



**Measures to Mitigate Agricultural
Distress in Alappuzha and
Kuttanad Wetland Ecosystems**

A Study Report by

M. S. SWAMINATHAN RESEARCH FOUNDATION

2007



FOREWORD

Every calamity presents opportunities for progress provided we learn appropriate lessons from the calamity and apply effective remedies to prevent its recurrence. The Alappuzha district along with Kuttanad region has been chosen by the Ministry of Agriculture, Government of India for special consideration in view of the prevailing agrarian distress. In spite of its natural wealth, the district has a high proportion of population living in poverty. The M. S. Swaminathan Research Foundation was invited by the Union Ministry of Agriculture to go into the economic and ecological problems of the Alappuzha district as well as the Kuttanad Wetland Ecosystem as a whole. The present report is the result of the study undertaken in response to the request of the Union Ministry of Agriculture. The study team was headed by Dr. S. Bala Ravi, Advisor of MSSRF with Drs. Sudha Nair, Anil Kumar and Ms. Deepa Varma as members. The Team was supported by a panel of eminent technical advisors.

Recognising that the process of preparation of such reports is as important as the product, the MSSRF team held wide ranging consultations with all concerned with the economy, ecological security and livelihood security of Kuttanad wetlands. Information on the consultations held and visits made are given in the report. The report contains a malady-remedy analysis of the problems and potential solutions. The greatest challenge in dealing with multidimensional problems in our country is our inability to generate the necessary synergy and convergence among the numerous government, non-government, civil society and other agencies involved in the implementation of the programmes such as those outlined in this report. This is why the team has suggested both a high-level policy guidance and monitoring committee as well as a task implementation mechanism.

The Kuttanad Wetland Ecosystem, particularly the Vembanad *Kayal* (lake), is now receiving global attention because nature is at the peak of its beauty in this Ramsar site. This Wetland Ecosystem comprises not only the Vembanad *Kayal* but also a huge network of rivers, canals and drains. The agriculture of Kuttanad wetlands is again unique because in large areas rice cultivation is being done up to 2 m below the sea level. The challenge now is to conserve and enhance the beauty and bounty of this ecosystem by creating an economic stake in its conservation. This will imply that the livelihood security of the farm, fisher and other families

living in this area must be strengthened through better infrastructure and multiple avenues of market driven income earning opportunities. The agricultural crisis in Alappuzha district is deeper in the Onattukara and its northwestern coastal regions known for unique *Pokkali* rice cultivation.

The report suggests an institutional mechanism like the creation of a Special Agricultural Zone (SAZ), which will help to address in a holistic manner all links in the conservation, cultivation, consumption and commerce chain. We must create a *Kuttanad Regeneration Symphony* with all the actors playing their part in harmony with each other. Saving the Kuttanad ecosystem and the regeneration of the agriculture of this area has to be a joint Centre-State responsibility. The Kuttanad Special Agricultural Zone is very worthy of the support the Government of India is planning to extend to State Governments for new initiatives in the field of agriculture, which can help to strengthen national food security and sovereignty.

I wish to express our gratitude to Shri. Sharad Pawar, Union Minister for Agriculture and Food, the Secretary and all the concerned Officers of the Ministry of Agriculture, Shri. T .K. A. Nair, Principal Secretary to the Prime Minister, Hon'ble Chief Minister, Ministers of Kerala Government, Members of Parliaments, Members of Kerala Legislative Assembly, the mass media, and civilian, farmers', farm women, fishermen, farm labourers' non-governmental and Church organizations, and all the others who so generously gave their time to share their views and to suggest solutions. I hope the report will be of help in initiating a new *Kuttanad Renaissance Programme*.

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We owe our greatest gratitude to the people of Kuttanad who with great enthusiasm and hope travelled long distances and partook in the discussions and shared their experiences and views. They were the part and parcel of our consultative study. Our interaction with each one of them, the farmers, fishermen, farm labourers, women, and the youth, was a learning experience. Many of them also provided representations detailing several issues and suggestions to rectify them. Their clarity and concern have shaped our thoughts, findings and some of the final recommendations for alleviating distress situations in the study area. We are deeply impressed and influenced by the indomitable never-say-die spirit and the commitment of the people towards the development of their homeland. Our most grateful acknowledgements are due to each and every one of these participants.

The study would not have been possible at the fast pace that it was conducted had it not been for the continuous support and assistance made available to us by the District Collector of Alappuzha and his body of departmental officials, bureaucrats, the political body of elected representatives from Kuttanad, the scientific academia, media, private institutions and non-governmental institutions. We are deeply grateful for their assistance in conducting public consultations, providing space and logistic support for discussions and field visits, preparing maps pertaining to the study area, providing access to a vast database and scientific information.

We are also grateful to many of them for partaking in several of our consultations and offering insights into what may ultimately work for Kuttanad and what may not. The local media, print and visual, deserves special mention for spreading the news of consultations so efficiently so that people from far and near could participate in our consultations. The media also offered their views and helped in compiling the public views published through their columns.

It has not been possible to list out the names individually, since such a large number of people have been involved. However, we would like to list a few of them who have been major catalysts in this study.

To the Hon. Chief Minister of Kerala and the Ministers for Agriculture, Cooperation, Transport, Fisheries, Irrigation and Finance, we are extremely grateful for their patient hearing of the draft report and their invaluable comments. The political body made of the MLAs and MPs of

Alappuzha, and Kuttanad regions falling in Kottayam and Pathanathitta have been involved in the development of the recommendations right from the beginning of the study and have offered their very useful comments. Special mention needs to be made of Dr. K.S. Manoj (MP) and Smt. C.S. Sujatha (MP) and Shri. Thomas Chandy, MLA, Kuttanad who have evinced a very keen interest in helping the study team.

We would like to express our heartfelt thanks to the District Collectors of Alappuzha, Kottayam and Pathanamthitta, and the Departments under them, especially the Departments of Agriculture, Irrigation, Cooperation, Fisheries, Local Self Governance, Labour, Social Welfare, Tourism, and Public Relations. The interest and contribution of Shri. K.R. Vishwambaran, IAS, the previous District Collector of Alappuzha, currently the Vice - Chancellor, Kerala Agricultural University, deserves very special thanks. We also wish to thank Shri. Balakrishnan, present Collector of Alappuzha for his interest and support. Our thanks are due to the Alappuzha Municipal Administration. The contributions of the Kerala State Land Use Board, GoK for making available the land use maps of Alappuzha and Kuttanad and their studies conducted in this region.

We also wish to thank Presidents of Alappuzha and Pathanamthitta district Panchayats and all Block and Village Panchayat Presidents who assisted this study in many ways through suggestions and discussions during field visits.

Thanks are due to many scientists from different Universities, Institutions, and in particular from the Rice Research Station, Mankombu and Regional Agricultural Research Station, Kumarakom for the useful help with expert views, research papers and models on successful livelihoods. Throughout our consultations we had taken care to involve multi-disciplinary specialists and advocates of a better Kuttanad from throughout Kerala. We thank them for their suggestions and advice, which immensely helped us. In this context, we would like to express our sincere thanks to Dr. Geethakutty, Associate Professor, Kerala Agricultural University and Ms. Sudha Soni, Consultant, *Gandhi Smaraka Grama Seva Kendram*, Alappuzha for their competent support for successfully organising and conducting the interactions with women of Kuttanad.

Representatives from the banking sector, notably the NABARD, the State Bank of Travancore (SBT) and the district Cooperatives have offered their valuable suggestions. We specially thank

the help of Shri.S.Sreekumar, General Manager, District Cooperative Bank. We have also held discussions with representatives of private industries, resort and houseboat operators and this has enabled us to gain an unbiased view on several issues; our most sincere thanks to them.

Several agencies and non-governmental institutions that have dedicated their work to the upliftment of the people of Kuttanad, and representing the civil society, have been involved in facilitating our study right from the beginning. Among them the *Kuttanad Vikasana Samiti* (KVS), *Pampa Parirakshana Samiti* (PPS), Gandhi Smaraka Grama Seva Kendram (GSGSK), and the Kerala *Shastra Sahitya Parishad* (KSSP) deserve special mention. The guidance extended by Fr. Thomas Peelianickal and Prof. M.K. Prasad at various stages of this study is gratefully acknowledged. Along with them we would also like to thank several members of the *Kudumbashree*, Women in Agriculture and the *Anganwadi* members who have contributed much to our discussions.

Sincere thanks are also due to the mass media – the Television, Radio and Newspapers, who have captured the essence of the consultations and disseminated it to the wider public. In this context the services extended by Shri. Unnikrishnan, PRO, Alappuzha is acknowledged.

Our team of Expert Committee Members have been carefully selected and have been those who are eminent in their respective spheres of knowledge and who have had considerable experience working on issues of Kuttanad. They have brought with them their enormous expertise and experience which has deepened our knowledge of Kuttanad considerably. They have been with us throughout the study and their contributions will no doubt benefit the people of Kuttanad one more time. We would like to take this opportunity to once again thank them, wholeheartedly for their support, participation and guidance.

Finally, we also wish to thank the Government of India for the study that has brought us very close to the people of Kuttanad and Alappuzha and the natural charms of the region.

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Radha Singh

सचिव, भारत सरकार
Secretary
Government of India

16/11/06
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D.O. No.12015/41/2004-Credit-I

November 7, 2006

Dear Dr. Swaminathan,

You may be aware that the Government of India has recently approved a special rehabilitation package for the farmers in 31 distressed districts of Andhra Pradesh, Karnataka, Kerala and Maharashtra. Along with this, Government has also approved a special plan of action for improving the farming conditions in Alappuzha and Idukki districts of Kerala. The special plan of action, Inter-alia, includes constitution of a multi-disciplinary team to study and suggest programmes for preservation and development of Kuttanad wetlands in Alappuzha district.

In view of the available expertise with the Swaminathan Foundation we have decided to assign the study and report on the Sustainable Development of Kuttanad Wetland Eco-system to the Foundation. Among other things, the study should particularly focus on the ecological security of the Kuttanad Wetland Eco-system and sustainable livelihood for the people of the area and should make specific recommendations on:-

- (i) Measures for strengthening the ecological security of the Kuttanad Wetland Eco-system;
- (ii) Measures for expanding sustainable livelihood opportunities for the people of the area.

This is with the request to kindly work out the design of study, including its financial implications, if possible, within 10 days, to enable us to take a decision on the commissioning of the proposed study.

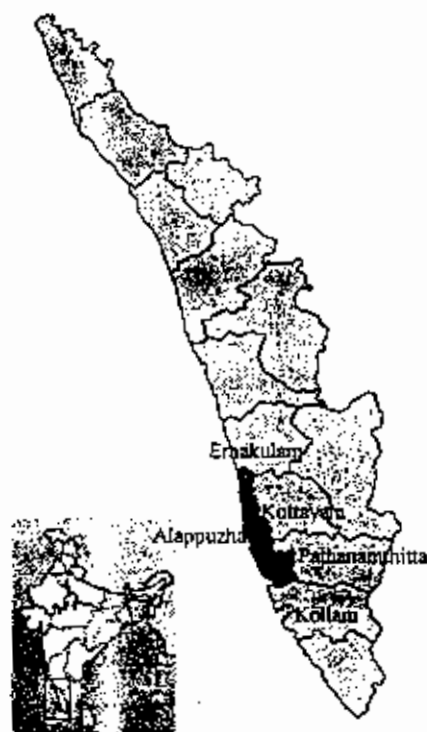
Yours sincerely,

(Radha Singh)

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THE MANDATED STUDY AREA

The geographical location of mandated study region is broadly shown in the Kerala map. The mandated study area includes the whole of Alappuzha, with 73 panchayats, including the panchayats falling under the Kuttanad Wetland System (KWS), and remaining part of the KWS spread over the districts of Kottayam and Pathanamthitta. Nearly 57 % of the KWS is shared by Alappuzha district, 30 % by the Kottayam district and remaining 13 % by the Pathanamthitta district. Administratively Alappuzha district is divided into 6 taluks, namely, Ambalapuzha, Chengannur, Chertala, Karthikapally, Kuttanad and Mavelikkara, comprising a total of 82 villages. Out of the 73 panchayats in Alappuzha, 32 panchayats fall within Kuttanad. Three taluks of Kottayam district, namely, Changanassery, Kottayam and Vaikom comprising 27 panchayats and 16 villages are part of Kuttanad. In Pathanamthitta district, 5 panchayats under Thiruvalla taluk fall within Kuttanad. Thus, the KWS has a total of 64 panchayats. Apart from Kuttanad, two major agricultural regions of uniqueness are Onattukara and *Pokkali* rice belt area. Onattukara is a region spreading to Kollam district, south of Alappuzha. The study is confined to the Onattukara region falling within Alappuzha, constituted by 16 panchayats and 2 municipalities. The *Pokkali* rice area is in Cherthala taluk, northwest part of Alappuzha, with major part falling in Thuravoor and Pattanakkad panchayats.



The boundary of Kuttanad is differently marked in different studies. The demarcation used in this study is in accordance with the definition of area made by an official Committee appointed by Government of Kerala and also in compliance with the map provided by the Kerala State Land Use Board, Thiruvananthapuram (see next page). The map demarcates the Alappuzha district together with Kuttanad, with panchayats falling in each of the three districts in different colours.

THE STUDY TEAM

The M.S.SWAMINATHAN RESEARCH FOUNDATION (MSSRF) has undertaken this study under the overall guidance of Prof.M.S.Swaminathan, Chairman, MSSRF and Hon. Member of Parliament (*Rajya Sabha*). The study team consisted of the following:

- ❖ Dr. S. Bala Ravi – Team Leader – Former Assistant Director General (IPR), Indian Council for Agricultural Research and currently Advisor, MSSRF
- ❖ Dr. Sudha Nair – Team Member – Programme Director, Eco-Technology, MSSRF
- ❖ Dr. N. Anil Kumar – Team Member – Programme Director, Biodiversity, MSSRF
- ❖ Ms. Deepa Varma – Team Member – Project Associate, MSSRF

The study was assisted by a multi-disciplinary expert team comprising:

- ❖ Shri. R. Hali, Former Director of Agriculture, Kerala
- ❖ Dr. P. Rethinam, Former Chairman of the Coconut Development Board
- ❖ Dr. E.J. James, Executive Director, Centre for Water Resources Development and Management, Kozhikode
- ❖ Dr. Babu Ambat, Executive Director, Centre for Environment and Development, Thiruvananthapuram
- ❖ Dr. K.G. Padmakumar, Associate Professor, Regional Agricultural Research Station, KAU, Kumarakom
- ❖ Dr. K.V. Krishna Das, Former Director & Professor of Medical College, Thiruvananthapuram

EXECUTIVE SUMMARY

1. Introduction

1.1 The Mandate: The Ministry of Agriculture, Government of India has recently approved special rehabilitation package for the farmers of 31 districts of Andhra Pradesh, Karnataka, Kerala and Maharashtra. Along with this the Government approved a special plan of action for improving farming conditions in Alappuzha and Idukki districts of Kerala. The Government requested M. S. Swaminathan Research Foundation (MSSRF) to suggest programmes for the strengthening the ecological and livelihoods security of Kuttanad wetlands in Alappuzha district with the help of a multi-disciplinary team. The study was directed to develop specific recommendations on (1) Measures for strengthening the ecological security of the Kuttanad Wetland Ecosystem, and (2) Measures for expanding sustainable livelihood opportunities for the people of the area

1.2 Mandated study area: The area approved for special plan of action included Alappuzha district and the Kuttanad Wetland Ecosystem spread across Alappuzha (55% area), Kottayam (35 % area) and Pathanamthitta (10 % area) districts. This covers, the whole of Alappuzha district, 24 panchayats and 3 Municipalities of Kottayam district and five panchayats and one Municipality of Pathanamthitta district. The map classifying Kuttanad area sourced from the Kerala Land Use Board is used to define the boundaries of Kuttanad.

1.3 The Study Team: The study team from MSSRF was constituted with Dr. S Bala Ravi (Team Leader), Dr. Sudha Nair, Dr. N. Anil Kumar and Ms. Deepa Varma, under the overall guidance of Prof M.S. Swaminathan. The multi-disciplinary team constituted included Shri. R. Hali, former Director of Agriculture, GoK; Dr. K.V. Krishnadas, former Director and Professor of Medicine, Medical College, Thiruvananthapuram; Dr. P. Rethinam, former Chairman, Coconut Development Board & Plantation Crops Management Specialist; Dr. E.J. James, Executive Director, Centre for Water Resources Development and Management (CWRDM), Kozhikode; Dr. Babu Ambat, Executive Director, Centre for Environment and Development, Thiruvananthapuram; and Dr. K.G. Padmakumar, Associate Professor, Regional Agriculture Research Centre, Kumarakom, Kerala Agricultural University.

1.4 *The Process:* The process adopted included an extensive study of all the earlier reports relating to the KWS, a series of consultations with all the stakeholders including the Hon. Chief Minister and Ministers of Kerala Government, MPs, M.L.As and representative of the three-tier Panchayati Raj Institutions, farmers, farm labourers and Farm Women Associations, Fishermen, coir workers associations, government officials from line departments, experts of the study area, academia, civil society and non-governmental organisations, media, and individuals with expertise on the problems of the area, and many visits by Prof. Swaminathan, the MSSRF team and experts to many locations. An Interim Report on Kuttanad was submitted to the Governments of India and Kerala on 13 February 2007. During the course of those meetings and visits, the Committee received many valuable suggestions from all stakeholders, public and private institutions as well as the media. Altogether the Committee received oral suggestions from more than 1,300 persons and about 503 memoranda and proposals. They have all been analyzed and disaggregated with reference to the suggestions for each region for preparation of this report and finalising recommendations and financial outlays. Throughout the formulation of the final draft report, officials of the Government department, particularly the Agriculture and Irrigation Departments, were frequently consulted for information, database and opinions. A draft report with recommendations and tentative budget was presented to the Hon. Chief Minister and his body of government officials and the M.L.As and MPs of Alappuzha and Kuttanad on 22 June, 07, for receiving their feedback. Their suggestions were also considered while making this final report.

1.5 *Agrarian distress:* Kuttanad area illustrates the paradox of co-existence of bountiful natural charm and acute agrarian distress. Alappuzha supports the highest density of population in Kerala. According to the data for 2004-05, out of about 4,00,000 families in the Alappuzha district 1,56,151 are below the poverty line. Embracing a typical developmental agenda over the past few decades with criss-crossing roads, reclamation of wetlands and construction activities, ignoring the sensitivity of the KWE and the vulnerability of the area to regular flooding, a serious man-made crisis has been created on ecology, livelihoods, agricultural activities and alternate options, which collaterally and cumulatively contribute to a spiraling agrarian distress in the region. The ecological uniqueness of the area has become a causal factor to the ecological decay, economic entropy, livelihood loss and social sedation being experienced under the developmental paradigms characterized by inappropriate options. A

unique agriculture, managed below the sea level with great vibrancy and confidence, is now dwindling under high cost of production, indebtedness and increasing risk from natural forces. The irony is that Kuttanad, once considered as the 'rice bowl of Kerala' has become a 'den of distress'. "If farm ecology and economics go wrong, nothing else will go right in agriculture" euphemises Prof. Swaminathan. Kuttanad truly portrays this paradigm. Income from uplands had decimated with sick and low yielding coconut palms, crashing prices, and lack of resources for on-farm or off-farm income generation activities. Wetland system fishery wealth is also severely declined with poverty as the only alternative for the dependant population. In many other parts of Alappuzha district, agriculture and related economic activities have paralysed with farmers and farm labourers left with no alternative. The agriculture based distress in the study area is so wide and deep as farming is the only source of income to more than 80 % of the population, out of which 95 % are small farmers with less than 0.4 ha land.

The first and foremost challenge in Kuttanad and Alappuzha is restoration of the ecology and natural assets to bring back vibrancy in agriculture, income generation and enhance livelihood options to the vast number of small farmers, landless labourers and fishermen. Apart from eco-restoration, forward movement in productivity, profitability and sustainability in small farm conditions are issues of high priority to the region for mitigating the distress in medium and long-term perspectives. A section of the farmers, landless labourers and fishing community of the region also needs to be provided with immediate relief, which is essential for re-starting of the agricultural and economic activities by the families affected by the crisis. If this region has not witnessed widespread farmers' suicides, it is largely due to gritty will of the people to defy hardship. Before this will wilts away this report offers an opportunity to urgently intervene to mitigate the distress, restore the ecologic and economic security of the people, strengthen the agricultural and ecological infrastructure and policy framework back up to ensure sustainability to the change. Kuttanad region also eminently deserves to be declared as a Special Agricultural Zone with adequate and regular support from the State and Centre.

2 Ecological disaster and remedial action

Good ecology is the desideratum for successful agriculture and allied livelihood activities. Years of exploitation and neglect have driven the KWS ecology into a state of *extreme*

fatigue. This has obvious impact on agriculture, which is the major economic activity of the area. Nursing and nurturing an abused ecosystem back to health is fundamental to revival and expansion of livelihoods. The elements of ecological challenge with short term and long term impact on agriculture and other livelihoods in Kuttanad are (i) declining area of Vembanad Lake and other waterways, (ii) flood management to minimize the risks and loss to the economy and productive assets of small farmers, (iii) better regulation of saline water intrusion all over Kuttanad with least impact to ecology, (iv) choked waterways and consequent problems in water availability and drainage to agriculture, and to human health, sanitation and clean drinking water, (v) pollution of water body due to many factors including alien invasive species, and (vi) declining ecosystem services and goods like water recharge, pollution control, fishery and loss of habitats and biodiversity. Integrated and well calibrated approach to mitigate all these and related problems are essential to achieve ecological revival and restoration of the lost livelihoods of the poorest of this region.

Declining water spread area of Vembanad Kayal: The rapid shrinkage of flood carrying capacity of the Lake by 78 % has come due to reduction in its area and depth. The pace of this decline has prompted prediction on its virtual disappearance in another 50 years. Major causes of this decrease are unchecked encroachments and reclamation of Lake area and raising Lakebed due to silting. While paddy agriculture was responsible for reclamation of Lake until the 1980s, the flourishing tourism is responsible for the current decline in Lake area. The Lake boundary along with that of river and canal networks have to be demarcated using landmarks and detailed satellite imagery to prevent encroachment and reclamation. Removal of all illegal encroachments into the lake is recommended and it is important to segregate a demarcated narrow strip (4-6 m) of 'ecotone', planted with mangroves or coconut (WC Tall), between the main land and water body all around the Vembanad Lake as a measure of conservation. Such an ecotone could possibly be owned and managed by the respective private institutions, individuals or panchayat. This is, however, considered essential for preventing further encroachment and erosion of the Lake.

Flood management: Increased frequency and period of flood and consequent losses arise from decreasing flood plane area including the Lake. The Thotappally Spillway (TSW) and the leading channel engineered to reduce the flood intensity in much of the Lower Kuttanad and the Lake area is declining over years in its flood regulation capacity due to poor

maintenance and lack of coordinated action on its operation. Farmers of Purakkad Kari Kuttanad, where paddy is grown in 3,500 ha during monsoon season, are facing brunt of decreased flood flow capacity and inefficient management of spillway. Measures recommended include modernization of TSW, deepening and side bund protection of lead channel and improved management of spillway operation.

2.3 Management of salinity intrusion: Salinity intrusion from sea into Kuttanad happens through few major and many minor inlets. The major inlets, which are regulated by permanent structures are TMB, Thrikkunnappuzha Lock, and Andhakaran-Azhi. The many minor inlets are in Vaikkom Kari, Purakkad Kari and Aroor-Pattanakkad areas. The salt intrusion through these minor inlets affects paddy cultivation in more than 12,000 ha. Usually temporary barriers called *orummuttus* are raised every year to prevent salt intrusion, which is costly and ineffective in terms of timely prevention. The operation of major regulators is involved in different government departments, which function without intra- or inter coordination. As there are conflicting interests for not closing these barrages and keep them closed for long time. Closure of TMB disconnecting Vembanad Lake from its northern half, preventing natural water movement for long time had impacted the Lake ecology and ecosystem. Measures recommended include modernization of TMB with efficiently operable shuttles, replacement of middle cofferdam with barrage, operation of TMB at scheduled time and exploration of opportunity for reducing the scheduled time. Other measures are erection of permanent regulators in place of *orummuttus* at important salinity entry points including Kariyar in Kaikkom Kari

2.4 Blocked waterways: The functions of major rivers and canals forming part of the KWS and several canals and drains draining the paddy fields in Onnattukara and Thuravoor Pattanakkad are seriously compromised with encroachments, unscientifically constructed roads, bridges and culverts, silting and aggressive spread of waterweeds. They block free flow of water resulting in flooding to water logging, breaching of bunds, accumulation of wastes, increased growth of waterweeds, promotion of prolific breeding of predator parasites and deadly pathogens, and degrading water quality, apart from obstructing navigation. Three major obstructions to be rectified on priority for regulating flood in Lakshadweep and Lower Kuttanad area for protection of paddy fields are those between the C and D Blocks in Pulinkunnu panchayat and Rani and Chithira blocks in Kainakari and in the A

canal flanking the AC road. Farmers in many memoranda and oral suggestions requested for renovation of a network of canals and drains in Upper Kuttanad, Onattukara and Thuravoor-Pattanakkad areas. Many of them essential for strengthening agricultural infrastructure are included in the recommendations. Many roads have changed the quality of communication and life in Kuttanad. However, the manner in which they are laid out are creating major ecological problems and is a cause of serious concern. Many major roads built by the PWD and minor roads laid out by local panchayats have violated the environmental norms essential in Kuttanad. Removal of several of these blocks including encroachments and land fillings, and prevention of creating such blocks in future are recommended.

Aggressive waterweeds and water pollution: The low salinity in Vembanad Lake and increased discharge of organic wastes and fertilizer residues into water bodies are promoting eutrophication. Alien invasive species like water hyacinth is densely spreading in all upper reaches of water body, canals and drains contributing to further pollution to water, preventing water navigation, depletion of dissolved oxygen, interfering in the entry of sunlight into water and thereby the fish reproduction and growth. This weed is a major problem to *padasekharams* causing major increase to the cost of cultivation.

Loss of biodiversity: With the depletion of Lake area, changes in land use pattern and modification of the Lake water by low saline mixing, increased pollution, aggressive growth of water weeds, continuous dredging operations, and other developmental interventions have led to substantial decline in the species diversity and population diversity of flora and fauna. The reclamation has almost decimated the mangrove and associated species diversity, which was once very diverse and luxurious. The cascading effect is on fish particularly prawn population and bird diversity. The changed ecology is believed to have lost about 23 species of fishes, preventing migration of about 13 other species, led to the decline of 33 % of bird population, brought in new predatory birds like *neerkozhi* and increased population of reptiles. There is hope that most of the fish diversity could be restored with restoration of Lake ecology. Focused conservation of important fish species, preservation of Pathiramanal Island in its pristine state, and other integrated measures that promote diversity of the wetland ecosystem is recommended.

2.7 Health, sanitation and clean drinking water: The ecological degradation is boomeranging on human health. The man made blocks to natural waterways and spread of waterweeds has created a congenial breeding ground for water-borne vectors like mosquitoes. The continuous fallow of rice fields also has increased rodent population. The rodents and vectors had been causing serious health threat to Kuttanad since some time, which has now assumed epidemic proportion affecting not only Kuttanad, but also the whole State and neighbouring States. This is causing an unfavourable impact on the high health standards of Kerala. Most households in Kuttanad do not have accessibility to toilets and discharge their household wastes directly to the water. Drinking water problem is also serious with water pollution, salinity and decline in water table. More than 80 % of the people in Kuttanad are reported to be relying on contaminated canal water for their daily needs. Piped safe drinking water is a luxury in most houses. Equally neglected is healthcare. With the recommended changes in Kuttanad ecology, immediate and long-term follow up measure are needed to strengthen health, sanitation, and augmenting potable water supply. A program for reviving existing potability canal systems and paddy cultivation chalked out in this report is expected to partially ease water availability and its quality.

3 Agricultural rehabilitation and alleviation of agrarian distress

Agriculture is the major economic activity in Kuttanad and other parts of Alappuzha. Rice and coconut are major crops contributing to about 80 % of agricultural income in this area. Area occupied by paddy and coconut is 38 and 45 % of the cropped area, respectively. Other crops are banana, tubers and vegetables. Alappuzha has nearly 4.66 lakh operational holdings, 95 % of them own holding size less than 0.5 ha and another 3 % less than 1 ha. The *punja* paddy in Kuttanad and its unique collective-management in *padasekhan* framework bear a *Kuttanadan* socio-cultural stamp. The *Pokkali* paddy Thuravoor and Pattanakkad areas area has its own uniqueness. Onattukara, once a region known for high intensification of paddy is severely hit with large part of the paddy area lying fallow. Farmers view that paddy cultivation is not profitable on grounds of high cost of production, low price and exploitative market. This is emerging as a major threat to paddy cultivation in Kuttanad while substantial area elsewhere in Alappuzha is already in fallow. In 1967 about 60,921 ha was under paddy in Kuttanad, which in 2003 declined to 37,624 ha. The share of Kuttanad in the State's total paddy production shrunk from 37 % in 1967 to 18 % in 2003. A line

projection of this decline leads to that by 2020 paddy cultivation may well become a history in Kuttanad.

The coconut in Alappuzha and Kuttanad is also becoming unprofitable due to declining yield. Several palms are irreversibly affected by root wilt disease and pests like red palm weevil and rhinoceros weevil. The price of coconut is also declining. Other land based livelihood options like dairying is less common due to shortage of fodder, forages, and high price of concentrates. Other livestock such as goat, rabbit, duck, and poultry play marginal role over all in providing livelihoods, despite their potential in the region. Kuttanad has highest number of ducks in the State. Duck farming is also constrained with non-availability of paddy fields for foraging and affliction of serious diseases. While capture fishing from water bodies is a major livelihood, culture fishing is not common, despite availability of water bodies. The fishing community depending on capture fishing is in distress. The culture fishing in paddy fields of wetland and *Pokkali* area under 'one paddy-one fish' system appears to have potential in limited areas for enhancing the farm income. While group or cluster approaches in agriculture is becoming common under the 'Farm Women Group', 'Kudumbasree', 'Ayalkkottom', 'Harithasangom', etc, the spread effect of these initiatives in mitigating farm distress is marginal.

Therefore, revival of agriculture based income generation and livelihood in Alappuzha and Kuttanad cannot be addressed by traditional approaches alone. This revival requires a major investment in infrastructure to promote paddy cultivation with reduced cost of production, improvement in coconut productivity with removal of disease affected palms and care of healthy ones, integration of land based farming with other on-farm and off-farm income generation activities with close connectivity to markets. Each component causing farm distress is examined and specific recommendations are provided in this report.

Lack of profitability in paddy: Increasing cost of production of paddy cultivation and lack of commensurate price for produce is pushing farmers in spiraling debt burden. This is the major reason for many leaving the cultivation leaving the land fallow. Many small farmers who own land less than 0.5 ha find it difficult to cope with the poor economics of paddy production. This is despite the fact that parts of Kuttanad offers fairly higher yield (4.5-5.0

t/ha). In Kuttanad, with the fields away from their house, these farmers are also not able to use their family labour.

An important factor contributing to high cost of production is the high recurring cost on the infrastructure for paddy cultivation, particularly in Kuttanad. This involves strengthening of outer bunds including repair of breaches, construction of motor *thara*, pump house and *vachals*. This, depending on the location, varies between 10-20 % of cultivation cost. Another major cost component is on hiring agricultural labour by small and medium farmer. Different studies show that 60-74 % of the cost of cultivation is accounted to hired manual labour. Farm labour in Kerala is paid two to three times higher than in most other paddy cultivating States. Farm machinery is scarce in Kuttanad and there is resistance against the option from organized labour. However, shortage of labour during peak operations is slowly facilitating entry of machinery. Considering all cultivation costs and current procurement price of Rs.8,500/t (State fixed MSP), the current net profit in areas where high yield is realized is between Rs.6,500-8,150/ha. In low productivity areas like Purakkad Kari and *Pokkali* areas, the profit level is much narrower or even loss at times. This has been causing increasing indebtedness and consequent distress among farmers. The decision not to grow paddy is invariably taken to avoid spiraling debt. The frequent crop loss from floods and poor compensation being paid virtually make rice farming a loss in the long run.

Mitigation of problems due to high cost of cultivation on infrastructure including farm machinery is recommended. This involves, strengthening outer bunds of all *padasekharams* across Kuttanad where such work is required, construction of motor *thara*, pump house *vachals* and threshing ground (*methikkalam*). *Padasekharams* are also to be supported with some essential machinery to facilitate timely operations in the context of decreased labour supply and the importance of taking up sowing and harvest in accordance with the new cropping schedule recommended. These machineries shall be kept under the supervision of concerned panchayats for use primarily in *padasekharams* within its limits.

3.2 *Padasekaram size*: The area of a few *padasekharams* is much higher than the desirable size of 250-280 ha to facilitate low cost transportation of inputs to plots located deep inside and transporting out produce from there. Manageable *padasekaram* size may also help in fast dewatering to conduct sowing on time. This would also reduce the overall loss in situation

of outer bund breach. For these reasons farmers welcomed division of larger *padasekarams* to operational sizes, ranging 150-250 ha or around. On considerations of efficiency of management and cost cutting in recurring operations, this suggestion to divide larger *padasekarams* in Kuttanad is recommended.

3.3 *Regulation of salt water intrusion:* Apart from the three major salt water regulation points, TMB, Thrikkunnapuzha and Andhakaran *Azhi*, saltwater enters paddy fields in Vaikom *Kari*, Purakkad *Kari* and from the coastal area through the different canals and rivulets. Construction of 33 permanent small and medium saltwater regulators, including one across *Kariyar*, is recommended to safeguard paddy cultivation in Kuttanad and Purakkad-Thuravoor area. Along with this paddy cultivation has to be undertaken at least one season, where currently fish/prawn culture is practiced round the year.

De-silting and Renovation of Irrigation and drainage streams: Paddy cultivation in many areas, including Upper Kuttanad in Alappuzha and Pathanamthitta districts, Onattukara and Purakkad-Thuravoor is not possible without repair and renovation of all irrigation and drainage canals serving the *padasekarams*. This was an important requirement farmers from these regions were pressing to put the fields back to paddy cultivation. Some of these canal renovation may combine with bunds adequate to allow farm machinery movement. Renovation of about 700 km long canals (*thodu*) and about 55 public ponds in these regions is recommended to revive paddy cultivation and associated livelihoods of farmers and farm labourers.

Crop calendar: Virtual absence of enforcement of a crop calendar for paddy cultivation in various seasons, particularly the *punja* crop, which is grown in largest area in Kuttanad including Lower Kuttanad, *Kayal Land* and North Kuttanad, an erratic cropping schedule is being followed, particularly after the commissioning of TMB. This compels longer period of closing for the TMB with cascading impact on Kuttanad ecology and ecosystem. Late sowing is also reported to increase pest and disease incidences and increased application of pesticides. It is known that prior to the construction of TMB, the crop was sown to harvest in February, although the duration of varieties then used were 10-15 days shorter. With the recommendations being made on TMB, its operation, outer bund strengthening, de-watering process, seed and input supply system, mechanization to compensate shortage of labour, and

common service system for *padasekarams*, it will be feasible to complete the *punja* sowing before first quarter of November and harvest the crop before March. Such *punja* crop calendar, in turn, would facilitate low pesticide use and opening of TMB by late February both substantially contributing to the improvement of the Kuttanad ecology. Similar crop calendars for other seasons and other regions in Kuttanad are recommended.

3.6 *Supply of seed and other inputs:* Among different inputs, farmers from Kuttanad and Onattukara specifically requested to improve the supply of seeds and its quality. They are enthusiastic in joining certified seed production under the guidance of professionals. After examining different options suggested for this process, the Committee supports Uppala Kuttanad as suitable place for production of certified seeds of popular varieties. The recommendation includes the whole chain of seed production, institutional role and infrastructure required for production, grading, storage and quality checking. Supplies of other inputs such as soil ameliorant fertilizers and other agricultural chemicals are also recommended for streamlining to provide quality material and right time.

3.7 *Soil health management:* Kuttanad soils are highly acidic and in some areas soil is affected by salinity. Soil treatment with ameliorants is common practice, which is partly subsidized. In view of the cost of cultivation and requirement to maintain soil health, regular soil analysis based ameliorant and fertilizer application is desirable. The Department of Agriculture is advised to provide this service to all *padasekharas* in Kuttanad, Onattukara and *Pokkali* area once in two years at least two months ahead of the cropping season. The *Padasekhara Samithies* are advised to keep this database as soil health cards and to restrain chemical application within these limits. Enhancing the ameliorant subsidy to *Kari* soil and production bonus to Purakkad *Kari* are recommended.

3.8 *Labour bank and labour and other farm service management:* Agricultural labour is the principal component of paddy culture. In Kuttanad the labour had played a very significant role in transforming major part of the *Vembanad Kayal* into golden paddy fields. They have been the strong allies to farmers in their continuous struggle with the recurring natural calamities of the region. However, today, Kuttanad is facing labour shortage during peak labour intensive operations. Timely operations required under new crop calendar require well-managed assessment of labour availability and supply. To facilitate this it is