmental and social implications. The following sections focus on the cycle of traditional rice-shrimp cropping system, livelihoods and problems associated with the farming system, and coping strategies. A detailed discussion of diversity in coping strategies adapted by farmers of Khuzupilly is also presented following at the end of this Chapter.

4.3 Rice-shrimp rotational cropping in Khuzupilly

One of the most eco-friendly farming practices in the world is the traditional pokkali rice cultivation and shrimp farming which is practiced in the wetlands of Allepy, Thrissur and Ernakulam districts. This singular method, which has been passed down from generation to generation, relies on the symbiotic nature of rice and

shrimp. This is a seasonal activity undertaken by the wetland agricultural farmers. The income generated from rice farming is considerably less than that earned from shrimp monoculture. The interesting factor about the traditional rice-shrimp rotational farming system is that there are no external inputs required. All the processes are based on natural conditions that follow the lunar cycle. Interviews were conducted with the households and individuals to understand the dynamics of the system, and focus group discussions gave us a clear picture of the farming system. The first objective of the research deals with the historical and current resource and livelihoods strategies of wetland agriculture landowners and labourers and to describe the drivers of change in those livelihoods.

Let me give a brief history of the current resource use in Khuzupilly. Rice-shrimp rotational cropping was the main source of livelihoods for thousands of farmers in Khuzupilly. There are five communities/farmer organizations in the village. Our area of study was in Puthen Padam and 31 Block, and the criteria for choosing these communities were mentioned in Chapter 3. Puthen Padam practices traditional rice-shrimp rotational cropping system and 31 Block practices monoculture of shrimp. The labourers in the study area and in the village are very much dependent on the rice-shrimp culture. Men work mostly during the transplanting process whereas women work year round (in rice fields and in shrimp peeling sheds). Their livelihoods are so tightly tied to the resource base that any change in the system will have serious implications on the livelihoods, rural economy and gender relations. The emergence of 31 Block has created confusion among the villagers, because it provides employment to more than one thousand women in the

form of shrimp peeling sheds and it is also one of the reasons for decline in pokkali rice cultivation. The following sections describe the process of traditional rice-shrimp rotational cropping system, problems associated with it, and the livelihoods and income from the farming activities.

4.3.1 Pokkali rice cultivation

The distinguishing feature of pokkali cultivation is that it grows in low to medium saline conditions. Interviews and discussions with pokkali landowners suggest that, although a lot of inroads are made towards cultivation of modern variety of rice, pokkali retains its traditional, organic, method of cultivation. Many natural problems are solved through this type of farming and traditional knowledge is the main base for pokkali cultivation. Pokkali cultivation begins during the south-west monsoon in May and goes on till mid November. This is completely a natural process which doesn't use fertilizers, insecticides and chemicals. Table 3 gives complete information on the seasonal cycle of rotational cropping activities taking place during the year.

Table 3: Seasonal cycle of rice-shrimp rotational system

	January	February	March	April	May	June	July	August	September	October	November	December
Pokkali					Dewatering of fields	Draining of the land	Ploughing and sowing	Transplanting	Weeding	Harvest	End of harvest (Nov 15)	
Shrimp		Shrimp harvest begins		End of harvest (Mid April)							Construction of sluices	Stocking shrimp fry

4.3.2 Environmental conditions

Estuarine water mixes with the sea water, increasing the salinity of the water. The movement of water in the pokkali field is due to two tides: high tide and low tide. Tides help the water to wash away the salt content in the soil which enables flora and some insects to colonize the pokkali fields. Cultivation of pokkali requires natural conditions, minimum pest management, and no use of organic fertilizers. Pokkali grows in low to medium saline conditions depending on the water flow and season. In some areas of Kumbalangi, Chellanam, Eadavanakadu and Khuzupilly of Ernakulam district, vast areas are marshy and waterlogged. These marshy tracts lie near the mouth of the estuary and are close to the sea. Therefore, these areas are prone to flooding and salinity. This is the interesting feature of pokkali rice, as it can withstand the salinity levels to some extent. In the international plant breeding labs, it is the

gene of the pokkali rice which is used as the parent gene to culture saline and flood-resistant varieties of pokkali rice.

Average rainfall received during pokkali season (May to November) and shrimp filtration (November to April) is 3000 mm. Temperature in the summer varies from 27-34 degrees Celsius and in the winter, it varies from 21 to 28 degrees. South-west monsoon reduces the salinity of water, making it conducive for pokkali cultivation. Harvesting begins by late November, and at the end of monsoon season water starts increasing in salinity, which is a precursor for shrimp cultivation. The presence of salt in the soil entirely depends on tidal action of the water and the salinity ranges between 3ppm to 8ppm* during pokkali cultivation and 25 ppm – 100 ppm during shrimp cultivation. The soil is rich in nutrients due to the leftovers from shrimp filtration.

4.3.3 Cultivation process

The outer bunds (dikes) constructed during mid May (soon after shrimp filtration), is the first step towards pokkali rice cultivation. At the end of April, soil is dried and small heaps (mounds) measuring one meter in width and half meter in height are made. This method is especially useful for washing salt³ from the soil. All the activities are based on Malayalam calendar that follows the lunar cycle (Table 4). The table represents the 15-day cycle, which reflects various processes involved in rice-shrimp rotational system.

* Salinity is measured in parts per million.

³ South-west monsoon begins in mid May; rain water washes away the salt from the soil mounds constructed to dry the soil. This is how the soil salinity levels are reduced to levels acceptable for rice cultivation.

Table 4: Pokkali rice-shrimp rotational system in Malayalam calendar (Lunar calendar)

Malayalam Calendar Months	Chingam 8/17-9/16	Kanni 9/17-10/16	Tulam 10/17-11/15	Vrikchikam 11/16-12/15	Dhanu 12/16-1/13	Makaram 1/14-2/12	Kumbam 2/13-3/14	Meenam 3/15-4/13	Medam 4/14-5/14	Edavam 5/15-6/14	Midhunam 6/15-7-16	Karkidakam 7/17-8/16
Pokkali	✓	✓	✓						✓	✓	✓	✓
Shrimp				✓	✓	✓	✓	✓				

4.3.4 Transplanting process

Pokkali is the name of a particular rice seed and it is the most popular one although not the only variety grown. *Chottu pokkali*, *chetty viruppu*, *Baali*, *Orkayama*, *Eravapandi*, *Orppandi*, and *Kuruka* are the other varieties of rice used (PLDA 2004). These seeds are highly resistant to saline conditions. They are aged for 115-135 days prior to use. The farmers can harvest 1500 – 1800 kg of rice per hectare. The recent discovery is Vytilla IV, which is almost the same quality as those mentioned above. The difference in the cultivation process makes pokkali distinct from other forms of rice, because it is salt tolerant and grown in natural conditions. Every method is different from sowing to harvest. The seeds are sown in the ratio of 100 kg per hectare. It is important to maintain the water level after the seeds are sown, because high tide can destroy the entire process of sowing. Water flow should be limited according to the plant growth.

According to a recent report on pokkali cultivation, scientists at the Rice Research Station (RRS) of the Kerala Agriculture University (KAU) at Vytilla, Cochin, have developed a high-yielding rice variety of pokkali for cultivation in the coastal saline ecosystem. Named 'VTL-6', the new variety was developed through hybridization and selection. It is semi-tall and non-lodging, and is tolerant to abiotic stresses such as salinity, acidity and submergence (The Hindu 2005).

4.3.5 Planting

Pokkali rice grows up to a height of 40-45 cm within 30-40 days. In the pokkali fields only one crop is cultivated during the monsoon (May to October), which is the low salinity phase. Subsequently during the high salinity phase, the fields are used for prawn filtration (November – April). In the months of April/May the waterlogged fields are prepared by making mounds to wash the salt content in the soil, and in June, with the onset of monsoon, the seeds are sown on top of the mounds. This traditional method has been proved by scientists as the best method to prepare the fields because of the larger surface area, and it enhances the leaching of the toxic contents of the soil by rainwater. This method is least practiced and farmers resort to the easiest method of preparing the field-bed formation (Ittyipe 2002). An interview with a plant breeder at Rice Research Station, Vytilla, Cochin, confirmed that, “Even though this traditional method has been recommended by us, most farmers just make the beds a little above the water to sow the seeds.”

June is the favorable month for pokkali; water begins to flow into the fields, and soil mounds are leveled on the ground. Since paddy plants are tall, they can

generally outgrow high tides. The mud blocks attached to paddy roots help them fix to soil strongly. These processes are mainly carried out by women labourers. Once the plant is rooted to the soil, water level is increased and maintained according to growth (height) of the paddy.

4.3.6 Caring

The methods used for caring for pokkali rice are totally different from the methods used for normal varieties of rice. Salinity of the water must be maintained on a regular basis. The floods during monsoon also affect pokkali cultivation. In spite of these hurdles, the farmers here follow a cultivation pattern that can overcome these complications. As one farmer puts it “Normally, it is a cycle of seasons, fresh water in the monsoon followed by saline water, i.e., paddy cultivation is followed by shrimp filtration” (rotational cropping process).

Pokkali cultivation is also prone to many threats from various sources. Rats and turtles harm pokkali at the seedling stages, while pigeons and parrots peck seeds. Farmers have learned to largely overcome these problems using traditional methods, without the use of pesticides and herbicides. The remedy for all these problems is to control the flow of water, because spraying of pesticides kills fish in the rice fields. After the harvest of the fish, the remains of the fish, shrimp and other insects act as fertilizer for rice cultivation.

4.3.7 Harvesting

The final process in pokkali cultivation is harvesting, which starts in the month of October. After three to four months of growth, pokkali rice is ready for

harvest. Pokkali grows up to a height of one to two feet. Direct observation and interviews confirmed that harvesting begins early in the morning, around 5:30 a.m., before the sunrise. Most parts of the harvesting are done by women. Jayesh and I took part in a two-hour harvest allowing us to experience difficulty involved in harvesting. Labourers have to soak their feet up to waist deep water, working in conditions of sweltering heat. Harvesting is done till 12 p.m., every day. The remainder of the day is spent in threshing, drying and packing in the study area (Puthen Padam).

4.4 Traditional shrimp farming

The pokkali fields are used for fish/shrimp farming after the harvest of pokkali rice crop. The seasonal rice and fish farming has been practiced effectively for centuries. In this natural system the ecological balance is maintained and a reasonable profit is obtained by the farmer. After removing the weeds like African moss, the outer bunds are strengthened so as to resist the water flow. When the monsoon subsides, backwaters and canals become saline. Juvenile shrimps and fingerlings of other fish come in large quantities in the outer canals. They are guided to the fields through trap sluices when the tidal flow is high (high tide), sluice gates prevent juvenile shrimps from moving out. Interviews and participant observations suggest that sluice gates are effectively used for the purpose of allowing the juvenile shrimps into the ponds. In order to attract juvenile shrimps, a small hurricane lamp is hung at the inner mouth of the sluice gate. Sluice gates play an important role in shrimp farming in pokkali area. This is used for regulating the water flow in and out of that field throughout shrimp filtration process. It is fitted in such a way so that maximum

flow of saline water and shrimp seeds are stocked⁴. It also prevents the escape of fingerlings and fish from the ponds, while providing a means for easy exchange of water. Exchange of water is necessary for the growth of shrimp, because every time there is an exchange of water, more fingerlings are stocked into the pond.

Harvesting starts by the end of December or beginning of January. Normally the filtration is done on the day of, before or after the full moon, locally known as *Thakkam*. In the study area, leasers follow the lunar cycle for shrimp filtration (Table 4). A cone shaped net is fixed at the outer end of the sluice gate. Water starts receding at the time of low tide, fish and shrimp are caught in the sluice net, locally known as *thoombuvalam*. This is an economical and effective way of fishing. Based on the size of the *Samajam* the number and size of the sluices are decided. Traditional sluice gates are made of local timbers like *Kanjiram*, *Irul*, *Thembavu*, *mango* etc. The size of the gate is 4 meters in length, 1.5 meters in height, and 1 meter width. Each natural canal has a master sluice gate, which is double the size of the respective farms' individual sluice gates.

Harvesting is done until mid April, 500 to 1000 kg of shrimp is harvested per hectare in five months. The species commonly harvested are *Penaeus monodon*, *Penaeus indicus*, *Metapenaeus dobsoni*, *Metapenaeus monocero*. Approximately 5,000 to 10,000 Rupees of profit is made from one hectare. The profit depends on the species of shrimp caught and their market value. All these processes are carried out naturally and are economically valuable to the traditional pokkali landowners.

⁴ The mechanism works in 2 ways, when there is high tide, shrimp workers use net with big mesh size so that juvenile shrimp, fish and larvae can pass through the net. When the water starts receding, the net with big mesh is replaced by a net with a smaller mesh size.

4.5 Problems with rice-shrimp rotational cropping system

Pokkali rice cultivation is an indigenous method of agriculture in a wetland setting. Seasonal cropping of rice and shrimp, is an eco-friendly and sustainable method of agriculture. Farming of fish/shrimp either together with rice or after the rice is harvested, is an age-old system in the study area. The system of shrimp culture varies depending on the ecological settings of the rice fields. Rice-shrimp rotational cropping is carried out on a larger scale in the coastal wetlands than on the upland rice fields in Kerala. While this farming has received some attention from agricultural and fisheries scientists, the socio-economic and institutional factors shaping rice-shrimp farming have received little analytical scrutiny from social scientists. In recent years, the wetlands in Khuzupilly, under rice-shrimp farming has been facing severe threats owing to a variety of factors including shifts from ecologically balanced rice-shrimp farming to an intensive monoculture of shrimp, adversely affecting the environment and livelihoods of the pokkali landowners and labourers. Any changes in the seasonal cropping can upset the prevailing ecosystem. The impact on the rice-shrimp rotational cropping system seems to be greater here than rest of the villages on Vypin Island. Problems with pokkali rice cultivation can be divided into two categories in the study community: environmental and socio-economic.

4.5.1 Ecological problems

In the pokkali fields, only one crop is cultivated during the monsoon season. The rainwater dilutes the concentration of salt in the estuary, which makes conditions suitable for pokkali rice cultivation. Pokkali rice cannot withstand high salinity; as a

result of this, farmers spend at least a month (May) in dewatering and other processes required for removing the salt content from the fields used for shrimp filtration. During the last decade or so, pokkali rice fields were subjected to changes in farming practices in Khuzupilly (Puthen Padam and other communities). As a result of this, natural conditions have been adversely affected. The change in the farming practices is attributed to monoculture of shrimp (primarily in 31 Block) and also due to economic pressures such as shortage and high cost of labour. The first and most dire problem is increased salinity in the study area. The root cause of the problem lies in the changing agricultural practices in the surrounding areas. Shrimp landowners, who practice monoculture of shrimp in 31 Block, release water directly into the estuary as a part of water exchange necessary for shrimp aquaculture. This effluent water contains high levels of salt and chemicals, which gets mixed with the water in the natural canals, and the same water is used for irrigation purpose by the traditional landowners, eventually leading to low yields in pokkali rice.

“Increase in salinity has caused severe problems to our crop; we can’t tell 31 Block owners to stop using salt and chemicals, there is no way to solve this problem...”

(PL, Puthen Padam)

Another major problem facing pokkali rice cultivation is “lack of time for preparation.” Pokkali cultivation needs ample time for preparation of fields after shrimp is harvested. Dewatering of fields (after mid April) should be carried out a month before so that the land is completely drained (See Table 3 for the monthly activities). Puthen Padam which is adjacent to the 31 Block is the most affected area in Khuzupilly. During the period of shrimp filtration, the whole area is leased out to

an outside party called a leaser. The problem of “time” appears here, as leasers have to hand over the leased fields to respective landowners. As a result of this, leasers increase their number of harvest after April 14th of every year and it extends up to mid May. According to the leasing terms and conditions, the leaser has to return the leased land to the respective land owner on the 14th of April. There is, however, a special kind of understanding or agreement between leasers and samajam leaders for the extension of the shrimp harvest, which will have direct consequences for pokkali rice farming. This arrangement reduces the time required to prepare for rice farming and as a result of this, dewatering is not done properly thus negatively impacting on pokkali rice yields.

All leasers in the area have special understanding with the samajam leaders to extend their harvest; they are not worried about the aftereffects of delay in returning the land. This problem has to be sorted out because leasers want to increase their profit at the cost of our livelihoods. Lack of time for preparation will lead to all sorts of problems...

(PL, Puthen Padam)

Pokkali rice cultivation is a highly labour-oriented activity; labourers are employed at various stages of cultivation. Men and women both work at the time of constructing of bunds, sluice gates, weeding, transplantation, and other related processes. Another interesting point here is that men are available *only* at the initial stages of cultivation because they are paid in cash whereas, during harvest, labourers are paid in kind (one seventh of the harvest per hectare). The landowners and the tenants alike expressed this mode of demand for local labour. To reciprocate the services drawn, the owners of the land granted fishing rights to the labourers. These customary rights are known as *Kalakkidutham* (gleaning rights) and are prevalent

even today. In *kalakkipidutham* period (mid April to first week of May), all villagers have access to fish/shrimp free of cost. During this time leasers have begun to take actions to ensure that they can harvest all of the catch before the labourers. Leasers poison the fields just before *kalakkipidutham* so that they can fish everything available, thus preventing the labourers from claiming *Kalakkipidutham*. Poisoning of fields is one of the common practices that leasers have adopted in recent years. This has led to widespread criticism among the labourers and landowners, as the practice has a direct impact on pokkali rice cultivation allowing poisons and chemicals to accumulate in the soil. In addition, the labourers who depend on gleaning rights over shrimp/fish are deprived of the catch afforded to them by *Kalakkipidutham* and their livelihoods are negatively affected.

The problem is with the leasers, they poison the fields before kalakkipidutham begins, this renders land infertile and reduces yield in pokkali rice!

(MW, Puthen Padam)

Our livelihood is dependent on Kalakkipidutham to some extent; these greedy leasers don't let us fish in the ponds. We have to start looking for other options to sustain our livelihoods during kalakkipidutham

(MW, Puthen Padam)

Another problem facing pokkali rice cultivation is increase in pests and weeds. Farmers have started spraying pesticides now, which adds more chemicals to the soils and increases the costs to the farmers. Apart from pests, birds peck seeds, putting extra pressure on the farmers to monitor the fields.

This year pokkali rice was more prone to pests; we sprayed pesticides to get rid of them! Birds keep pecking our rice grains often; we have to keep watching them!

(PL, Puthen Padam)

4.5.2 Socio-economic instability

Any change in seasonal cropping patterns can upset the ecosystem and its components. Moreover, the ability of a pattern of agriculture to simultaneously provide fair returns to the owners and labourers and to satisfy the needs of the nonagricultural population in an ecologically sound manner depends not only on ecological interactions, but also on complex social conditions – conditions that are even less understood today (Lele 1991). Due to changing economic realities and the resultant change in agricultural practices, pokkali cultivation in Khuzupilly is going through socio-economic changes. This study focused on the socio-economic problems associated with the rotational cropping system.

Organizing rice farming on coastal wetlands has been a major challenge for coastal communities. Due to the transformation of rotational cropping to monoculture of shrimp and the resultant deteriorating environmental conditions, pokkali rice farming is under severe threat in the study area. High investments and low returns from pokkali, coupled with demand for increase in labour wages, have aggravated the situation. Based on the findings in Khuzupilly, the production cost of pokkali rice per hectare has increased and farmers are experiencing loss at an alarming rate. Table 5 shows the investment and returns per hectare (0.40 ha = 1 acre) of rice-shrimp rotational cropping system. It also shows the loss per hectare and the figures are mentioned in Indian Rupees (1 \$US = Rs 45 at the time of research).

Table 5: Annual investment and returns from rice-shrimp rotational system

L'owners (PL) (N=10)	Area of Land (ha) (0.40 ha = 1 acre)	Investment Rupees/ha	Returns Rupees/ha	Loss/acre Rupees/ha	Returns from leasing (shrimp farming) Rs/ha/season
PL 1	0.97	12,000	8,000	4,000	28,000
PL 2	0.40	6,000	5,000	1,000	12,000
PL 3	0.40	4,500	3,000	1,500	13,000
PL 4	0.40	6,000	3,000	3,000	11,000
PL 5	0.40	5,000	3,000	2,000	13,000
PL 6	0.12	2,000	1,500	5,00	3,000
PL 7	0.40	3,500	2,000	1,500	14,000
PL 8	0.40	3,000	3,500	5,00	10,000
PL 9	0.40	3,000	2,000	1,000	15,000
PL 10	0.40	6,000	4,500	1,500	20,000

The results shown in the table are based on the interviews with landowners who practice the traditional rice-shrimp rotational cropping system. The investment and returns value mentioned in the table were collected from individual landowners, and it is not based on any government data. It is completely dependent on landowners' perceptions. Ninety-five per cent of the landowners interviewed confirmed loss in pokkali rice farming. Investment returns and loss varies every year based on the maintenance costs and ecological conditions.

“Loss increased every year; it was hard to depend on pokkali rice for our livelihoods and income...”

(PL, Puthen Padam)

As a result of this, landowner's inclination towards rice farming gradually decreased and they started concentrating on shrimp farming in Puthen Padam. Returns from seasonal shrimp farming proved profitable. The landowners were able to cover their loss and debts through seasonal shrimp farming. In the traditional rice-shrimp rotational cropping system, shrimp farming is a one-time investment activity; they can recover all the loss they incur from rice cultivation. The landowner leases his land to a leaser based on pre-agreed terms for six months of the year, and the leaser in turn pays the agreed amount to landowner before he starts operating.

Due to high investment, high labour inputs and low returns, pokkali rice cultivation has posed some serious problems. Shortage of labour is a major problem surfacing in the last decade. Youths were no longer interested to work in the rice fields, because rice cultivation in wetlands is a tedious process, more manpower is required throughout the processes starting from transplanting to harvest. The youth prefer white collar jobs, or daily wage jobs like masonry, carpentry, plumbing etc. As a matter of fact, it was left to old people to work in rice fields. Even though a lot of other occupations were available in and outside the village, most of the old people wanted to work in the rice fields. As mentioned earlier, men work only during the time of pre-harvest. They disappear at the time of transplant and all other activities were carried out by women. The number of working days was reduced because landowners slowly started abandoning rice fields, hoping that profit made from shrimp farming is enough to meet their livelihoods. Agricultural production from pokkali lands was reduced as many farmers kept their land fallow. The labour force

also started shifting from these activities to other jobs, as their employment possibilities reduced considerably due to the non-viability of pokkali farming.

Most areas of Khuzupilly samajams remain uncultivated during pokkali season. Though no accurate data of non-cultivable land is available either with panchayat or with any government bodies, interviews with male and female labourers confirmed that no woman is getting more than one week labour days during cultivation and during harvest in pokkali fields. In other words, they are getting only a maximum of 14 days during one season of rice cultivation. Table 6 shows the estimate of the number of man days required in rice-shrimp rotational cropping system per hectare.

Table 6: Rice farming activities and labour requirements (6 months)

Sl. No.	Details	Man days/ha	
		Men	Women
1	Bund raising and channeling	5	00
2	Mound raising	20	5
3	Seed soaking and soil	5	3
4	Ploughing	2	20
5	Weeding	2	20
6	Transplanting	2	20
7	Preparing of ground for threshing and building of shed	4	2
8	Harvesting	5	20
9	Post harvest labour	6	10
10	Measuring and storing	3	3
	Total	54	103
Total man days		157/ha	

For example, bund raising and channeling requires 5 man days of labour per hectare and transplanting requires 20 man days of labour per hectare. Therefore, 157 man days (in total) of labour are required per hectare of pokkali field for one season (six months). Man days are calculated based on the presumption that the entire cultivable land is available. However, the lesser number of working days revealed by the interviewees points to the fact that the area under cultivation is considerably reduced. This is due to the general perception among the farming community of non-profitability of pokkali rice cultivation on the one hand, and the possibility of huge profit margin from shrimp farming. In terms of seasonal shrimp farming, 182 man days of labour are required per hectare starting from the construction of dikes to transportation and marketing (see Appendix 2, Table C for labour requirements in seasonal shrimp farms). What is more interesting is that at least 20 women are required to peel shrimp that is harvested from one hectare. The women employed in shrimp peeling sheds also work in rice farms, making their livelihoods more diverse.

Since the average age of labourers was 55, the general nature of displacement from pokkali rice to other activities is hard to access in the study area. The younger generation is totally absent in pokkali related work. Pokkali rice farming is generally hard, because all the work has to be done in muddy water and, without expertise, it is virtually impossible to do the work. The present wage for men is 150 Rupees per day and for women, 55 Rupees per day. This wage rate is not lucrative and the present generation feels it is inadequate. The fast declining pokkali cultivation, along with hard labour and low wage rates, do not attract the much-needed younger generation. One of the reasons for shortage of labour in wetland agriculture in Kerala is, more

and more people are absorbed in industries and other sectors in the Gulf and other parts of the world.

The issue of conflict among landowners, workers and trade unions is also an issue. Workers demand increases in labour wages and landowners cannot afford to spend more on already declining pokkali rice cultivation. As a result of this, there is an increase in trade unions such as KSKTU (Kerala State Karshaka Thollali Union). Landowners are reluctant to cultivate pokkali due to so-called economic instability and non co-operation of workers during harvesting season. Interviews with landowners revealed problems associated with the rice-shrimp cropping system (See Table 7).

Table 7: Major problems faced during rice-shrimp rotational system – Landowners

Land Owners (rice-shrimp) (N=10)	Description
PL1	Lack of workers, cultivation process is very expensive
PL2	Dewatering problem, no subsidy from the government
PL3	Lack of workers during transplanting process
PL4	Lack of workers during harvesting season, increase in wage rates
PL5	Increase in salinity
PL6	Lack of workers and low returns from rice
PL7	Dewatering not done on time; shortage of labour
PL8	Birds peck the rice grains; poisoning of fields before Kalakkpidutham
PL9	Lack of interest in rice farming after tasting success in shrimp filtration
PL10	Dewatering problem; salinity; increase in depth, and lack of government grants

* These were the common problems experienced by landowners since the last five years.

The major problems faced during rotation cropping system are given in Table 7. PL1, PL2, PL3, etc. represent pokkali landowners who practice traditional rice-shrimp rotational cropping system. Lack of workers, dewatering problems, and increase in salinity were the prominent problems expressed by landowners during interviews and focus group discussion. The landowners want more than one occupation, they can no longer rely on pokkali rice, shrimp cultivation lessens their problems to some extent, but it is not sufficient to sustain their livelihoods. Whereas, interviews with the male labourers (Table 8) confirmed another set of problems contrary to what landowners expressed. In Table 8, MW1, MW2, MW3...etc. represents male labourers in the study area.

Lack of incentives at the time of harvest, low wage rates, decrease in number of working days, conflicts with landowners, lack of interest among younger generations and low yields in pokkali cultivation were the important concerns expressed by male workers. Men get less number of working days than women because they are moving out to cities looking for white collar jobs. They no longer want to wet their feet in the muddy water. Moreover pokkali rice cultivation is a seasonal activity with low wages. As one worker puts it, *“There is absolutely no income from working in rice fields; I can earn more if I work in a city.”*

Table 8: Major problems faced during rice-shrimp rotational system – Male Workers (MW)

Rice-Shrimp male workers (MW)(N=10)	Description
MW 1	Dewatering problem; low wage rates, poisoning of fields during shrimp filtration
MW 2	Lack of incentives at the time of harvest, - “payment in kind, not in cash”
MW 3	Yields are decreasing; less number of working days
MW 4	No government incentives
MW 5	Less working days in the field; lack of workers during harvest
MW 6	Landowners have no interest to cultivate pokkali, climate is not favorable anymore
MW 7	Landowners – workers relationship not on good terms
MW 8	Youngsters not willing to work in rice fields, interested in daily wage jobs
MW 9	Increase in salinity due to exchange of water from 31 Block
MW10	Low yield from pokkali

MW1, MW2, MW3...etc represent male workers in the study area. These were the common problems experienced by male workers since the last five years.

Interviews with women revealed that landowners were not interested in cultivating pokkali after tasting success in shrimp farming (Table 9). FW1, FW2, FW3...etc represent female labourers in the study area. They were not happy with the kind of payment during harvest. “No payment of cash, payment only in kind” during harvest. Most of the women labourers (95%) interviewed complained about payment at the time of harvest in the study community. Focus group discussions with women suggested that women were interested in working in pokkali fields if they were offered a better wage at the time of harvest. They also mentioned that landowner-worker relationships were not good due to increases in workers unionization.

However, the concentration of shrimp peeling sheds in Khuzupilly panchayat is providing job opportunities for many women labourers displaced from pokkali cultivation. I will be discussing the role of women in rice-shrimp rotational cropping system, especially during shrimp farming and processing activities at the end of this Chapter.

Table 9: Major problems faced during rice-shrimp rotational system – Female workers (FW)

Rice-shrimp Female Workers (FW) (N=10)	Description
FW 1	Landowners are reluctant to cultivate pokkali
FW 2	Dewatering problem (understanding between leaser and samajam presidents), no incentives
FW 3	No payment of cash during harvest, only in kind
FW 4	Poisoning of fields, no incentives during harvest or transplanting process
FW 5	Labour wage problem, lack of workers during harvest
FW 6	Dewatering not done on time, poisoning of the fields before rice cultivation
FW 7	Low wage rates
FW 8	Landowner –worker relationship not in good condition
FW 9	Lack of incentives
FW10	Increase in labour unions

FW1, FW2, FW3...etc represent women workers in the study area. These were the common problems experienced by female workers since the last five years.

4.6 Livelihoods and Income

In Khuzupilly, livelihood for the wetland agriculture farmers depend largely on the income gained from rotational rice-shrimp cropping system. The majority of the farmers in this panchayat are of socio-economically “backwards” groups. Of the

total area of panchayat, 89% constitutes pokkali and cultivable lands (mixed cropping), and the remaining lands are wastelands or barren lands. (See Appendix 2, Table B for classification of land in Khuzupilly).

There also exist many traditional institutions in Khuzupilly, which provide services to traditional communities. One key social institution that grants access to the workers, especially to women, to earn a substantial amount of cash income from the fishery resources in wetlands is *Kalakkidutham* (gleaning rights). This social arrangement has been practiced for decades. It is seen as a reciprocal arrangement of the land owning classes to acknowledge the services offered to them by the agricultural labourers. For laymen, technocrats and policy makers *Kalakkidutham* is merely a traditional fishing method commonly found in pokkali fields. “It is described in official documents as a tribal activity undertaken by the *pulaya* (caste) women belonging to the agrarian labour class. They are engaged in agriculture activities during the paddy season and help out in the fields during the period of shrimp filtration” (Thomson 2002). This arrangement serves as livelihood and income for the fishing communities and other labour class. Here is the example of income earned through *Kalakkidutham* (Table 10) in one of the fishing villages called Kumbalagi. The table shows that the income generated is sufficient enough to sustain the livelihoods of rural fishing communities and *pulayas*. It is the same scenario in Khuzupilly, where *pulayas* rely on *kalakkidutham* to eek out their living.

Table 10: Distribution of value generated through Kalakkippidutham during April-May 2000

No of days fished	Quantity caught		Price(Rs)		Value produced(Rs)		Total Value(Rs)	No of workers
	shrimp	fish	Shrimp	fish	Shrimp	fish		
April 1-22	35000	1800	125	30	4375000	54000	4429000	500
April 22-30	48000	2400	110	25	5280000	60000	5340000	1000
May 1-10	24500	2000	75	25	1837500	50000	1887500	700
May 11-31	18000	1500	50	30	900000	45000	945000	450
Total Per capita = 4755							12601500	2650

Source: Thompson (2001)

Total Effort in man days = 35,000
 Revenue realized (Rs) = 1, 26, 01,500
 Average revenue/man-day = 360.04

Pokkali cultivation is a seasonal activity, which requires high labour inputs with low returns. The total labour required for pokkali farming is 157 man days per hectare (See Table 6) in the study area. These numbers keep dropping every year. In earlier times the labour class was sufficient to meet the labour requirements of rice cultivation. With the passage of time there is a gradual reduction in the strength of labour class. Rice-shrimp rotational cropping system has been followed since the beginning of the 15th century and it has been the source of livelihood for approximately 80% of the population of Khuzupilly. Interviews with landowners and workers (male and female) indicated that the rotational cropping system is an age old,

organic system, and it continues to be the best farming practice for the local environment. Table 11 indicates the number of years respondents were engaged in rotational cropping system. One of the interesting features of this table is 80% of landowners, 92% of male workers and 91% of female workers interviewed were engaged in traditional indigenous cropping system for more than 25 years. This is a clear indication that rice-shrimp rotational cropping system is environmentally sustainable.

Table 11: Number of years engaged in rice-shrimp rotational system

	Pokkali owners (PL) (n=6)						Male labourers (MW) (n=6)						Female labourers (FW) (n=6)					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
More than 5 yrs					■													
More than 10 yrs				■					■									
More than 15 yrs															■			
More than 20 yrs	■	■	■			■	■	■		■	■	■	■	■		■	■	■

4.6.1 Earnings of rice-shrimp labourers

The socio-economic conditions of pokkali workers in Khuzupilly have to be examined in light of the politics and struggles that are taking place in the village. For most of the farmers, rice is the important single crop for their livelihood. Thus, traditionally they had a more intimate relationship with pokkali fields than shrimp farms. Considering the fact that rice-shrimp cropping system is an age-old system, I examined the involvement of workers in rice fields in terms of years. Analysis of the data on age distribution of agriculture labour shows that 60% of the male and 55% of

the female workers were above 60 years of age in the study community. The number of working days is reduced every year. This is due to the fact that landowners are no longer interested in pokkali cultivation because of shortage of labour and economic factors mentioned in the previous sections. It is the labourers who are most affected by change in culture practices, because many are still dependent on pokkali rice. Table 12 shows earnings of male and female workers and the caste is included in the brackets. It is interesting to see caste-based labour assumes significance in this context.

Traditionally, *Pulaya* community has more intense association with pokkali resources as they depended on pokkali lands not merely for wage labour. They also fish in these waters at the time of *Kalakkipidutha*. Another interesting issue is the lower number of working days. Based on the analysis, it is clear that none of the male or female workers got more than 20 days of work in pokkali season (for the year 2004). Pokkali landowners have either abandoned rice cultivation, or kept their land fallow, or have leased lands to workers for six months for pokkali rice cultivation.

Since there is a shortage of labour, aged workers demand increased wages. In a situation where labour supply becomes a constraint affecting the cultivation of pokkali lands, the fallowing of lands could have serious implications/consequences on the livelihoods of labourers who depend on pokkali lands. This situation has created a rift between workers and landowners and, in many cases, their relationship is not good. The daily wage of a male worker is fixed at Rs 150/day (8 a.m. to 1 p.m.) and that of a female worker is Rs 50-55/day (8 am to 1 pm). This price applies to all the labourers in Khuzupilly panchayat. Based on the situation mentioned above, it

leads me to conclude that there is a shift of labour force from agricultural to non-agricultural and to other occupations. Youths are no longer interested in working in pokkali fields. The fact that the younger generation is uninterested in pokkali cultivation and in acquiring traditional farming skills is evident from the results presented in Table 12. Informal interviews with youths in Puthen Padam community confirmed that they were looking for white collar jobs in the cities. In fact they were willing to consider any job (e.g., carpentry, masonry, electrician, plumber), in preference to pokkali cultivation.

Table 12: Earnings of rice-shrimp labourers for Workers, Male (MW) and Female (FW)

Men	Number of years engaged in farming activities	Number of working days	Wage /day	Women	Number of years engaged in farming activities	Number of working days	Wage /day
MW1 (Kudumbi)	10	7	150	FW 1	37	10	50
MW2 (Kudumbi)	27	4	150	FW 2	45	9	50
MW 3 (Pulaya)	40	8	150	FW 3	35	20	50
MW 4 (Pulaya)	20	11	150	FW 4	45	10	50
MW 5 (Pulaya)	45	20	150	FW 5	19	5	50
MW 6 (Pulaya)	35	9	150	FW 6	45	7	55
MW 7 (Pulaya)	41	10	150	FW 7	15	3	55
MW 8 (Pulaya)	25	9	150	FW 8	20	4	55
MW 9 (Pulaya)	35	5	150	FW 9	35	15	55
MW 10 (Pulaya)	20	12	150	FW 10	28	20	50

4.6.2 Other sources of income

The landowners and labourers of Puthen Padam have adapted a diverse assortment of livelihood strategies. Landowners and labourers are engaged in various activities starting from rice-shrimp rotational cropping to white collar jobs in the cities. On the other hand, women work year round in the rice fields and shrimp peeling sheds. Landowners and male and female workers were generating income from various sources in the study community. They were no longer dependent on pokkali as their sole occupation. Table 13 shows various sources of income from respective landowners, male workers and female workers. Results from the table are described here:

Landowners: Interviews with landowners indicated that their main occupation was pokkali cultivation and leasing land for shrimp farming. They were also dependent on other sources like, wife's income from shrimp peeling sheds and son's income from factories and other sources. Out of 21 landowner's interviewed, 63% of landowner's wives looked after household jobs and 37% of them worked in shrimp peeling sheds. This indicates that majority of the landowners were the sole income earners for their family. In a few cases, wives and sons were also involved in pokkali cultivation activities.

Male workers: Due to less available working days in pokkali fields, most of the males were dependent on their wives and son's incomes. Out of 25 workers interviewed, 73% of male workers' wives worked in pokkali fields and shrimp peeling sheds. Their sons were involved in jobs like masonry, automobile works, or painting works. Based on the visual observation, men do a lot of sitting in Khuzupilly

- playing cards, reading newspapers, arranging meetings. Most of the men are dependent on their wives for their livelihood and income.

Table 13: Various sources of income from other members of the family (rice-shrimp rotational System), for Landowners (N=10), Workers, Male (MW) and Female (FW)

L'owners (PL)	Description	Worker (men)	Description	Worker (women)	Description
PL1	Wife housewife	MW 1	Wife shrimp peeling Son-works in a automobile shop, daughter studying	FW 1	1 st Son masonry activities 2 nd son-painter
PL2	Wife works in pokkali fields 2 sons are involved in masonry activities	MW 2	Wife shrimp peeling, Son working in a company	FW 2	Husband works in rice fields Son carpenter
PL3	Wife housewife	MW 3	Wife shrimp peeling	FW 3	Husband chef at a restaurant
PL4	Wife housewife	MW 4	Wife works in rice fields and shrimp peeling, son- masonry	FW 4	Husband works in rice fields. 2 sons - Rickshaw drivers
PL5	Wife housewife	MW 5	Wife- works in rice fields, 1 st son working in a automobile shop 2 nd son - Rickshaw driver	FW 5	Husband mason Son-carpenter
PL6	Wife housewife 1 st son working for Indian Navy 2 nd son-working in Dubai	MW 6	wife- house wife, 1 st son-working in Bombay, 2 nd son- masonry works	FW 6	Wife involved in animal husbandry
PL7	Son engaged in rice-shrimp rotational system	MW 7	Wife works in rice fields son- painting works	FW 7	Husband government employee
PL8	Wife engaged in shrimp peeling activities	MW 8	Wife house wife, son works in automobile company	FW 8	Husband works in rice fields Son- construction and painting works
PL9	Wife works in rice fields Son painter	MW 9	Wife house wife	FW 9	Husband no work 1 st son working in Bombay 2 nd son carpenter
PL10	Wife engaged in shrimp peeling activities	MW10	Wife works in rice fields, son painter	FW10	-

Female workers: They are the hard working people in Khuzupilly panchayat. Women have jobs year round. Conversion of pokkali fields to monoculture of shrimp has resulted in displacement of labour for women in the agricultural sector. The concentration of shrimp peeling sheds in Khuzupilly is providing job opportunities for these women labourers. Monoculture shrimp peeling sheds are capable of providing 150-200 days of employment to these women whereas traditional peeling sheds provide only 70-80 days of employment. It was difficult to collect information on the number of women employed in traditional and shrimp peeling sheds because it is not a permanent activity. They can change jobs any time, and more and more women will be absorbed every day. Approximately 1,000 local women are employed in shrimp peeling sheds. They get 3 to 3.50 Rupees to peel one kilogram of shrimp. On a normal day a woman can peel up to 20-25 kg of shrimp, which is substantial enough to maintain their daily activities. Women are not dependent on their husbands or sons for their livelihood, but they had additional source of income from their husbands who worked in rice fields (occasionally). Other than shrimp farming, women also worked in the rice fields, were also involved in catching fish and crab, collecting clam shells, and a few women worked as maids for landowners.

4.7 Coping Strategies – Diversification in adoption of coping strategies

Adaptation of short term coping strategies calls for a special investigation in the study area. An earlier study on the wetland resources of Khuzupilly looked at how the resource base has been undergoing degradation in recent years. Other studies have concentrated on the social consequences of resource degradation and mentioned that it is the poor and underprivileged in society who are the worst affected by this

process. Neither of the studies, however, focuses on the coping strategy of farmers at the time of degradation of wetland agricultural resources. The coping strategies mentioned here are from Puthen Padam alone.

Khuzupilly panchayat has undergone a series of changes ever since the introduction of shrimp monoculture. Traditional rice farmers are more interested in shrimp filtration than rice cultivation. A good export market exists for shrimp, and there are also high prices in the domestic market in accordance with the international demand. The monoculture of shrimp requires high investment, offers high returns but is a risky process. Not all pokkali landowners can afford to venture into this business because of certain barriers: technical, institutional and financial. The owners of pokkali lands who do not depend on rice cultivation just hold on to the land, only because it is a secure asset and a source of secondary income from traditional shrimp filtration.

Transformation from the rotational cropping system into monoculture of shrimp has put a lot of stress on people of Khuzupilly, especially Puthen Padam. The shrimp landowners in 31 Block area are getting richer every year by selling their shrimp to international markets. The traditional landowners have no other option; they are mute spectators who rely on seasonal shrimp filtration for their livelihoods. According to the law, the landowners in Puthen Padam have to practice six months of rice cultivation and six months of shrimp filtration. The following Chapter deals with the license and unlicensed shrimp farming with respect to Puthen Padam and 31 Block. The gap among rich and poor is increasing which has serious implications on rural livelihoods and gender relations. As transformation increases, number of

working days available in pokkali fields is reduced. The people of Khuzupilly have shown strong, diverse coping strategies, even though it is a short-term process, they have ensured that it is enough to maintain their livelihoods for the time being.

During other seasons, landowners and male and female workers are engaged in different professions. Pokkali rice cultivation or seasonal shrimp farming alone cannot sustain their livelihoods; they have had to opt for different livelihood strategies. Based on direct observation, the data collected from semi-structured and structured interviews, and focus group discussions, and wetland agriculture farmers in Puthen Padam community have developed a diverse assortment of livelihood strategies (short term) that reflects the diversity of the ecosystem in which they exist. Due to the shift in farming practices from rice-shrimp to monoculture, male and female labourers were the worst affected. The transformation has forced them to diversify their approach to livelihoods. Some of the livelihood strategies they adapted are mentioned in Table 14. The table shows landowners and workers engaged in different professions during other seasons. Results from the table are discussed below:

Table 14: Professions engaged in different seasons – rice-shrimp Landowners (PL), and Workers, Male (MW) and Female (FW)

L'owners (n=10)	Activities	Workers (male) (n=10)	Activities	Workers (women) (n=10)	Activities
PL1	Animal husbandry	MW 1	Electrician	FW 1	Shrimp processing activities
PL2	Mixed cropping	MW 2	Fishing and construction activities	FW 2	Shrimp processing activities
PL3	Business	MW 3	Fishing at sea	FW 3	Shrimp processing activities
PL4	Business	MW 4	Mixed cropping and animal husbandry	FW 4	Shrimp processing activities
PL5	Business (boat owner)	MW 5	Works in shrimp farms	FW 5	Shrimp processing activities and construction works
PL6	Nothing	MW 6	Daily wage jobs	FW 6	Animal husbandry
PL7	Nothing	MW 7	Daily wage jobs	FW 7	Shrimp processing activities
PL8	Mixed cropping and coconut farming	MW 8	Daily wage jobs	FW 8	Shrimp processing activities
PL9	Animal husbandry	MW 9	Fishing and daily wage jobs	FW 9	Nothing
PL10	Fishing and masonry activities	MW10	Daily wage jobs	FW10	Shrimp processing activities and works as a maid

Landowners: Rice-shrimp rotational cropping was their main occupation. Other than that, they were engaged in different professions during other seasons. Out of 21 landowners interviewed, 30% of them mentioned that they were engaged in mixed cropping (pepper, jasmine, arecanut coconut farming etc.), 20% in fishing, 10% in animal husbandry, 3% did nothing and the rest were engaged in various professions like, government work, construction activities, boat operations, grocery store operation, fishing and shrimp works.

Male Workers: Working in rice fields (during pre harvest) was their main occupation. Other than that, they were engaged in different professions during other seasons. Of the total male workers (25) interviewed, 36% of them were engaged in fishing, 28% in construction-related activities, 16% in mixed cropping, 10% in shrimp farming activities and the rest in daily wage jobs. Another important livelihood strategy was poultry farming (duck and chicken farming). This provides a lot of profit, almost every land owner or worker was interested in duck farming in Puthen Padan community.

Female workers: Working in pokkali fields was their main occupation. Other than pokkali, they were also engaged in other professions. Of the total female workers (20) interviewed, 95% of them were engaged in shrimp peeling activities (these women were also engaged in collecting clam shells), 2% in animal husbandry, and 1% as maids. I think that the female labourers benefited from this transformation process. The majority of female labourers in Puthen Padam and 31 Block are employed in shrimp peeling sheds. They have two major jobs: first, better year round employment than men in shrimp peeling sheds (traditional and monoculture), and the second, most of the women collect clamshells from lagoons and canals. They separate the clam meat from the shells and sell it to cement and pulp and paper-making industry. One kilogram of clamshells fetches 20-25 Rupees, and a woman may collect approximately 20 kilograms of clam shells a day. Another interesting livelihood option is migration. Workers migrate to other farming areas from one field to another field during the time of harvest. Migration helps in procuring more produce (harvested rice) from the field.

Rice-shrimp cropping was a major occupation of all the interviewees in Puthen Padam community. Based on the data collected, Table 14 indicates that landowners and workers were dependent on other incomes. For example, landowners were mainly engaged in mixed cropping throughout the year, male workers were engaged in fishing throughout the year, and female workers had jobs all year round. Female workers fared better than male workers in choosing jobs; they had year round employment. Women worked in both traditional and monoculture shrimp peeling sheds making their livelihoods more secure than the others in the study area.

4.8 Role of women

Rural women constitute the individual work force, which keeps the family and rural economy alive. But they and their labour often go under- or unrewarded. Women represent half of the world's population and one-third of official labour force, but they receive only 1% of the world income and own less than 1% of the world property (U N Conference Copenhagen; Jose 1999). According to a FAO report, women play a major role in food production, producing half of the world's food. In Kerala about 79% of the female work force is absorbed by the agriculture sector; female cultivators constituting 33% of total female work force and female agriculture labourers constituting 45.6% (Census of India 2001). Jose further supports his argument by saying that, nevertheless, underestimating the amount of agriculture work done by women is very common.

This sections aims to explain the role of women in wetland agriculture in Khuzupilly panchayat. As I mentioned earlier, Khuzupilly is going through a series of changes in socio-economic and environmental realms due to transformation from

traditional rice-shrimp rotational cropping system to shrimp monoculture. The fast changing scenario of conversion of indigenous pokkali cultivation to other activities like monoculture has led to displacement of female labourers and has affected labourers' livelihood security.

According to Shyna and Joseph (2000), the labour displacement, if any, can result in greater gender disparities and a financial overdependence on their male counterparts. My research focused on the livelihoods of female labourers, their role in rice-shrimp farming and, last but not the least, "self organizing units", where Kerala stands out from the rest of the Indian states. Women in Kerala follow a different culture; they are more independent and better educated. Kerala enjoys the privilege of having a 97% literacy rate. Women are employed in various sectors like agriculture, fisheries, aquaculture etc. Many panchayats and Krishibhavans (agriculture offices) have women presidents, such is the case in Khuzupilly Women also constitute major the work force in panchayat and Krishi- bhavan offices.

According to my sample of interviewees, rice farming and shrimp peeling was their main source of income. Twenty women were interviewed on the basis of a questionnaire, and a focus group discussion was organized to discuss issues that came out of semi-structured and structured interviews. During seasonal (traditional) shrimp farming, i.e., December to April, shrimp peeling is the main source of income for women. During the five-month shrimp harvest, women get to work around 70-80 days in shrimp peeling sheds. Every month there will be two thakkams (shrimp harvest or availability period; one thakkam is seven days). During this period, a women gets around 10-15 kg of shrimp per day for peeling. The price of peeling

depends on the size and species of shrimp, 4 Rupees per kg for good quality shrimp, *Panaeus indicus* (*Naran Chemeen*) and 8 Rupees per kg for high quality shrimp, *Kara Chemeen* (*Penaeus monodon*).

Since the average age group of labourers is around 50-55, the general nature of displacement is hard to assess. Women are switching to different jobs, especially to shrimp peeling activities (because they get to work around 70-80 days in traditional peeling sheds and 150-200 in monoculture peeling sheds). The present wage factor for working in rice fields is around 55 Rupees per day. From the available 157 man days per hectare (Table 6), an individual woman is getting hardly 20 days work in pokkali fields, due to the large number of “women labourers” in the village and the consistent decline in pokkali cultivation. Shrimp peeling sheds have brought relief to more than 1,000 women in Khuzupilly (this includes Puthen Padam and 31 Block). As a result of that, more and more women are dependent on shrimp peeling sheds which makes their livelihood secure to some extent.

4.8.1 Payment in kind, not cash

Women are not paid during the time of harvest; they are paid in kind (i.e., one-seventh of the harvest). No money is given as wage during harvest. This was a serious issue raised in the focus group discussion. Labourers were willing to work more if they were paid in cash. The work days in pokkali cultivation fall at the beginning of one month (May) and during harvest (October). Another interesting phenomenon is the gleaning rights (*kalakkipidutham*). During this period, everyone has the freedom to fish; hand-picking is mostly done by fisher folk and *pulaya*

community women. *Pulaya* women of elder generation are expert in hand-picking. Today, *kalakkipidutham* is in jeopardy. Leasers of shrimp farms try to get maximum possible catch before *kalakkipidutham* and they do it by poisoning the fields. Kerosene is used to poison the field, so that they can get maximum catch before the farms are open to public. This will have a deleterious effect on the livelihood of women who depend on *kalakkipidutham*, for their survival. The leftover fish resource is very limited and getting hold of quality fish or shrimp during *kalakkipidutham* is a rare occurrence these days. Most of the interviewees were unhappy about the entire process of gleaning rights because they could hardly fish in the seasonal shrimp farms.

4.8.2 Kudumbashree units – Self organization units/self help groups

Kudumbashree (etymological meaning is prosperity of the family) is a women-oriented, community-based poverty alleviation program which is being implemented in Kerala by the State government, with the active support of government of India, National Bank of Agriculture and Rural Development (NABARD). The program is designed to cure the gloomy development imbalance of the state (Women Empowerment 2003). Kudumbashree began in April 1999; it is a 10-year project consisting of three components – micro credit, entrepreneurship and empowerment. When paddy cultivation became an unprofitable affair, farmers of the state deserted paddy fields. Kudumbashree found this as an opportunity. Neighborhood Groups of the mission were given encouragement to start paddy cultivation. Many groups have identified the immense potential of lease land farming.

Lease land farming is beneficial both to the landless poor women of Kudumbashree Neighborhood Groups and the landowners who are not interested in paddy cultivation. Same is the case in Khuzupilly; there are many small kudumbashree units by name - Sree Laxmi, Ashwathi, Abhaya. Almost all the interviewees were members of Kudumbashree units. They meet once a month to discuss the ongoing situation regarding pokkali cultivation and shrimp peeling activities. Many female labourers are also members of KSKTU, Kerala State Labourers Union. Every member has to pay Rs. 25 a year as membership fees so that they can get it back as pension later. Currently, KSKTU is not organized well; they concentrate on membership issues rather than solving real time problems.

“Last year, our unit members leased land from landowners and cultivated pokkali rice, we all worked sincerely! We were able to get good returns from pokkali fields.”

(FW, Puthen Padam)

“If landowners and workers can put in more efforts, pokkali can do wonders and most of the problems can be solved, but they are not interested in cultivating pokkali anymore!”

(FW, Puthen Padam)

“Common understanding between samajam leaders and leasers has dampened the dewatering problems. Leasers delay the harvesting process, eventually affecting pokkali cultivation!”

(FW, Puthen Padam)

Pokkali cultivation is declining every year due to commercialization of shrimp farms. This shrimp farming creates employment for female labourers in the

form of shrimp peeling activities. Any labour displacement taking place in pokkali fields is being absorbed in shrimp peeling activities. This is the situation in Khuzupilly panchayat now, and I believe that situation can only get worse from here, if the conversion rate continues or increases.

Rice-shrimp rotational cropping mechanism is the only solution for ecological sustainability in pokkali fields. As one worker puts it, “*We are already facing acute drinking water crisis, any further transformation of pokkali fields can end up in deleterious situation.*” This statement refers to the seepage of chemicals that are used in monoculture shrimp farms. The chemicals accumulate in the soil and down to the water table, negatively impacting the drinking water quality.

4.9 Summary

Wetland agriculture in Khuzupilly has undergone significant changes in the past ten years. The traditional rice-shrimp rotational cropping system has been on the verge of collapse due to economic pressures and increased demand for shrimp on the global market. Several factors (lack of production and harvesting incentives, low yields in pokkali rice, shortage and high cost of labour and increased dependency on shrimp peeling sheds by women) have favored monoculture of shrimp over traditional rice-shrimp rotational cropping system. These factors coupled with lack of support from the government have changed the livelihood strategies of the pokkali landowners and labourers, who formerly depended on rice-shrimp system. The interesting phenomenon is that the farmers have shown strong coping strategies (short-term) by diversifying their approach, and they have coped well with the situation. Women’s livelihoods are more secure compared to others in the study area,

but what needs to be considered is how long they can rely on shrimp peeling sheds (traditional or monoculture). Working in peeling sheds has decreased livelihood diversity for women. The landowners and workers require more than one livelihood option so that their vulnerability is decreased.

Chapter Five - Transformation from Rotational Cropping to Shrimp Monoculture



Plate 9: Leasing agreement between a pokkali landowner and leaser (Photo by M. Ranga)



Plate 10: Women working in a shrimp peeling shed (Photo by M. Ranga)

5.1 Introduction

In monocultures, the system's diversity is reduced so that it is more easily 'controlled'. Such changes are usually achieved by increases in external inputs rather than relying on services of the original system (Holling and Meffe, 1996). Coastal people throughout Asia have been farming fish and crustaceans for hundreds of years. With the advent of new technology and rising global demand for fish and fish products, however, the basic character of marine aquaculture in coastal communities is changing dramatically (Ling 1977; Flaherty and Vandergeest, 1999). Whether a pattern of exploitation is ecologically sustainable or not, in the sense of maintaining a flow of ecosystem services, is seldom a part of the management agenda or institutional framework, nor is it reflected in the economic measures of progress and growth. This type of exploitation often provides relatively high and fast returns on investment, which is often due to lack of appropriate institutions (norms and rules) to internalize the cost of extraction (*ibid*). When natural resources are depleting or there is a change in practices at an alarming rate, it is obviously a question of mismanagement. The result is that short-term benefits are realized at the expense of long-term benefits and often results in the long-term degradation of environmental and social conditions (Costanza and Daly 1992; Pritchard et al., 2000).

5.2 Monoculture of shrimp

Indigenous coastal people in India have been farming fish for hundreds of years. The nation's long coastline, warm climate and relatively low wage rates, provide both enormous physical resource potential and comparative economic advantage for the development of aquaculture. Indeed, many analysts describe India

as the potential "fish basket" of Asia in terms of production from marine aquaculture (Aquaculture Authority 2001). The underlying conditions of poverty, rapid population growth, and food insecurity, however, intensify the pressure to choose short-term exploitation over long-term management. For the people living in coastal communities, the potential impacts of aquaculture cuts two ways. On one hand, it holds the promise of improved welfare through direct participation or employment. On the other hand, it raises serious concerns over the potential for environmental degradation and/or displacement by commercial interests, resulting in increased marginalization, exclusion, and pauperization of already disadvantaged groups.

5.2.1 Brackish water potential in Kerala

A unique feature of the Kerala coast is the occurrence of large numbers of interconnected Backwaters with vast potential for aquaculture. The entire estuarine ecosystem along the coast of Kerala is exposed to tides from the sea. Hence, water is brackish almost throughout the year. According to one of the estimates, the total brackish water area in Kerala is 242,600 ha. Now the extent of brackish water area has been reduced to 65,000 ha. Almost half of the brackish water area belongs to Ernakulam (Khuzupilly belongs to this district) and Allepy districts (Ayyappan 2003).

Seasonal shrimp farming is an important livelihood activity for the farmers of Puthen Padam and Khuzupilly. As stated earlier, this system has been in practice for at least five hundred years. One area of wetland can have multiple uses and serves Khuzupilly's economy and the local poor people. Due to its unique taste, high market

value, quick returns on investment and persistent demand from domestic and international markets, shrimp is the preferred commodity in export markets. Based on these factors, 31 Block (which was a part of Puthen Padam in 1996) broke up ties with Puthen Padam to start monoculture of shrimp. The community wanted to transform from traditional rice-shrimp rotational cropping to shrimp monoculture on the same lands that were used for rotational cropping. This is an unlicensed activity. According to Kerala State Fisheries Act, pokkali fields “must” be used for rice-shrimp rotational cropping system, i.e., six months for rice cultivation and the remaining six months for shrimp farming. Ignoring the laws, 31 Block went ahead and started shrimp cultivation year round. They had several reasons for transformation and the factors that led to this change are documented in the following section. Shrimp landowners not the leasers were highly reluctant to reveal information pertaining to the reasons for transformation, their investment returns and profit. Jayesh, my translator was instrumental in conducting most of the interviews with shrimp landowners and providing me with much needed information.

5.3 Causes of transformation

Shrimp landowners cited various reasons for transforming their farming practices. It was extremely hard to interview a shrimp landowner because of the intricacies associated with them. They were always reluctant to respond to our questions during interviews. It is quite clear from the interview data that some of the landowners were leasers and bought lands for lease (traditional and monoculture) to earn extra income. Full time shrimp farming was their main occupation and

livelihood activity. To start with, most of the shrimp landowners mentioned that their losses in pokkali cultivation made them turn to this option. As one landowner put it:

“I suffered huge loss from pokkali cultivation since past 8-9 years, it proved very expensive to me, there were no returns from pokkali, and I decided to switch to full time shrimp farming.”

(SL, 31 Block)

Of the total shrimp landowners (n=9) interviewed, 90% of them talked along the same lines. All landowners in 31 Block had been practicing traditional rice-shrimp cropping and the transforming to monoculture began a decade ago. The 31 Block lies in the south west region of Khuzupilly. This area has more depth which gives more room for salt water intrusion. Monoculture shrimp farming requires saline conditions to stock excess shrimp fries, and these fields were tailor-made for intensive farming.

“My land is very close to the sea and there is every chance of salt water entering through small holes. There was no growth in pokkali rice, so I decided to transform in to ful-time shrimp farming.”

(SL, 31Block)

In addition to these problems, there was a shortage of workers during pokkali cultivation. Landowners had to look for workers during the time of harvest. Increased demand in wage rates, non-availability of youngsters to work in pokkali fields, unfavorable environmental conditions, increased demand for shrimp in domestic and

international market and strong political influence (31 Block landowners enjoy the support from the current ruling political party in the state) made them switch from traditional practices to monoculture of shrimp.

Currently (in Puthen Padam and other communities), rice cultivation is practiced just to follow the rules of the government. Almost all farmers are dependent on shrimp farming (six months) to make up for the loss incurred in rice cultivation. 31 Block clearly stands out on these issues; they are not governed by panchayat or any other government bodies. It lies adjacent to Puthen Padam and this clearly indicates that Puthen Padam is the worst-affected community in the village in terms of environmental degradation and socio-economic conditions.

5.4 31 Block and its activities

The emergence of 31 Block came about mainly due to economic pressures and increased demand for shrimp in international markets. 31 Block covers an area of 28.32 ha, with five to seven landowners representing seven plots of land. The shrimp landowners in 31 Block receive a license for six months of the year (as per the rules), and the remaining six months, shrimp is cultivated without a license. This is an illegal activity practiced by shrimp landowners because they have strong political influence. This community has faced serious opposition from other communities, especially Puthen Padam, panchayat and other officials. This is the only community that practices monoculture of shrimp in Khuzupilly. Most of the shrimp farms are owned by Muslims and the cultural divide further complicates the issue.

Shrimp landowners were interviewed based on the questionnaire prepared (See Appendix 1) in agreement with the project's investigator and co-investigator.

Jayesh and I had to be extra cautious because these landowners always mistook us for income tax officials. Shrimp landowners do not pay taxes for the non-licensed period of the year and that is one of the reasons for being suspicious about us. It was extremely difficult to get information on investment, returns and profit for a hectare of land. Table 15 represents earnings of landowners per hectare. 28 hectares of land has been divided into seven plots and each plot belongs to a landowner or his siblings. The table also indicates that the profit made in monoculture farms is twice the profit made from the traditional shrimp farms. The prices are calculated per hectare of land. These figures were obtained from shrimp landowners and it is entirely based on their perceptions.

Table 15: Shrimp landowners' investment and returns – Monoculture

Shrimp landowners (SL) (N=7)	Area of Land (ha)	Investment/ha	Returns/ha	Profit/ha
SL 1 (Hindu)	0.40	17,000	34,000	17,000
SL 2 (Muslim)	0.40	20,000	45,000	25,000
SL 3 (Muslim)	0.40	20,000	40,000	20,000
SL 4 (Christian)	0.40	15,000	28,000	13,000
SL 5 (Christian)	0.40	20,000	75,000	55,000
SL 6 (Muslim)	0.40	-	-	-
SL 7 (Muslim)	0.40	-	-	-

* Controversial figures. This landowner was reluctant to divulge the details of shrimp farming.

The majority of shrimp landowners were Muslims and they dominate monoculture farms in Khuzupilly. It is interesting to know that most of the landowners are not from Khuzupilly, they are from the neighboring village called Edavanakadu (a village that was devastated by the December 2004 Tsunami). The data in the table indicates that the income generated from monoculture was double the

income generated from rotational cropping. Few landowners were interested in revealing the details of their transaction, because they believed us to be tax officials. Seeing this transformation, landowners of Puthen Padam and other communities also want to transform their farming practices. They cannot do so because panchayat and the state fisheries department do not permit them to practice monoculture. This is a perfect example of unequal sharing of resources, where one community benefits and the surrounding communities suffer. It is interesting to know how 31 Block continues their hegemony in spite of strong criticism and opposition from other communities. The success of 31 Block can be attributed to the following factors: a steady price and a huge demand for shrimp from Japan, South Africa and USA; more exporting companies in and around Ernakulam; expertise in aquaculture; strong self investment capabilities; and, eventually, political support.

This section would be incomplete without mentioning political intervention. Politicians and politics play a major role in Kerala government. Khuzupilly's case is a sensitive issue; the ruling party in the panchayat is led by LDF (opposition party at the state), whereas the shrimp landowners enjoy the support of UDF (current ruling party). There is a major rift between these two parties and there are alleged incidents of the panchayat president being threatened or warned of protest against monoculture shrimp farms.

5.5 Role of leasers

The leasers play an important role in shrimp filtration. There are two types of leasing processes in Khuzupilly, leasing land for shrimp filtration in traditional system and leasing land for shrimp filtration in monoculture system. In the traditional

system, land is leased for six months of the year, which is a formal arrangement between samajam leaders, panchayat leaders and the leasers. Shrimp monoculture falls under a different arrangement, shrimp landowners themselves acting as leasers or they lease their land to the known leasers. Leasing agreement and other related activities are done informally without the presence of panchayat and other departments. It is important to mention that leasers have a union called the “Vypin Chemeen Karshaka Union” (Vypin Shrimp Farmers Organization). It was established in 2000. The role of this union is minimal as it is still in the initial stages. They are demanding government support for full-time farming.

5.5.1 Traditional and monoculture shrimp farming

Traditional shrimp farming is primarily a capture fishery and the entire process is explained in Chapter 4. Here, the shrimps are usually harvested eight to ten times before gleaning rights apply and all these activities are carried out by leasers. Monoculture of shrimp is organized in the same way for six months of year with additional shrimp seeds. Artificial shrimp seeds from hatcheries are used along with the natural ones. This kind of filtration is prone to diseases because the shrimp seeds that are brought from hatcheries may be infected or contaminated with viruses or other diseases. The returns are higher and faster compared to seasonal shrimp farming, but the system is also more risky.

5.5.2 Leasing policy in traditional shrimp filtration

Immediately after the harvest of pokkali rice at the end of October or during the first or second week of November, paddy fields are leased out for shrimp filtration. The usual practice is to auction the fields to local leasers. The Samajam and revenue department conducts public auction in front of Krishibhavan officials. Generally, big leasers participate in the auction of land for lease. The leaser who bids the highest and pays the whole lease amount before the commencement of the operation is awarded the lease. “The lease is generally for four months in order to enable the field for rice cultivation” (Thomson 2003). The lease amount varies according to the field location and nearness of the field to the bar mouth, depth, productivity of the fields, etc. The lessee has to take a license on a nominal fee of Rs. 15/- per acre, which is levied by the state department of fisheries. The Fisheries Department has only a minor role of issuing a shrimp filtration license after receiving a nominal amount from the lessee as a licensing fee. The lease amount varies between Rs. 4000 to 6000 per hectare depending on various factors. The lessee has the right to prawn filtration from November 15th to April 15th. *Kalakkipidutham* (gleaning rights) marks the end of traditional shrimp filtration.

Harvesting starts in December, leasers wait for the shrimp to grow to a certain size before harvest. The intervals of harvest depend on the size of shrimp, exchange of water, feed, and proper maintenance. Water quality is continuously monitored and the rate of exchange of water depends on the number of shrimp stocked, and the quality of pond water. Some landowners in 31 Block aerate their ponds using mechanical or electrical aerators. After continuous monitoring of the stock, they are

harvested when they reach a marketable size of 30-35g. It normally takes two to three months to achieve this size in tropical conditions. Currently, leasers do not wait for two to three months; they want a quick profit in less time. The process of shrimp trapping, harvesting and catch composition per hectare is explained in Chapter 4.

5.5.3 Leasing policy of monoculture leasers

The leasing policy in monoculture slightly differs from that of traditional shrimp filtration. Here, the leasers have to follow the official procedure of obtaining license for six months (November 15 to April 15). The arrangement is similar to the one followed during traditional shrimp filtration, differing mainly in the auctioning process. The lease is awarded neither based on the acreage or any bidding process. It is purely based on the agreement between the shrimp landowners and leasers. A “pinch” of nepotism may be involved; as I mentioned earlier, shrimp landowners (not everyone in the community) themselves act as full-time leasers. Lands are leased to those leasers who have a proven track record of producing good harvest. Leasing procedures, documents, bidding and identification of leasers is carried out informally without the presence of panchayat and Krishibhavan officials. The State Fisheries Department does not issue license for monoculture of shrimp and, this is one of the most interesting findings of this research as to how they manage these resources without the involvement of state and local level organizations. This kind of arrangement gives more room for conflict, and it is interesting to see how state and local government interact to resolve conflicts between samajams and restore sustainable use of resources.

5.5.4 Flow of shrimp from leasers to exporting companies

As mentioned earlier, some of the shrimp landowners were leasers and commissioning agents (buyers). Almost all the current leasers in monoculture shrimp farms were leasers in traditional shrimp farms. When monoculture began in Khuzupilly, these leasers switched to full time occupation. Many leasers still take traditional lands for lease along with full-time farming. One of the leasers said, *“Full-time shrimp farming is risky, but profitable compared to rotational cropping system.”* There are more than 55 leasers in Khuzupilly, taking lands on lease for their main occupation and income.

In monoculture farms, leasers have to sign an agreement stating that they will carry out shrimp filtration process for a certain period of time. Normally the agreement will be for one year (Nov 1st to Oct 30th). Leasers were also involved in pokkali rice cultivation, mixed cropping and other activities, but shrimp filtration was their main occupation. Out of the total leasers (n=9) interviewed, 25% of them took loans from federal, co-operative and Catholic banks. The loan period was for six months. Another interesting aspect in shrimp filtration is, almost all leasers are connected to buyers. These buyers can be leasers too; they buy shrimp from leasers, because they are rich and capable of owning peeling sheds, storage units and other related equipment. The price of the shrimp is determined by these buyers who then sell it to exporting companies like ABAD, Baby Marine, Mangala Choice Company in Ernakulam. They are the main exporters of shrimp to international markets. Also, exporting companies like Thevar and Kadal Kanni from Tamil Nadu buy shrimp from

these buyers. The chart below indicates the flow of shrimp from shrimp landowners to international markets (Figure 4). The same chart applies to traditional shrimp farms; the only difference is the landowners represent Puthen Padam. The buyers profit the most in the shrimp industry. They not only sell shrimp to domestic markets, but also end up paying money in advance to small leasers so that they can get all the shrimps harvested by leasers. This is a kind of informal agreement between the leasers and the buyers.

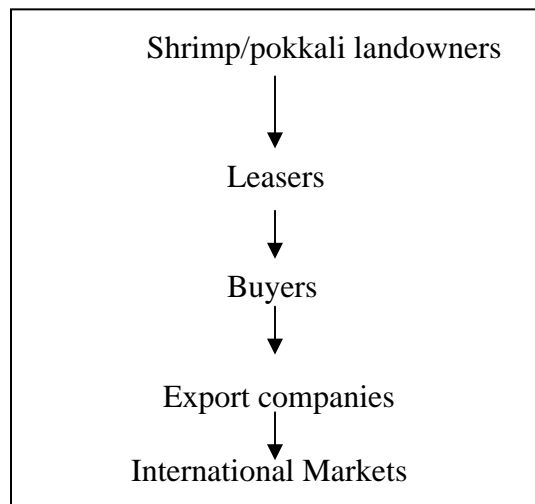


Figure 4: Flow of shrimp from landowners to exporting companies

5.6 Species harvested

The number of harvests varies in traditional and monoculture farms. In traditional shrimp filtration, leasers normally harvest eight to ten times in six months before gleaning rights apply. Fishing time is fixed based on a particular phase of full moon and new moon. Filtration starts right before the end of high tide and lasts for a few hours. The filtration time is locally known as “*Thakkam*.” As the stocking process is non selective in nature (traditional farming), the yield is a mixture of

superior and inferior quality species of shrimp. The main components of the catch are contributed by *Penaeus* species and fish such as Mulletts, Milkfish, Pearl Sport and Tilapia in Puthen Padam. Among shrimp species, *Penaeus indicus* (*Naran Chemeen*), *Penaeus monodon* (*Kara Chemeen*, *Tiger Shrimp*), *Metapenaeus dobsoni* (*Thelley Chemeen*), *Metapenaeus monoceros* (*Choodan Chemeen*), constituted the catch. Formal and informal interviews with leasers and shrimp peelers confirmed that 80% of the catch constituted shrimp species and the rest were fish and crabs. *Penaeus monodon* (*Kara Chemeen*) has the highest market value and its maturity period is 90 days. The maturity period of *Penaeus indicus* (*Naran Chemeen*) is 120 days. This is the most favored species of all the species grown in the study area. According to one of the estimates, annual production of shrimp from shrimp filtration is on the decline in Kerala. The catch of 1400 to 1700 kg in 1930 has come down to 300 to 400 kg in 1985 (KLDC 2000). Discussions with leasers confirmed that they were using artificial Kara seeds along with the natural ones in traditional shrimp farms in order to increase production and the profit.

In the case of monoculture shrimp farms in the study community, leasers used artificial shrimp seeds brought from hatcheries. *Penaeus monodon* (*Kara Chemeen*) and *Penaeus indicus* (*Naran Chemeen*) are stocked and harvested exclusively. Direct observation and interviews confirmed that *Kara chemeen* had high market value compared to other species. In 31 Block, leasers usually harvest 20 to 24 times in a year. The catch composition in the area was 5,000 to 15,000 shrimps per hectare per year. There is no gleaning rights system here; the leaser has complete rights to harvest

all the shrimp and fish present in the pond. Any community member caught trying to harvest would be met with serious repercussions.

5.6.1 Post harvest and marketing

Once the catch is brought to the shrimp peeling sheds, women generally take charge of separating and sorting species based on size. Sorting of the catch, depending on the quantity, takes anywhere between three to four hours and consists of separating the different species of shrimp into piles and disposing the unhealthy ones or those species with little or no value. Discarded ones are used as fertilizers for palm trees. Post harvest and marketing activities (peeling, cleaning, cold storage, packing and transporting) are the same for traditional and monoculture shrimp farms in the study communities. The question is where the catch is taken after filtration and how the prices are fixed? It works in two ways; the leaser himself can bring the catch to his own peeling shed and sell it directly to the exporting companies or the leaser sells the catch to a buyer who had given small loans in order to ensure that all the catch would be brought to his peeling shed. The buyer in turn sells it to the exporting companies.

The next issue is pricing of the shrimp species and who decides the price. Now that we know what species are grown and exported, it is critically important to know how they are priced. The pricing of shrimp species in aquaculture is different than the pricing of shrimp in stake net fisheries. Price is determined by the buyer and the shrimps are priced based on the counts. Table 16 shows species of shrimp grown and their market value in the study communities. L1, L2, L3 represents leasers.

Table 16: Species of shrimp grown and their market value* (Rs per Kg)

Species (Malayalam Name)	Leasers (LR)						
	LR1	LR2	LR3	LR4	LR5	LR6	LR7
Penaeus indicus (<i>Naran Chemeen</i>)	280	200	210-400	250-300	250	Below 100	150-200
Metapenaeus monoceros (<i>Choodan Chemeen</i>)	130	100	80	110	120	150	120-150
Metapenaeus dobsoni (<i>Thelley Chemeen</i>)	100	80-100	80	90	70	75	80-100
Penaeus monodon (<i>Kara Chemeen</i>)	400-450	350-380	310-480	450	500	500	400-500

US \$ 1 = Rs 45 at the time of the research

* Price to leasers from the buyers

These leasers leased land in traditional and monoculture farms. Interviews and informal discussions confirmed prices of shrimps to leasers from the buyers. As we can conclude from the table, Kara Chemeen has the highest market value followed by Naran Chemeen and other species. One kg of Kara can go up to Rs. 500 and that of Naran Chemeen to Rs. 200. The price is fixed by the buyer and, in some cases, the leaser directly sells his catch to the exporting companies. In that situation, exporting companies determine the price of shrimp. Most buyers and exporting companies are interested in Kara and Naran Chemeen because of their taste and demand in the international markets. During the field research the prices were as follows: *Naran Chemeen* – 150-200 Rupees/kilo; *Choodan Chemeen* – 120-150 Rupees/kilo; *Thelley Chemeen* – 80-100 Rupees/kilo; *Kara Chemeen* – 400-500 Rupees/Kilo.

5.7 Globalization

Aquaculture has developed rapidly over the last three decades to become an important economic activity worldwide (Aquaculture Authority 2001). In India, as in much of Asia, the increased demand for export-oriented products was a result of increasing market liberalization by the central government, a process that had begun as early as the 1960s, as India began to realize and exploit its fishery resource to bolster its foreign exchange. Increasing exports from fisheries, particularly shrimp, represented one option for dealing with the shortage of foreign exchange. (Bhatta and Bhat 1998; Lobe and Berkes 2004) India is a leading country as far as aquaculture is concerned with a long tradition of inland and brackish water aquaculture (Vivekananda and Kurien 1999). With the rising foreign and domestic demands for shrimp, private corporations saw a good opportunity for financial profits in the estuarine resources (Bhatta and Bhat 1998).

Starting in a small way in the late 1980s, modern coastal shrimp culture became a significant activity in the early 1990s in selected parts of India's 6000 km coastline (Kurien 1999). In Kerala, farmers started realizing the value of shrimp in 1970s when the state opened its gates towards globalization. From a commodity formerly used as a fertilizer for coconut palms, prawns grew to become the "pink gold" of marine exports from India (Kurien 1992). Formal discussion with Kurien suggested that demand for export-oriented shrimp increased, specifically for US and Japanese markets. He considers this type of demand as "Pink gold rush", where the price of shrimp increased exponentially.

While the increase in aquaculture for export-oriented business has been discussed in detail by authors examining the traditional shrimp farming system in Kerala, little has been written on the transformation of traditional systems to monoculture and the impact resulting from these changes. Before the development of the marketing of frozen shrimp for the markets in the developed countries (especially, Japan, USA and Western Europe), the shrimp caught in India were dried and exported to the Far East. It is, therefore, important to understand that even in the past, shrimp culture in the traditional system was also dependent on export markets (Vivekananda and Kurien 1999).

The market price of the shrimp increased in the 1990s. Export oriented companies (in Ernakulam) like ABAD and Choice started investing in processing shrimp (cold storage, peeling, packing, etc) to cater to the demands of international markets. Interviews with leasers further suggested that export companies and buyers provided cash to leasers and women vendors in the study area, in order to ensure that they would sell their shrimp to that company for export. “The boom in shrimp consumption and the shrimp industry led to cultured shrimp production increasing from 10 per cent in 1985 to 30 per cent in 1992”(Shiva 1999). During the last decade, shrimp aquaculture has become a major component of shrimp farming in terms of area and market value. Observing the push for economically more profitable, export oriented intensive farming by 31 Block, Puthen Padam is also interested in transforming to monoculture. They are waiting for the Fisheries Department and panchayat’s approval before they can begin the transformation. Focus group discussions with Puthen Padam landowners suggested that, at least 95% of the

community members want to transform their farming practices into shrimp monoculture.

Once the shrimp have gone through primary processing in peeling sheds, they are packed in ice and transported to exporting companies in Ernakulam (Cochin). The price is negotiated between the buyer/leaser and the exporting companies before the harvest. Interviews reveal that two (*Kara and Naran Chemeen*) out of four species harvested by the traditional shrimp filtration process, go almost exclusively to peeling sheds for primary processing for the export market. While in monoculture farms, *Kara and Naran Chemeen* are the most sought after species. They are exclusively harvested for the purpose of export. Based on the demand for specific species in the international market, monoculture leasers buy only Kara and Naran Chemeen seeds from hatcheries.

5.8 Problems associated with shrimp monoculture

A stable price and large demand for shrimp from Japan, USA and South Africa promoted shrimp landowners of 31 Block to promote full-time shrimp farming. However, yields in the monoculture farms have been dropping considerably in the past five to six years due in part to disease, pollution, and maintenance problems. First and foremost, the principal reason for the decline is disease caused by high stocking densities; leasers want to increase their profit by stocking more shrimp seeds, which increases the risks associated with shrimp farming. Monoculture requires proper maintenance and continuous monitoring and exchange of water. Nutrient levels and salinity must be maintained throughout the process of filtration. For example, Thailand's yields of shrimp have been dropping, due in part to disease

problems caused by lack of water treatment, high densities of shrimp in ponds, and high densities of ponds, all of which is conducive to rapid spread of disease (Ahmed, 1997; Primavera 1997; Kautsky et al., 2000; Huitric et al. 2002).

“The seeds we buy from the hatcheries are infected with virus; hatcheries provide us infected seeds without our knowledge...”

(Leaser, 31 Block – October 05, 2004)

“The lease period is for only one year; there is no chance of making up for the loss.”

(Leaser, 31 Block – October 05, 2004)

“We invested Rupees 160,000 for 13.5 acres of land last year; the investment was shared by four to five leasers. We got Rupees 130,000 as returns, it was a huge loss. It is highly difficult to pay loans when there is a huge difference between the investment and profit cost.”

(Leaser, 31 Block – October 05, 2004)

These factors have forced leasers to reduce stocking densities. Leasers and shrimp landowners attribute the decreasing yield to a number of factors, including water pollution, animal waste, factory waste, household waste and other sources. Industries in Cochin discharge waste directly into the estuary, pollutants along with shrimp fry flow into pokkali fields and monoculture farms through natural canals. It was hard to find the actual information for the decrease in yield, as one leaser sums up, “It is a combination of all these factors” responsible for the loss.

5.8.1 Adversities of monoculture

Monoculture of shrimp farming is not as simple as it looks. For the people living in rural communities, the potential impact of low-salinity shrimp culture cuts two ways. On one hand, it holds the promise of welfare through direct participation or employment. On the other hand, it raises serious concerns over the potential for environmental degradation, resulting in increased marginalization, exclusion and pauperization (Flaherty and Vandergeest 1999).

Commercial shrimp farming is highly capital-intensive in the sense that relatively large amounts of seed (post larval shrimp), artificial feeds and chemicals are used to obtain high yields (Bhatta and Bhat, 1998). Water in the pond is recycled continuously with clean brackish water to maintain the salinity (up to 35%) and to flush out the unused shrimp feed, dead biomass, and shrimp fecal matter. Chemicals are applied to the ponds to keep disease and predators under control. For reliability and quality, only shrimp seeds raised in the hatcheries are used. Naturally grown shrimp have become scarce and the traditional system has also been found to be decreasing in productivity. As one shrimp landowner confirms “Leasers buy artificial seeds from Madras hatchery, where the seeds are produced to grow in fresh water. When leasers try to use them in salt water, the production ultimately comes down.” The major problem of monoculture shrimp farms in the study community is contamination. The shrimp seeds brought from hatcheries “may be” infected or contaminated with virus. The exact source of contamination is not known, but it can be attributed to various factors.

“History of viral infection surfaced around six to seven years ago and it is creating havoc now. Virus is very contagious, it affects the entire plot which leads to mass destruction and we don’t know the exact source of its origin.”

(SL, 31 Block)

“Water is contaminated when peeling shed operators release shrimp waste and discarded shrimp into natural canals; we receive the same contaminated water in our fields...”

(PL, Puthen Padam)

“There is no remedy for this problem and government has no development plans to support this issue.”

(SL, 31 Block)

“Artificial seed adversely affects the natural ones; they may be contaminated in the hatchery itself!”

(Leaser, 31 Block)

Interviews with shrimp landowners and leasers suggested that viral infection has been around for past the six to seven years. As one leaser said; *“Government has to intervene at some stage to support us, otherwise all our efforts will be in jeopardy.”* Rice-shrimp rotational cropping system landowners are unhappy with the situation because they feel that these lands are not meant to be used for monoculture of shrimp. Only an insignificant part of the community is getting the most benefit.

Another problem with viral infection is, once it is detected in the pond it spreads rapidly to nearby ponds. The entire area has to be cleaned, dried and, chemicals and pesticides should be added to restore the system to normal conditions. Once the leaser understands that his pond has been infected, he releases the water

directly into the estuary. Infected water with contaminated waste and shrimp feeds flows through the estuary, and this water, in turn, is used by traditional farmers for rice-shrimp rotational cropping system. An increase in stocking densities coupled with viral infection has aggravated the problem.

Leasers have increased stocking density to more than 100,000 shrimp fry per hectare in 31 Block, which is not conducive for the conditions prevailing in Khuzupilly. Ninety per cent of the leasers (n=9) interviewed confirmed that shrimp seeds were infected at the processing place (hatchery). These problems will have a cumulative effect on the financial status of leasers. Leasers take loans from cooperative and federal banks; the time period for returning the loan without interest is six months. When they undergo loss due to reasons mentioned above, they are in no situation to pay back the debts. As one leaser puts it, "I shall commit suicide if government does not provide insurance for failure or entire crop is wiped out by the disease." This is the current situation of commercial shrimp farmers in Khuzupilly. Until 1988, Taiwan was the world's largest producer of shrimp; however, a major disease outbreak in 1998 led to the collapse in industry there, and it has still not recovered. Shrimp farms in India were subject to a major virus attack in 1994 and early 1995, which led to the government declared a moratorium for the industry (Shiva, 1999).

5.8.2 Coping strategies

Monoculture shrimp farming is the main livelihood activity of leasers and shrimp landowners in the study community. Any change to this system will directly

affect their livelihoods and income. Due to the lack of support from government and other organizations, members of 31 Block developed strong co-operation and support among themselves.

“We landowners are strong and co-operative; there is a great level of understanding between us...”

(SL, 31 Block)

The leasers evolved new techniques or short-term strategies to counter the problem of viruses in intensive farming. As one leaser puts it, *“We add sugar and homeopathic medicines to the ponds to counter the problem.”* It is not clear how this system works. Interviews and informal discussions with leasers suggest that this method seems to be working to prevent the disease from spreading. Another--but environmentally harmful--way of solving the problem is to drain out the pond completely. Once they discover black spots on shrimps, leasers arrive at a conclusion that shrimps are infected with virus. They quickly harvest the available catch and drain the entire pond into the estuary. Contaminated water along with the infected shrimp mixes with the estuarine water. In order to avoid external costs, 31 Block is polluting the estuarine ecosystem, which also hurts the rice-shrimp rotational cropping system. Here, the benefits are shared by one community, whereas the other communities in the panchayat suffer.

Interviews with shrimp landowners and leasers also confirmed the usage of chemicals to prevent infection. Chemicals accumulate in the soil as a result of continued application and use. This practice directly affects all water users including

the wetland agriculture farmers who have been using their organic farming system for centuries.

5.9 Environmental and social impacts of transformation

Conversion of pokkali and low-lying brackish water lands to shrimp ponds can be characterized as non-trivial and irreversible because the mitigation of attendant environmental impacts is either technically infeasible or uneconomical. This produces irreversible land development. Here, the term “irreversible” applies to this development because once the land is excavated and converted to full-time shrimp farming, pokkali lands are not easily restored to their natural state of function.

In Kerala, commercial shrimp farming is relatively new and it is progressing fast due to the boom in both domestic and international markets. Commercialization of shrimp aquaculture is generating extra income and also improving the national economy by bringing in foreign exchange. But, it has serious implications on rural livelihoods and local environments. Although, it is a quick money-making business, it has often proved totally unsustainable, both from the social and ecological perspective. For this reason, Shiva (1999) criticizes the shrimp industry as the “rape and run” industry. Industrial development without regulation or enforcement can have serious environmental consequences and ‘artificially’ increase the profitability of the industry (Lopez and Scoseria 1996). Incentives driving the shrimp farming industry, the unreliability of the industry itself and the problem of the fit of the regulations between the incentives and the dynamics of the resource base, need to be addressed (Folke et al. 1998; Huitric et al. 2002).

The landowners in 31 Block have been practicing monoculture of shrimp for almost 10 years and this development is leading towards irreversibility. Bhatta and Bhat (1998), further explain that continued storage of salt water in shrimp ponds alters the chemical properties of pond soil, making it unsuitable for crop production in the future. Furthermore, shrimp is not an efficient converter of feed and therefore, in commercial shrimp ponds as much as 77.5% of nitrogen and 86% of the phosphorus feeds are wasted. This waste either accumulates in the sediment within the shrimp ponds or is discharged into the environment. Accumulation of waste can affect productivity of shrimp lands for crop and eventually, it leads to aquifer contamination through water runoff and leaching because of the build-up of nutrients in the soil.

First, I will look at the environmental concerns of commercial shrimp farming and the impacts associated with it in the study area. In Khuzupilly, traditional rice-shrimp rotational cropping system was the major occupation of farmers since time immemorial. Recent developments indicate that farming practices are changing from traditional rotational systems to shrimp monoculture. This change has led to serious environmental implications and altered the livelihood strategies of rural farmers. An increase in salinity due to shrimp monoculture is a major problem that has critically affected rice cultivation in Khuzupilly. Despite the fact pokkali rice is tolerable to some salt, 'almost all rice varieties are sensitive to salinity' and commercial shrimp farming often raises the salinity level beyond what pokkali rice can tolerate (Greenland 1997; Flaherty and Vandergeest 1999). Salinity induces stress in growth, biomass, and chemical composition of rice plants. It can also increase the plants

susceptibility to insect pests. Concern over salinization of paddy plants adjacent to shrimp ponds has existed in Thailand for sometime (*ibid*).

In Khuzupilly, farmers have complained vigorously about low rice yields and the contamination of groundwater aquifers that has rendered large areas of land unsuitable for cultivation. Interviews and focus group discussion with rice-shrimp owners indicate that low yields are directly related to the increased salinity content of the water.

“Pokkali rice requires low to medium saline water. Salinity level is increasing every year, because full time shrimp farmers add more salt to their fields. The water is released directly into the estuary for water exchange process; this will directly affect yields in rice cultivation...”

(PL, Puthen Padam)

Salt not only leaches directly out of the culture ponds into ground and surface waters, but most leasers remove the sediments from the bottom of the pond after each harvest and dump them nearby or on the bunds (dikes) These piles of sediments contain large amount of salt that can be leached to nearby fields by rainfall, thereby contaminating the surface body of freshwater. This will eventually spread to the nearby fields in Puthen Padam, because Puthen Padam lies adjacent to 31 Block. Without quick and effective intervention by the government, a major environmental problem is in the offing.

A wide range of chemicals are used in shrimp culture, to control diseases (bactericides, fungicides, pesticides), and aquatic vegetation like algae and herbs. There are some cases where leasers used antibiotics to control the spread of disease. A lot of research has been done on the environmental impacts of shrimp farming. It is

also important to know that shrimp are affected by water quality degradation. Interviews with leasers and shrimp landowners suggested that water pollution has increased enormously. Plastics, animals waste, household waste, and pollutants from industries get mixed with estuarine water used for shrimp filtration. There is little information regarding the health risk to consumers resulting from the consumption of shrimp exposed to pesticides and antibiotics in the ponds. I personally think that more research has to be done on the health risk to consumers, locally and internationally. Flaherty and Vandergesst (1999) also feel that mechanisms and pathways for pesticide accumulation in shrimp tissue are not well understood. In the longer term, such environmental degradation for short-term gain can affect a nation's economy because in the long run the well-being of a nation is dependent on ecosystem support (de Groot, 1992; Daily 1997; Huiritic et al. 2002).

5.9.1 Socio-economic impacts of transformation

In the wake of fast developments witnessed during the nineties, the development of monoculture shrimp farms have led to many discussions and debates on issues regarding socio-economic impacts on coastal communities. "Shrimp is the most significant product of industrial aquaculture. It is primarily consumed in the northern societies. However, most production takes place in poorer countries in the South" (Shiva 1999). Shrimp culture has been heralded as simultaneously contributing to solving the problems of unemployment, poverty and foreign exchange. Shrimp culture being a capital-intensive venture does not generate much employment. It generates additional employment only when it is located where it

does not displace labour involved in other jobs. “As far as being panacea for poverty, it is evident that the poor have neither the resources to take it up, nor the ability to face the inevitable risk”(Vivekananda and Kurien 1999). Though pushed by both national and international organizations as an answer to world food scarcity particularly to supplement protein intake, in reality, it contributes little to the nutritional needs of the world’s population, being a luxury item that is consumed mainly by the rich in developed countries (Shiva 1999).

In Kerala, though shrimp monoculture is in a fledgling stage, issues of socio-economic impacts have surfaced at large. Increase in exporting companies in Ernakulam coupled with government support has led Kerala to explore new dimensions in aquaculture. This development has serious repercussions on rural communities who cannot afford shrimp monoculture. Signs of economic instability in communities traditionally dependent on coastal ecosystems are clear. In a short span of five to six years, several communities would have lost their traditional livelihood. In Khuzupilly, traditional rice farms are gradually being replaced by monoculture shrimp production. Labour intensive rice production (See Table 6) requires 157 man-days per hectare whereas monoculture of shrimp requires much less, 50 man days per hectare, resulting in a net loss of jobs. Male workers are most affected by this transformation. They hardly work in rice fields and when it comes to monoculture shrimp farms, they are required less than female labourers.

Conversion of pakkali fields can ultimately result in the displacement of female labourers who work on farm lands. One major and positive impact of this transformation in agriculture is increased employment for women. Khuzupilly

harbours many peeling sheds owned by buyers and leasers. The concentration of peeling sheds is providing job opportunities for these displaced female labourers. Any displacement taking place in pokkali rice fields is getting absorbed by shrimp peeling activities; this is the case in Khuzupilly panchayat. These peeling sheds are providing 150-200 days of employment to these women. These women could be from any community in the village, but the majority of the women are from Puthen Padam and 31 Block. Originally working in peeling sheds was a secondary activity but soon after the emergence of monoculture farms, there was a boom in the number peeling sheds. They have increased in size and number, and more and more women are employed by peeling sheds every year. This turn of events is mainly because of the presence of export oriented peeling sheds whereas in the neighboring village, Nayarambalam, the situation is different. There are no export oriented peeling sheds, and as a result of this displaced female labour does not find work as easily there.

The employment scene is bad for men than women and hence, it is difficult to conclude that gender inequalities mentioned in this section are the sole result of disparities resulting from displacement of pokkali fields. “In Thailand, more than 150,000 people are directly employed in shrimp farming. In Ecuador, 195,000 people were engaged directly and 17,000 people on part-time basis in 1,567 farms involved in shrimp farming, processing and hatcheries. In India, a study conducted in Nagapattinam district of Tamil Nadu showed that the employment opportunities have increased due to shrimp farming. The average labour requirement for paddy cultivation is 180 labour days/ crop/ ha, whereas in shrimp farming it is about 600 labour days/crop/ha “(Aquaculture Authority 2001).

“The problem with working in peeling sheds is that we don’t get to work continuously in a week; sometimes we get 3 days, 4 days in a week...”

(Female labourer, Puthen Padam 03/11/2004)

Interviews and focus group discussions with women confirmed that they are getting less working days in peeling sheds because of increase in demand for labour. Women from neighboring villages come to work in peeling sheds in Khuzupilly, as a result of this; there is a demand for experienced peelers.

Due to increase in demand for peeling activities, women work in two ways. They will either sit in a peeling shed and peel; or, they have the option of taking shrimp home to peel. On an average, they can peel 20-25 kilograms of shrimps per day. The age factor along with lack of transportation facility, coupled with men’s domination, prevents women from finding job opportunities elsewhere. Moreover, Khuzupilly’s social structure prevents women from migrating to other places.

It can be argued that the best way to push towards sustainability is to implement a complete ban on shrimp monoculture. That could be done involving panchayat level institutions, as local people are the best to monitor compliance and report violations. But the irony is that landowners who are most influential among local people are often shrimp farmers themselves or benefit directly from shrimp farming activities. Traditional rice-shrimp farmers cannot be blamed or faulted entirely because pokkali rice has failed to improve the economy of the village; it is seen as a valueless crop. Pokkali landowners in Puthen Padam believe that transforming to monoculture can provide farm incomes greater than that provided by

rice farming. Unfortunately, the underlying conditions of low incomes in rice farming households, indebtedness, limited off-field employment opportunities, and the high profit associated with monoculture shrimp farming intensify the pressure to choose short-term exploitation, benefiting relatively few people over long-term resource stewardship.

5.10 Summary

Due to the increased demand for shrimp in domestic and international markets and also due to local economic pressures (mentioned in Chapter 4), 31 Block transformed their traditional practices to a monoculture of shrimp. The conversion to monoculture shrimp farms by 31 Block has created confusion among the traditional landowners, because they are not allowed to convert their lands for shrimp aquaculture. Focus group discussions with pokkali landowners suggested that, if the government permits, all the landowners in Puthen Padam want to convert their traditional fields to monoculture shrimp farms. However, pokkali labourers who are still dependent on traditional system want pokkali landowners to cultivate pokkali rice. As a result of that, the relationship between the workers and landowners in Puthen Padam has deteriorated. 31 Block is benefiting at the cost of other communities, because the amount of pollutants (discharge of water during water exchange process) released from their ponds directly affects pokkali rice cultivation in the adjacent fields.

One interesting aspect of monoculture shrimp farms is that it has increased the employment for women in the village. More and more women are dependent on shrimp peeling sheds, which has become a major livelihood activity now. But it also

has decreased the diversity in local livelihood strategies. Monoculture shrimp farms have increased the gap between the rich and the poor, displaced many labourers, affected small farmers' income and brought the traditional rice-shrimp rotational cropping system to the verge of collapse.

Chapter Six - Conclusions and Opportunities for Learning



Plate 11: A village level meeting held in Khuzupilly (Photo by M. Ranga)

In this Chapter, I revisit my original objectives and examine how they shaped my thesis and how these objectives themselves were organized by the research. I then examine the findings that emerge from the research, identifying opportunities and policy implications.

6.1 Revisiting the objectives

The purpose of this study was to describe how people change their livelihood strategies in the face of the shift from traditional rice-shrimp farming to monoculture of shrimp in the coastal agro-ecological zone of Khuzupilly near Cochin. The objectives of the project were: (1) to describe historical and current resource use and livelihood activities of wetland agriculture farmers (landowners and labourers), and (2) to analyze and explain the transformation from traditional rice-shrimp system to monoculture of shrimp. The study site was chosen to facilitate the comparison of one community practicing traditional rice-shrimp rotational cropping, and the other community practicing monoculture of shrimp. My objectives provided guidance during site selection, where interactions with individuals and organizations served to put into perspective some of the ideas and current situations in Kerala. Community members helped to shape the objectives and explore new avenues by orienting me to the community. Revisiting objectives and discovering how these objectives developed will help to begin the process of reflection in this concluding Chapter. The initial objectives are presented below, followed by a more specific description of the direction that they took on during the course of the research.

6.1.1 Livelihood activities

The first objective of the research was to **describe historical and current resource use and livelihood activities of the wetland agriculture farmers.** Focusing on the rice-shrimp rotational cropping system, we began the process of understanding the system and the livelihood strategies of wetland agriculture labourers and landowners. The process involved: understanding in detail the process of pokkali rice cultivation, shrimp filtration, income from rice-shrimp, marketing and processing activities, general livelihood details, and problems associated with rice-shrimp cropping, coping strategies, and diversification in opting livelihood strategies. Working with current resource use practices associated with wetland agriculture, provided a wealth of information. It was very clear through the interviews that there was an historical context for the current conditions and it also gives an idea of how people have changed their livelihood strategies in the context of the rice-shrimp rotational cropping system. Understanding and describing these conditions and the historical forces at work took considerable time and is reflected in the discussion in Chapter 4.

The findings show the intricacies of livelihoods associated with the traditional rice-shrimp rotational cropping system in the study area. Rice-shrimp rotational cropping is the major livelihood activity in the wetland agricultural region of Khuzupilly. The system has been in practice for the past five centuries. The operation of rice-shrimp rotational cropping system provides insights in to the traditional knowledge associated with rice cultivation and shrimp filtration.

During the last 10 to 15 years, there has been a change in cropping patterns, from traditional rice-shrimp to monoculture of shrimp. The change in farming practices can be attributed to a number of factors. Pokkali landowners are no longer interested in cultivating pokkali because of poor returns, and concentrate instead on seasonal shrimp farming, mixed cropping and other occupations. Some of the pokkali landowners have gone to the extent of abandoning rice cultivation by keeping land fallow, hoping that very soon their traditional fields are converted to shrimp monoculture. This situation has resulted in labourers migrating to other areas, raising ducks and chickens, working in shrimp peeling sheds etc., ultimately changing their livelihood strategies. The changes in livelihood strategies of the workers, in turn, impact agriculture practice through labour scarcity and increasing labour cost. Thus, there is a positive feedback loop between change in agriculture practice and change in worker's livelihood strategies, with the result that high cost and scarcity of labour speeds up the transformation to monoculture. Such changes have had implications for rural livelihoods, gender relations, and the local economy, all of which is documented in Chapter 4.

Trends in global shrimp markets and local economic pressures are the two major factors that help explain the shift from rice-shrimp rotational cropping system to monoculture of shrimp in Khuzupilly. Kerala's integration into international markets for the export of shrimp has resulted in shrimp landowners catering to the demands created by domestic and international markets. Shrimp cultivated in the small villages of Kerala are exported to Japan, USA and South Africa. This is a perfect example of globalization where small communities cater to the demands of

international markets. In addition to this, leasing land for shrimp filtration plays a major role on the livelihoods of pokkali landowners. Leasing land in the traditional system operates differently than leasing land in a monoculture system (see Chapter 5 for discussion of the leasing process). All pokkali landowners in Puthen Padam and 31 Block (few shrimp landowners were leasers themselves) leased their lands to leasers for shrimp filtration based on pre-arranged terms and conditions. What is more interesting is that pokkali farmers, without exception, lease out land for shrimp production despite the fact that they can earn as much as leasers by cultivating shrimp on their own. Interviews with pokkali farmers indicated that they encountered several barriers (capital and technical) to undertaking shrimp cultivation on their own.

The findings illustrate that shrimp aquaculture is totally dependent on the leasers. It is the leaser who takes the risks starting from stocking to harvesting shrimp. Pokkali landowners and shrimp landowners have to *just* (emphasis mine) lease their lands based on some terms and conditions for a specified period of time. The landowners will receive the money from the leasers before the onset of shrimp filtration process. The pokkali landowners rely on shrimp filtration because the debts incurred in pokkali rice cultivation are easily covered by the profits made from shrimp filtration.

Cause and effect relationships are not only difficult to prove, but also tend to oversimplify what often is a complex set of relationships and interactions between the social and ecological system (Lobe and Berkes 2004). However, understanding the trends and drivers of changes that have shaped the livelihood strategies of wetland agriculture farmers in Khuzupilly clearly shows that demands originating outside the

context of communities have the potential to affect conditions at the community level. The drivers of change that caused landowners and labourers to change their livelihood strategies (away from rice) have increased vulnerability and decreased resilience. These implications signal major changes that have the potential to impact the community of wetland agriculture labourers and the ecosystem upon which they depend.

6.1.2 Transformation processes

The second objective was to **analyze and explain the transformation from traditional rice-shrimp system to monoculture of shrimp**. Focusing on the monoculture of shrimp, Jayesh and I began the process of identifying the factors that were responsible for the transformation, major drivers behind the transformation, the leasing process, post harvest and marketing processes, adversities and impacts of monoculture shrimp farms on the socio-economic system and the local environment.

It is clear from the findings presented in Chapter 5 that globalization and economic pressures were the major drivers responsible for the transformation from traditional rice-shrimp rotational cropping system to a monoculture of shrimp. Driven by market forces and lack of profit in pokkali rice, 31 Block converted their traditional fields to monoculture shrimp farms. The major force behind the shrimp landowners is the political support, without which 31 Block would not exist. The shrimp landowners enjoy the support of ruling political party (UDF in the current government); also they have strong ties with buyers and the exporting companies. The landowners in 31 Block are financially strong and have the ability to cope with

adversities like viral disease and other related problems. Another important finding is the unlicensed shrimp farming activity. According to the law (Kerala Fisheries Act), pokkali fields should be used for cultivation of rice and shrimp (for rotational cropping), whereas, shrimp landowners in 31 Block practice monoculture of shrimp without license.

One major positive impact from monoculture shrimp farms is employment for women and these jobs are not sanctioned by the government. More than 1,000 women are employed in shrimp peeling sheds. These women work in both traditional and monoculture peeling sheds, which has become an important livelihood activity.

The discharge of pollutants directly into the estuary causes serious problems to pokkali fields and the local environment at large. The shrimp landowners/leasers release water from monoculture farms as a part of water exchange process. The effluent water is mixed with the estuarine water and the same is used by pokkali landowners for rice cultivation which increases salinity, resulting in low yields. These conditions have led to political unrest in the village. The profit made in monoculture shrimp farms is double the profit made in traditional shrimp farms (See Table 15). This has increased the gap between the rich and the poor in the community. Considering the example of shrimp landowners, pokkali landowners in Puthen Padam have stopped cultivating pokkali rice; they are keeping their land fallow hoping that government could permit them to practice monoculture at some stage. This will have a direct impact on the labourers who are still dependent on rice-shrimp rotational cropping system in order to provide their livelihood. Monoculture shrimp farms have already reduced employment opportunities for men, decreased women's livelihood

diversity, increased vulnerability among pokkali landowners and workers, and contributed to wetland degradation.

6.2 Insights and learning opportunities for wetland agriculture management

Documenting the livelihood strategies of wetland agriculture landowners and labourers was one of the important findings of the research. Economic pressures coupled with the blossoming shrimp industry have changed the natural settings of the village. The diversification in coping strategies in response to a shock (transformation) explains that, coastal communities have innumerable options of sustaining their livelihoods. Some of the options include: mixed cropping (pepper, coconut, jasmine, arecanut, jack fruit, etc.), duck farming, chicken farming and fishing (also catching crab). The reality of rice-shrimp rotational cropping system in the study community illustrates the need for recognition of local institutions. The Samajams are the local level, informal institutions that are engaged in managing the rice-shrimp rotational cropping system (to some extent) in Khuzupilly. Some of their functions include: construction of master sluice gates and dikes, auctioning of pokkali fields to leasers, organizing meeting with Panchayat and krishibhavan officials etc. The recognition of these institutions and the interaction of state government at various levels can promote synergies, to attain sustainable use of resources.

6.2.1 Livelihoods and coping strategies

Livelihood diversification is a key feature of many coastal communities. Rice-shrimp rotational cropping system on Cochin estuary and lagoon (Backwaters) has been the important characteristic feature of coastal communities of Ernakulam

district. This mode of rice farming has served the people of Khuzupilly for hundreds of years. Their livelihoods are tied strongly to the wetland agricultural resources and any change in the ecosystem could respond in altering their livelihood strategies and create pressures eventually leading to unsustainable practices. The development of shrimp aquaculture has created opportunities for male and female labourers to examine alternative livelihood strategies. Pokkali landowners have almost abandoned rice cultivation, or have started investing in mixed cropping. One of the important lessons from this research is that labourers in pokkali fields, especially women who depend on gleaning rights will be losing their livelihoods. The mutual understanding between the Samajam leaders and the leasers to go for extended harvest has stopped women from catching (remaining) fish/shrimp after shrimp filtration in traditional pokkali fields. The revenue generated from gleaning rights is sufficient enough to sustain their (labourers) livelihoods for three to four months (see Chapter 4 for gleaning rights). This is one of the negative outcomes of shrimp cultivation in traditional system.

In shrimp aquaculture, the short term economic returns are very high. However, there are a number of impacts, both ecological and social. Wetland degradation and spread of shrimp disease has made the environmental situation worse. The leasers in monoculture shrimp farms use chemicals to increase their harvest; these chemicals accumulate in the soil and may impact either pokkali rice or shrimp. The biology of shrimp and its chemical intake was beyond the scope of this research. One of the major concerns expressed by the villagers is that the ground water aquifers are contaminated through the seepage of chemicals, affecting the

drinking water quality in the nearby areas. Thus monoculture shrimp farms can have deleterious effects on pokkali rice fields resulting in lower yields, and may impact human health through contaminated drinking water or contaminated shrimp.

The pokkali landowners and labourers have showed strong coping strategies, they have not let the system collapse. The short-term coping strategies include switching to different occupations in different seasons which is discussed in Chapter 4. The other professions like mixed cropping, duck and chicken farming, fishing, etc. have been undertaken to overcome the problems faced during pokkali rice cultivation. Though their livelihoods strategies are vulnerable at times, they have demonstrated that livelihoods can be maintained through secondary occupations. Female labourers played a substantial role in wetland agriculture, women organizations called “self help” groups were instrumental in solving some of the problems associated with rice farming. These “self help” groups are the result of the Peoples Planning Program introduced by the Kerala government in the year 1996, as a process of decentralization.

Shrimp aquaculture provides jobs to women year round in the form of shrimp peeling sheds; thus women’s livelihoods are more secure than the rest of the people in Khuzupilly. What needs to be addressed is how long can they rely on one option, heavy dependence on shrimp peeling units has decreased livelihood diversity. Another interesting livelihood strategy is to migrate to other fields to earn more produce (they are paid in kind, not in cash). Low incomes for rice farming households, indebtedness, limited off-farm employment opportunities, and high profit potential associated with monoculture shrimp farming, intensify the pressure to

choose short-term exploitation benefiting relatively few people over long term, sustainable resource use.

6.3 Policy recommendations

Priorities for policies that work towards sustainable development with the involvement of state should include:

- **Provide enabling legislation for the farmer organizations.** Only two farmer organizations (Samajams) in Khuzupilly are registered under the *Charitable Societies Act*. The Samajams are recognized by the state, but their *de facto* management functions are not. Enabling legislation could be created in order to incorporate the existing functions of the Samajams. This would recognize the role of farmer organizations and provide basis for vertical linkages. The padashekaram system with its flexible local rules helps to adapt people for short-term coping strategies. Recognition of local institutions, their rules and norms by the state government would help to improve the situation and build flexibility into the system.
- **Use traditional knowledge.** The traditional rice-shrimp cropping system is dependent on knowledge accumulated over 500 years of practice. It is imperative to preserve this knowledge because it is a cultural heritage of Kerala, and educate younger generations so that the traditional knowledge is passed on.
- **Provide equivalent subsidy for pokkali rice.** Aquaculture is currently subsidized in a number of ways, which puts pokkali rice at a disadvantage. Providing a subsidy for pokkali rice cultivation could provide incentive to the

landowners to continue pokkali production. This will also help them cover the infrastructure costs and seek specialized markets for export business. It may also promote landowners to give equal emphasis to the traditional rice and shrimp cropping system. The state government and panchayat should take the responsibility of providing infrastructure facilities to pokkali landowners that will reduce the investment cost individually. Equivalent incentives for both traditional and monoculture systems will promote landowners and labourers to actively participate in pokkali rice cultivation.

- **Certify traditionally produced shrimp.** Environmentally appropriate shrimp may be promoted by certification. The government should support initiatives for shrimp certification to help exporting companies to get higher value for traditionally produced shrimp as opposed to monoculture shrimp. This is a key issue that provides an opportunity for supporting responsible shrimp monoculture.
- **Open communication between PLDA, Krishibhavan, Panchayat and farmer organizations.** Active communication between landowners, workers and leasers will help to improve the situation. Timely advice, counseling and field visits by Krishibhavan, panchayat and PLDA officials can organize farming activities in a better way. Incentives during pre-harvest and harvest can reduce the shortage of labour crisis and minimize migration of workers to other fields.
- **Decentralize resource management planning.** Decentralization has seen little success in all the sectors in Kerala. There is no decentralization policy

associated with wetland agriculture. Transfer of power and responsibility to panchayat and farmer organizations can bring in more changes to pokkali rice-shrimp rotational cropping system. The women's self help group is a direct result of decentralization and its success indicates this policy should be furthered.

- **Introduce new policies aimed at improving rice-shrimp rotational cropping system with maximum involvement of Kerala state government.**

The government should work with farmer organizations in promoting pokkali rice cultivation. The landowners should be encouraged to practice pokkali rice cultivation by providing incentives and bonuses and women should be paid in cash (not in kind) at the time of harvest. Kerala Agriculture University should work in participation with PLDA to come up with high-yielding varieties of pokkali.

- **Build conflict resolution mechanisms.** Kerala is dependent on both the national and the global economy. In such situations, conflicts tend to happen due to inequality in sharing resources, wage rates, etc. State government has to bridge the gap between the organized and the unorganized sectors, and the implications for economic and social development should be recognized. Panchayat and Samajam leaders should work in collaboration to formulate rules that minimize conflicts during shrimp filtration, leasing process, land use processes while deciding fair labour wages.
- **Build institutional capacity.** Currently, the five Samajams in Khuzupilly operate in isolation. Puthen Padam, which is the apex body consisting of 20

sub Samajams, provides a network of institutions which addresses issues around increasing pressure on pokkali rice cultivation. Cross-scale (horizontal and vertical) institutional linkages are needed, involving governments and farmer organizations to network towards achieving sustainable use of resources.

6.4 Conclusions and areas for further study

There is no doubt that globalization has altered the dynamics of the coastal agricultural system in Khuzupilly. The statements from the pokkali labourers and direct observation strongly suggest that shrimp aquaculture has put pressure on age-old rice-fish/shrimp rotational cropping system in Khuzupilly. The Samajams address the issue of infrastructure, lease, sharing and organization of resources, but they fail to address the problems faced during pokkali rice cultivation such as: shortage and high cost of labour, processing of pokkali rice or ecological degradation. There is a real dilemma, whereby traditional landowners are trying to increase their incomes and government is trying to manage for both sustainability and economic growth. The balance has to be restored at some stage. As more and more traditional landowners shift to monoculture, there will be an increase in the vulnerability of the backwaters ecosystem as a whole.

Several factors (lack of production and harvesting incentives, high cost of investment and low yields in pokkali rice, shortage and high cost of labour and increased dependency of shrimp peeling sheds by women) have favoured shrimp aquaculture over traditional rice-shrimp rotational cropping system. In turn, shrimp aquaculture has changed the livelihood strategies of the people of Khuzupilly; it has

displaced many labourers, increased the gap between the rich and the poor, created ecological vulnerabilities, affected small farmers' incomes, and brought the traditional rice-shrimp rotational cropping system to the verge of collapse.

There are many areas that could be considered for further research, including: discharge of waste from domestic sources and industries which directly affect pokkali cultivation, seepage of chemicals from shrimp aquaculture farms, and socio-economic issues like how long people can depend on already declining pokkali rice cultivation system. Another issue related to coping strategies is how long the landowners and labourers can continue to cope through short-term coping strategies, and how will the farmer organizations react to these new emerging problems. This would be an interesting subject for further research. Another interesting area that could be considered is how pokkali landowners would react if the government does not permit shrimp aquaculture.

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Appendix 1 –Semi-structured Interview Questions

Pokkali Landowners – Puthen Padam

- How long you have been engaged as a wetland farmer (pokkali)?
- Is everyone in your family engaged in wetland farming?
- How many family members in household do you have?
- What is your main occupation? What other members do?
- What other professions do you engage yourself in different seasons?
- When did your family arrive in this area?
- What is the main source of livelihood and income for your family?
- How long have you been working? Where? When did you learn to grow rice and shrimp?
- How many pokkali farmers are there in the community? How many families depend on wetland agriculture for their livelihoods?
- Are most of the pokkali farmers residents of the community?
- Where/how is your shrimp sold/marketed? How are shrimp products priced?
- Who are middlemen (auctioneers)? What is their role?
- Have you borrowed money from middlemen/institutions? If so, how much and with what conditions?
- What are the major problems you face in different seasons?
- What do you do to cope with these adversities? For example, Virus attack
- Do you have any plans of converting rotational cropping in to full time shrimp farming?
- How safe is pokkali from pest attacks and other diseases? How do you overcome that? Is there any assistance from PLDA during this period?
- Did you receive any financial assistance or help from PLDA? If so, to what extent?
- What measures do you suggest to improve the situation, if any?
- How local institutions have been impacted by the change in the agrarian practices?
- What is your comment on the role of government institutions in this regard?
- What measures can be taken to ensure sustainable agrarian practices and your livelihoods?
- Please tell me about the management structures of this farming system.
- What role do the government agencies play in this structure?
- What role do the farmers play in this structure?
- What is the role of Panchayat (local administrative unit)?
- What are the conflicts among different actors?
- How such conflicts are being mitigated?
- What role do local institutions (padashekarams) play in the management process?

- What role do farmers play in the management structure?
- Are their opinions given sufficient importance?
- How frequently you sit together to analyze the situation?
- What about the representation of the farmers in resource management committees?
- Do the farmers have a real say in the decision making? If so, how?
- Why do younger generations hesitate to work in Pokkali fields? What are the reasons? Lack of technology? Labour wage? Or what?

Shrimp Landowners – 31 Block

- How long you have been engaged as a Chemeen farmer?
- How many family members in household do you have?
- Is everyone in your family engaged in chemeen farming?
- What is your main occupation? What other members do?
- Is chemeen farming your full time occupation? If not, what do you do in different seasons?
- When did your family arrive in this area?
- What is the main source of livelihood and income for your family?
- How long have you been working? Where? When did you learn to grow chemeen?
- What made you to transform from rotational rice-shrimp farming to full time shrimp farming?
- Is it legal to do full time chemeen farming? (not sure)
- How many chemeen farmers are there in the community? How many families depend on chemeen farming for their livelihoods?
- Are most of the chemeen farmers residents of the community?
- Where/how is your shrimp sold/marketed? How are shrimp products priced?
- What are the species of chemeen grown and which one has a high market value?
- Who are middlemen (auctioneers)? What is their role?
- Do you lease your land to auctioneers for chemeen farming or you do it on your own? If so, what is the contract amount per acre?
- How productive is chemeen for you? What was the productive income from chemeen and pokkali farming over the years?
- Have you borrowed money from middlemen/corporate sectors? If so, how much and with what conditions?
- What are the major problems you face in different seasons?
- What do you do to cope with these adversities? For example, Virus attacks?
- What are the reasons for virus attack? Few shrimp farms and no disease or lots of shrimp farms and they get disease? Or what? Please explain.
- How do you overcome the situation? Is there any assistance from any organization during crisis?

- How do you decide to move from rotational cropping to full time chemeen farming? One bad year of pokkali, you shift or three bad years of pokkali, you shift? Please explain
- Is there any effect on land or soil quality after 4-5 years of farming?
- Do you have any plans of converting full-time chemeen farming into rotational cropping? If so, why?
- Please tell me about the management structure of this farming system
- Do you have any joint management institutions (padashekaram)?
- What is your comment on the role of government institutions in this regard?
- What is the role of panchayat (local administrative unit)?
- What role do local institutions (padashekarams) play in the management process?
- What is yield of chemmeen/acre? What is the investment cost/care and what are the returns/ acre?

Leasers

- Are you a land owner? If so, how much area of land you have?
- How long have you been engaged as an auctioneer?
- What is your main occupation?
- Are you an auctioneer in rotational cropping or full time chemeen farming? Which is more profitable?
- What is the investment cost per acre of land for chemeen farming?
- What is your role in chemeen farming? Please explain the process
- Where and how is your chemeen sold/marketed? How are chemeen products priced?
- Do you have any union or organization?
- Have you borrowed money from any corporate sectors or institutions?
- What are the species of chemeen grown? What are their market prices? Which one has the high market value?
- What are the prices of chemeen species per kilogram? Thelly, Naran, choodan, Kara.....
- What are the returns per acre of land?
- What is the area of land you have bought for lease from a landowner?
- What are the conditions and time period for leasing the land?
- What are the problems you face during chemeen farming? Example virus attacks and how do you overcome the situation?
- Please tell me about the viral disease, few farms and your field is infected with virus or a lot of farms and they get infected?
- Do you pay your contract amount before leasing or after harvesting?
- What is the role of women in shrimp farming?

Pokkali workers

- How long you have been engaged as a wetland farmer (pokkali)?
- Is everyone in your family engaged in wetland farming?
- How many family members in household do you have?

- What is your main occupation? What other members do?
- What other professions do you engage yourself in different seasons?
- When did your family arrive in this area?
- What is the main source of livelihood and income for your family?
- How long have you been working? Where? When did you learn to grow pokkali and chemeen?
- What was your previous occupation? if any?
- What do you obtain from Pokkali? Income?
- Do you own some land? If so, how much?
- How many pokkali farmers are there in the community? How many families depend on wetland agriculture for their livelihoods?
- Are most of the pokkali farmers residents of the community?
- What do you do for other 6 months of the year? Are you involved in chemeen farming?
- What are the major problems you face in different seasons?
- What do you do to cope with these adversities?
- Is there any assistance from PLDA during this period?
- Did you receive any financial assistance or help from PLDA? If so, to what extent?
- What measures do you suggest to improve the situation, if any?
- Do you have committee or organization of farmers?
- Are you satisfied with your landowner? What is he paying for you? Cash or kind?
- Do you think the labour union president is exploiting labourers?
- What is your comment on the role of government institutions in this regard?
- What measures can be taken to ensure sustainable agrarian practices and your livelihoods?
- Do you have any idea about the management structures of this farming system?
- Do you have any role to play in this structure? Is your opinion given sufficient information?
- What is the role of panchayat (local administrative unit)?
- What role do local institutions (padashekarams) play in the management process?
- How frequently do you meet?
- What about the representation of the farmers (workers) in resource management committees?
- I always hear that there is a shortage of labour problem? What are the reasons?
- Why do younger generations hesitate to work in Pokkali fields? What are the reasons? Lack of technology? Labour wage? Or what?

Female workers

- Do you have access to pokkali fields?
- What is your role in wetland Farming? Please explain

- What is the present status of agriculture you are involved in?
- What are the major livelihood strategies you adopt when the system collapses?
- What is the response of panchayat?
- How do you get involved in panchayat activities? Do you have a real say?
- Are you involved in any self organization or kudumba Samajam activities?
- Is there any subsidy for women who work in pokkali fields? Is there any incentives provided during sowing of seeds or any other process?
- Are you engaged in shrimp collection? If so, how do you collect shrimp?
- Are you engaged in shrimp processing activities? What other activities are you engaged in other than shrimp collection?
- When did you start working in shrimp processing units?
- Is this amount sufficient enough to maintain your family's livelihood activities?
- What is your role in shrimp processing units? Please explain
- What are the wage rates per day?

Government officials

This set of questions will deal with role of government and samajams

- Please tell me about the management structure of wetland agriculture (hierarchy).
- Who are the persons involved in the management process?
- What role do the government agencies (Krishibhavan....etc) play in this structure?
- What role do the farmers play in this structure?
- Are their opinions given sufficient importance?
- What measures do you suggest to improve the situation, if any?
- What are the issues that triggered the transformation of rotational cropping to full time shrimp farming?
- How samajams have been impacted by the change in the agrarian practices?
- What is your comment on the role of government institutions in this regard?

The next set of questions will deal with role of local administrative units (local leaders, and government officials)

- What are the conflicts among different actors (e.g. Workers and landowners, trade unions and samajams, panchayat and landowners)?
- What are the conflicts among samajams? Who do they report to mitigate the conflicts (Ikya samajam or state government)?
- How such conflicts are being mitigated?
- What role do samajams play in the management process?
- How frequently you sit together to analyze the situation?

- What about the representation of the farmers in resource management committees?
- Do the farmers have a real say in the decision making? If so, how
- What is the role of panchayat (local administrative unit)?

The next set of questions will deal with resource rights and resource management (local leaders, and government officials)

- How decisions are made regarding the use of local resources? (land, water, infrastructure)
- What about the leasing process of the farming lands?
- Who actually have access to such a leasing process?
- Why do poor farmers fail to get control over the local resources?
- What is your opinion about the overall performance of the co-management structure?
- What is your opinion for improving co-management structure?

The next set of questions will explore decentralization issues (government officials):

- Please tell me about your experience of the current centralized management structure.
- What are the strengths and weaknesses of current structure?
- When did the process of decentralization started, if any?
- Are you aware of the existing decentralization policies related to wetland agriculture, land use and aquaculture?
- How decentralization process is reflected at the local level?
- Do you think that government agencies handed over both responsibility and authority to the local management structure?
- If so, to what degree?
- Who enforces the policies of aquaculture, land use and agriculture?
- How do the government agencies mediate in the process?
- What are the hurdles to implement the existing decentralization policies?
- What is your opinion to improve the limitations of the decentralization process?
- Do you think decentralization policies (in practical) are going to work here?

Structured Interview Questions

Name:

Community:

Date:

Land owner:

Pokkali worker (men):

Pokkali worker (women):

1. How long have you been engaged as a pokkali farmer?
More than 5 yrs: More than 10 yrs: More than 15 yrs: More than 20:
2. Is everyone in your family engaged in pokkali farming?
Yes or No, if yes how many?
3. How many family members in household do you have?
Please specify
4. What other members do?
Please specify
5. What is your main occupation?
Pokkali farming Shrimp farming Auctioneer others
6. What other professions do you engage yourself in different seasons?
Please specify
7. When did your family arrive in this area?
8. What is the main source of livelihood and income for your family?
Please specify
9. How long have you been working? Where?
Specify the number of the years
10. How did you learn to grow rice and shrimp?
11. How many pokkali farmers are there in the community?
12. How many families depend on wetland agriculture for their livelihoods?
13. Are most of the pokkali farmers residents of the community?
Yes or No

14. What are the major problems you face in different seasons?
Please specify
15. What do you do to cope with these problems?
Change your occupation? Or please specify
16. Do you have any plans of converting rotational cropping in to full time
shrimp farming?
Yes or No
17. Did you receive financial assistance rom PLDA? If so, how much?
Yes or No
18. Have you borrowed money from contractors /institutions?
19. How safe is pokkali from pest attacks and other diseases?
Scale of 1 to 10:
20. Why do younger generations hesitate to work in Pokkali fields?
Reasons: Lack of technology: Labour wage: Or what:
21. Yield of pokkali per acre: Investment per acre: Returns per acre:
22. Contract amount of an auctioneer/acre of land for chemeen filtration:
23. How frequently you sit together to analyze the situation?
Once in a year: Twice: Trice:
24. Do the farmers have a real say in the decision making?
Yes or No

Appendix 2

Table A: Religious affiliations of workers and owners

	Hindus	Christians	Muslims
Rice-shrimp workers (Male)	(100%)	-	-
Rice-shrimp workers (Female)	(98%)	(2%)	-
Rice-shrimp L'owners	(60%)	(30%)	(10%)
Monoculture Landowners	(2%)	(25%)	(73%)
Leasers	(30%)	(25%)	(45%)

Table B: Classification of land (area in hectares)

Type of land	Area (hectares)	Number of holdings	Percentage of holdings
Pokkali lands	275.20 (31.8)	862	47.10
Cultivable lands	494.30 (57.1)	764	41.75
Unsuitable for cultivation/barren lands	95.85 (11.1)	204	11.15
Total	865.35 (100)	1830	100.00

Table C: Seasonal shrimp farming activities and labour requirements (6 months)

Serial. Number	Details	Number of man days	Men	Women
1	Fabrication of sluice gates and its installation	4	5	-
2	Raising of dikes and excavation of canals	10	5	-
3	Eradication of weeds	4	2	2
4	Fabrication of work shed and shelter	2	2	-
5	Fabrication of bamboo/plastic screens	2	2	-
6	Setting of nets	2	1	-
7	Nursery operation, stocking and feeding	3	2	-
8	Sluice gate operation and filtration	90	1	-
9	Fishing operations such as cast netting, gill netting and hand picking	30	5	2
10	Terminal operations	5	2	2
11	Cleaning and categorization of field	5	2	2
12	Storage (icing)	5	3	-
13	Peeling	10	-	20
14	Weighing and packing	8	2	1
15	Transporting/marketing	2	5	-
	Total	182	39	29