



**GOVERNMENT OF KERALA  
KERALA STATE PLANNING BOARD**

**FOURTEENTH FIVE-YEAR PLAN  
(2022-2027)**

**WORKING GROUP ON  
PREPARATION OF SOIL AND LAND USE PLANS IN LSGIS FOR  
AGRICULTURAL GROWTH**

**REPORT**

**AGRICULTURE DIVISION  
MARCH 2022**



## FOREWORD

Kerala is the only State in India to formulate and implement Five-Year Plans. The Government of Kerala believes that the planning process is important for promoting economic growth and ensuring social justice in the State. A significant feature of the process of formulation of Plans in the State is its participatory and inclusive nature.

In September 2021, the State Planning Board initiated a programme of consultation and discussion for the formulation of the 14th Five-Year Plan. The State Planning Board constituted 44 Working Groups, with more than 1200 members in order to gain expert opinion on a range of socio-economic issues pertinent to this Plan. The members of the Working Groups represented a wide spectrum of society and include scholars, administrators, social and political activists and other experts. Members of the Working Groups contributed their specialised knowledge in different sectors, best practices in the field, issues of concern, and future strategies required in these sectors. The Report of each Working Group reflects the collective views of the members of the Group and the content of each Report will contribute to the formulation of the 14th Five-Year Plan. The Report has been finalised after several rounds of discussions and consultations held between September to December 2021.

This document is the Report of the Working Group on “Preparation of Soil and land use plans in LSGIs for Agricultural Growth.” The Co-Chairpersons of Working Group were Dr Srikumar Chattopadhyay and Mr. S. Subramanian, IIS. Dr.R.Ramakumar, Member of the State Planning Board co-ordinated the activities of the Working Group. Sri.S.S.Nagesh, Chief, Agriculture Division was the Convenor of the Working Group and Smt. G. C. Roshni, Agronomist, Agriculture Division was Co-Convenor.. The terms of reference of the Working Group and its members are in Appendix 1 of the Report

Member Secretary



## PREFACE

As part of formulation of the 14th Five Year Plan, the Kerala State Planning Board had constituted working groups of experts in all the major sectors. In Agriculture and Allied Sectors, 6 working groups were constituted viz. Agriculture and Cooperation, Animal Husbandry and Dairy, Inland and Marine Fisheries, Forest and Environment, Water Resources and Regional Packages. To discuss and frame policies in each of these sectors, the working groups were further divided into 28 Expert Sub-Groups (ESG) with specific mandates.

Each Expert Subgroup held at least three meetings beside one focused group meeting before finalising the report. We, the Co-Chairs, place our deep appreciation and gratitude to all the esteemed members of the ESG for their valuable contributions in preparing the report. We are extremely grateful to Dr. V. K. Ramachandran, the Honourable Vice-Chairperson, Kerala State Planning Board, Dr. R. Ramakumar, Member, Kerala State Planning Board, Sri. S. S. Nagesh, Chief, Agriculture Division for their consistent guidance and suggestions in preparing the report. Support provided by Smt. Shahida M.N, Research Assistant in bringing out this report is appreciated. The drafting team put in commendable work in bringing together all the views and opinions of the members. We sincerely hope the recommendations in the report can lead to important changes in the public policy on agricultural development in the State.

Dr Srikumar Chattopadhyay  
Expert co-chairperson

Mr. S. Subramanian, IIS  
Official co-chairperson



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# PREPARATION OF SOIL AND LAND USE PLANS IN LSGIs FOR AGRICULTURAL GROWTH

## HIGHLIGHTS

- The limited availability of land, demographic shifts, and socio-economic growth indicate that there is tremendous pressure on land resources and a need for evolving an appropriate land use plan.
- The work accomplished by KSLUB, KSREC and the Department of Soil Survey and Soil Conservation in land use planning have been reviewed.
- This document contains a Land Use Plan for Mayyil panchayat, as well as suggestions for integration and convergence of Government agencies and modalities to initiate Land Use Planning.



## 1. INTRODUCTION

Agriculture occupies the central stage in sustainable development. Many of the sustainable development goals like no poverty (SDG 1), zero hunger (SDG 2), water resource (SDG 6), climate action (SDG 13), and life on land (SDG 15) are directly or indirectly linked to agriculture. Besides, providing food, fodder and fibre, agriculture is the mainstay of rural economy, and plays an important role in natural resource management and functioning of ecosystems. A great deal of scientific research has been undertaken to understand the fundamental physical, biological, technical, social and economic aspects of agricultural development and the production processes. Perhaps the greatest challenge that the agriculture is facing today and will continue to face in foreseeable future is to resolve conflict caused by a growing competition between agricultural and non-agricultural use of services provided by land, water and other natural resources. Besides, the agriculture sector itself is facing big challenges like declining size of landholdings, mono-cropping, loss of agro-biodiversity, deteriorating natural resources specially, soil and water, adverse impact of climate change, declining factor productivity, rising input costs, fluctuating market and declining farm income. Agriculture also contributes to non-point source water pollution. A broad-based knowledge centred approach, science-based interventions and policy formulations placing actual land-user at the centre of decision making and recognising their role as guardians of our shared environment and ecosystem is necessary to meet all these challenges. This requires a radical shift in thinking and examining agriculture as a managed ecosystem using social ecological system lens, which offers a novel interdisciplinary platform to integrate landscape ecological elements and social and institutional variables as coupled dynamics. A strategic land use plan evolved from the bottom and aggregated at different hierarchic level is necessary to initiate this process.

Apparently static land is highly dynamic through uses. Apart from agriculture, forest and inland water bodies, land use covers the other types of land being used for settlements, industrial sites, roads, and other human activities including recreation. Land use planning is therefore an exercise of spatial distribution or allocation/ reallocation of land to accommodate all types of human activities of commodity and non-commodity value including land for maintenance of biodiversity, carbon cycle and to preserve the eco-balance of the whole system. The sustainability of the land use system as a whole is important than to strive for sectoral sustainability. Scientific approach to achieve such a land use system calls for examining ecological, social and economic dimensions of landuse, its resilience, environmental impacts, and constraints, in addition to, institutional, financial and managerial frameworks, human resources, access to resources, technology transfer, networks and finally the governance mechanism. Land use decisions are taken by individuals at micro level considering prevailing biophysical system, socio-economic condition and access to resources. Land use is one of the key elements of Earth System processes that triggers non-linear dynamics at the local scale which may on aggregate become a matter of concern at regional and global scale.

Therefore, land use analysis should be a part of a continuum from the farm level to the state and national level.

### **LAND USE PLANNING IN THE CONTEXT OF NAVAKERALAM INITIATIVES**

Kerala is at a developmental crossroad. With limited availability of land, demographic shift, and socio-economic growth there is tremendous pressure on land resources and a need for evolving appropriate land use plan to make the most efficient use of land and to achieve society's economic, social and environmental goals. The recent flood and climate change related imperatives has necessitated internalisation of risk assessment as part of land use planning. There is broad agreement that the existing land use practices are far from appropriate in most parts of Kerala and the land use changes that had taken place in many cases are irreversible. The future challenges are to (i) arrest further diversion, (ii) redeem ecosystem services of various land units, both in the catchment and in the command areas, (iii) zoning of lands and working out appropriate use, (iv) avoid inappropriate development in the areas of high risk, (v) manage land use and development so that it does not increase risk in other areas without prior agreement, and finally (vi) increase resilience of the State as a whole. The post flood reconstruction activity, dubbed as "Nava Kerala" programme provides an opportunity to rework and devise appropriate land use plan adhering to the planetary boundaries of the ecosystems.

#### **14<sup>th</sup> Plan requirements of land use planning**

The Kerala Development Report (Planning Board, 2021) has dealt with several challenges that the state is facing in the matter of agriculture and related issues and identified 'The Pathways to Growth'. Among various other measures, it proposed to reinvent the role of panchayats in agriculture during 14th Plan period and observed that 'the panchayats should play a leading role in planning for agriculture at the local level even as the block and districts panchayats are given larger responsibilities to ensure that regional policies in agriculture are aligned to the needs of specific agro-ecological zones'. This sub-group on Soil Survey and Land use Planning has been constituted to look into the issues of soil and land use plan for agricultural growth at the panchayat level and come out with specific recommendations. The terms of reference of this sub-group are given below.

1. To critically assess the status of preparation of land use plans by LSGIs in Kerala over the past five years and identify reasons for the poor performance of LSGIs in this regard.
2. To suggest and prepare a back ground note for effective preparation and development of land use plans and its integration with watershed plans and agricultural production systems.
3. To suggest ways to integrate and converge the objectives and activities of multiple Government agencies processing data on land ownership, land use and agriculture to facilitate regular updating of land use plans prepared by LSGIs
4. To suggest a road map for a state level people's campaign to complete the preparation of land use plans at the LSGI level over a period of six months

## **2. STATUS OF LAND USE PLAN PREPARATION AND AVAILABILITY OF REQUIRED DATA BASE - A CRITICAL EVALUATION**

Land use planning as strategic instrument to guide use of land and water based assets, agricultural growth and environmental sustainability faces several challenges. Lands are privately owned and the decision to put the land into a particular use primarily rests on the wisdom of the owner, which is largely determined by socio-economic factors. There are broad biophysical limits which are generally being adhered to in case of growing crops. However, transgressions are often noted and crop substitution takes place to maximise output with little regard for the land suitability and environmental issues. The larger questions arise about immediate individual survival and profit maximisation vis-a-vis common good and long term environmental sustainability. Even an enabling environment created by the State may not be sufficient to address these challenges as evident in case of Kerala.

The 73 and 74 constitutional amendment empowered Local Self Government Institutions (LSGI) like Panchayats / Corporations and Municipalities to prepare their plan for managing local resources. Kerala has introduced decentralized planning following this amendment. Twenty five years have passed since launching of the People's Plan Campaign in 1996 that has revolutionized the decentralized planning process and empowered the panchayats both administratively and financially. There are several activities undertaken at the behest of the panchayats and local people. Gram Sabhas are active. Panchayat Resource Mapping programme generated local level land and water resource data. Concerned departments like Kerala State Land Use Board, and Soil Survey and Soil Conservation Department developed data base and worked out normative land use plans for some of the panchayats and watersheds. In spite of all these initiatives there is little progress in working out land use plans at the panchayat level.

### **POSSIBLE CAUSES HINDERING FORMULATION OF LAND USE PLAN**

Some of the issues hindering formulating of land use and agricultural development plan at the panchayat level are indicated here.

- a. Land use-based activities such as map making and plan preparation necessitate specialised technical know-how and geographical awareness. The personnel dealing with land use at the level of the LSGI, including LSGI staff, MGNREGS staff and Agricultural Officers are not equipped with the knowledge or tools to handle the geospatial data for land use planning. Agricultural Officers are directly involved with the land use in an LSGI. It is clear from enquiries that the majority never consult land use plans while formulating the annual plans for the LSGI. The Agricultural Officers are overburdened with nearly 40 schemes and this has affected the quality of service provided by them. The same has also become a major bottle neck in the preparation of the land use plan-based projects. Geo- spatial tools can play vital role at every level in the MGNREGS, through activity formulation, implementation, management and monitoring. However, the geo-spatial tools largely remain unexplored in this important programme. Most of the local leaders and administrators remain unaware of

the programme conceptually and technically. However, at the highest level, adequate technical skill is available, so that they produced high quality maps for the local bodies. Once these maps were transferred to the local administration, it is important that the local level officers are imparted with adequate training to absorb this technology and get essential skill to use the spatial data in the planning process at the local level. Hence a process of conversion of the technical output to implementation is now required.

- b. Watershed based land use plans were prepared for many of the LSGIs in Kerala under different projects by different agencies in the past few decades. However, the prevailing question is whether the plans thus formulated have had any impact on the expected outcomes of these projects? Was there any production or productivity improvement of crops and subsequent increase in the income of farmers in the area? Did the plan ameliorate the impact of climate change and contribute towards the conservation of natural resources in the area? Broad review indicates that the watershed-based land use plans missed much of their targeted objectives.
- c. Enquires were carried out at local bodies and Krishi Bhavans about the availability of land use plans or watershed maps, however, the responses were not at all encouraging. In most cases, the concerned employees were either unaware of the data or its necessity. Even if the plan existed, it was hardly used. In some cases present employees are not aware of its existence. Evidently the land use plan was neither used in the formulation nor implementation of projects.
- d. Participatory Resource Mapping (PRM) was completed in 881 local bodies and the data is available with the Land Use Board and the same for six districts were published on Website, whereas, the exercise is yet to be completed for 79 local bodies. PRM digital data is available for Thrissur, Palakkad, Ernakulam, Kannur, Kottayam and Wayanad districts, while others are yet to be digitised. Land use board prepared a land use Decision Model for 84 Grama panchayaths, based on PRM and Google Earth Images, especially for agriculture planning.
- e. All the agencies created spatial data, now available to the local bodies as hardcopy maps. However, functionaries of the local bodies or Agricultural Officers have little experience to use these maps in the real-world situation. Hence the resource maps, created after an elaborate exercise, remain totally out of use and thus the advantages of using spatial data in developments could not be harnessed. Making the data available in the digital format too would not change the situation as the officials and other functionaries lack the knowledge and skill to use GIS software. This is the major constraint in making use of the already available spatial data in the implementation of programmes. There are also other factors which come in the way of land use plans being used in project preparations such as data availability and use, technical constraints at all levels as well as administrative and financial constraints.
- f. Availability of spatial and non-spatial data is central to land use-based plan preparations. However, the data lay scattered among different agencies such as Kerala State Land Use Board, Department of Soil Survey and Soil Conservation, and Kerala State Remote Sensing and Environment Centre. As there is no convergence of these agencies at any

level, the data remain raw and not useful for land use plan preparations.

- g. Quality temporal data is essential for agricultural spatial planning and management. The large-scale maps available with the local bodies are based on PRM completed ten years ago, hence they have to be updated. Temporal resolution and spatial resolution of the remote sensing data are critical for their use in agriculture. However, the remote sensing data available with the Kerala State Remote Sensing Centre is on small scale which can't be used for microlevel planning. LISS 4 scanner images (spatial resolution 5.8 m) is available with KSREC, however, it is in raster format that can't be used as such. These raster image can be converted into vector format and then updated with the existing land use based on PRM with processed LISS 4 images.
- h. Detailed Soil Survey (DSS) Reports and Maps at Cadastral level are available with the Soil Survey Department. These include soil and land resources data of Local bodies (Panchayats /Municipalities/ Corporations) on large scale (1:4000/1:5000) and are available as both digital and hard copies. Hard copy of the Soil Survey Reports were transferred to the concerned local bodies.
- i. The Information Kerala Mission (IKM) have digitised cadastral maps of the entire State, besides Premises mapping survey in limited local bodies in connection with computerisation of local bodies. This includes linear and non-linear features and land use on individual land parcel (field measurement book- FMB). Agencies such as IRTC, KILA, Maitri and Grameena Patana Kendram have provided digital watershed maps to a few local bodies.
- j. The Animal Husbandry Department in collaboration with IIITM-K, (presently Digital University of Kerala) has developed a comprehensive GIS based mobile application namely BHUMIKA, for animal resource management. They have generated animal population data based on farmers' identity. The GIS mapping of locations of farms and other facilities with animals on a single map makes monitoring and surveillance extremely efficient, quick and accurate. Ongoing programmes of the Diary Development department for Milk Collection Centres as well as Rashtriya Krishi Vikas Yojana collected and used the spatial data of the beneficiaries. The Fisheries department is yet to make use of the spatial data.
- k. Plan preparation is a technical exercise. It requires multidisciplinary domain experts, appropriate data base and integrated perspective. There are deficiencies on all these counts. Panchayats do not have the necessary experts available at their command. Relevant farm level data base are also wanting. Both these issues are important as land use plan has to spell out allocation of land for specific use, improvements of land use types, introduction of new land use, setting standards – room for rivers, slope limit, offsets for flood hazard or land slide zones, and finally development options, solutions and budgetary requirements.
- l. Interdepartmental coordination at the panchayat level is missing. There are various departments dealing with different aspects of land use plan and each of them has their priorities and work programmes. Hardly, their activities converge to achieve a common goal like preparation of panchayat plan. Which department will provide the

- fulcrum for a coordinated exercise is also not sufficiently resolved.
- m. There are incongruities with respect to the administrative boundaries and ecosystem boundaries. Distribution of land and water follow a continuum. Panchayat boundaries in most cases cut across the ecosystem boundaries. The upstream and down stream panchayats within a watershed may not have the same priorities and conflicting interest. Resolving these conflicts is also an issue.
  - n. Another issue that will hinder panchayat land use plan may arise due to inconsistencies of local and regional plan. Regional plans have not yet been developed in Kerala. Nevertheless, this will be a contentious issue.
  - o. Perhaps the most important issue is to involve farmers/ local people and generate interest among them to taking up such an exercise. All the technical issues can be addressed and regulatory provisions can also be developed, but convincing people to undertake this task of land use plan preparation and committing themselves to act accordingly may be the greatest hurdle in evolving panchayat level land use plan. It is a real governance challenge. The spirit of PPC might have to be revived to meet this challenge and a new generation initiative may be taken up for formulating land use plans at the panchayat, district and State levels.
  - p. Lack of funds for implementing the projects, even if prepared on the basis of land use plans, is a serious constraint. Although it is mandatory to allot 60 % of the plan fund of local bodies to the production sector, fund allocation to land use-based activities is often not sufficient. Hence separate guidelines for plan fund utilisation for land use planning has to be formulated.

### **Brief review of Departmental Work on Land use Planning during 13<sup>th</sup> FYP**

It is proposed to discuss here the work accomplished by KSLUB, KSREC and the Department of Soil Survey and Soil Conservation.

#### **KSLUB**

By the beginning of 13<sup>th</sup> FYP, KSLUB has completed the Land Resource Information System (LRIS) for all the districts and the entire data is available online ([www.kslublris.com](http://www.kslublris.com)). During the 13<sup>th</sup> FYP, KSLUB has updated the landuse/land cover mapping of all the districts and the same will be completed during 2021-22. The data is updated in 1:5000 scale and it is proposed to deploy the data in the LRIS website during 2022. Kerala State Land Use Board has published the Watershed Atlas of the Kerala in a user friendly format in the LRIS website. This was done by comparison and fine correction of the micro watershed boundary prepared based on Survey Of India (SOI) toposheets using Google/satellite imageries. This will help the planners and administrators in identifying the boundaries in a free open GIS platform. The data available will assist the planners to identify the LSGIs falling under each micro watershed, sub watershed and watershed and plan accordingly. In addition to this, KSLUB has initiated a new component of preparing web based Wetland Information System. The work is progressing in Palakkad, Ernakulum and Kannur districts. KSLUB also prepared Land Use Decision Models for the selected LSGIs affected by natural disasters of 2018 and 2019. During the 12<sup>th</sup> FYP, KSLUB has launched the preparation of Natural Resource Management Plan at micro watershed level. The project is launched in

the Gayathri sub basin of Bharathapuzha River. The recommendations of the NRM plan were implemented by the MGNREGS in the LSGIs. KSLUB is also providing hands-on training to the officials of MGNREGS in those LSGIs in using the GIS database for planning and implementation.

#### **KSREC**

Kerala State Remote Sensing and Environment Centre in association with ISRO has prepared the land use/land cover map of Kerala in 1:50,000 scale during 2005, 2010 and 2015. The preparation of LU/LC map of 2020 in 1:50,000 scale will be initiated soon.

#### **Department of Soil Survey and Soil Conservation**

The Department of Soil Survey and Soil Conservation generates data on soil, land use, watersheds and similar aspects as mandated by the Government. It also undertakes consultancy services. Generation of soil data is a continuous process. Activities mainly cover (a) reconnaissance soil survey, (b) detailed soil survey covering (i) soil and land resource data for the panchayats/ municipalities/ corporations in a scale of 1:5,000/ 1:4,000, (ii) thematic maps for the panchayats/ municipalities/ corporations in 1:8,000/ 10,000 scale showing soil series, soil texture, slope, nutrient status, land capability class, land irrigability class, present land use, proposed land use and soil conservation priority, (iii) soil series level morphological soil data, (c) Watershed Atlas, (d) micro watershed atlas, (e) detailed watershed reports and maps (1:10,000/ 1:8,000 scale), (f) point layer for soil fertility of Wayanad district, (g) special reports and maps and (h) data generated as part of consultancy services. Department of Soil Survey and Soil Conservation has developed MISSK (Microlevel Information of Soil System in Kerala). This web-based information system provides cadastral level information on all aspects of soil. It is one of the most detailed data base available for land use planning. It may be developed for all the districts in the State.



### 3. LAND USE PLANS, WATERSHED PLANS AND AGRICULTURAL PRODUCTION SYSTEM

Sustainable land management is a global challenge. It stresses on land resource planning and management, and calls for an integrated approach through reorganising planning instruments and wherever necessary strengthening decision making structures and policy initiatives. The issue has been deliberated at various levels across the world and a series of guidelines have been issued by Food and Agriculture Organisation (FAO) with the objective of sustainable land use planning (SLUP). The SLUP aims to make optimal and informed choice of the future use of land on the basis of efficient and comprehensive data, a set of nodal institutions, and involving planners, stake holders and decision makers. FAO also suggested to document and scaling up of sustainable land management practices, evolved through individual and collective initiatives as noted in different parts of the World.

Although, originally land use evolved according to natural potential there had been several changes with economic growth, technological innovation and progress of society. Land use changes with changing socio-economic requirements. Assessment of alternative use against needs and aspirations of all social and economic groups is necessary to take decisions to proceed with acceptable land use, and formulate alternative land use and non use plan. There is renewed thrust on land use science, and strategic land use planning is now considered as a tool for sustainable use and management of land resources. Development of geospatial technology has strengthened land use planning process both in matter of data gathering and analysis. The objective of strategic land-use planning is to provide a guideline for decision makers and land users in selecting and putting into practice those land uses that will best meet the needs of people while safeguarding natural resources and ecosystem services for current and future generations. Tools and methods for strategic land-use planning at appropriate scales should encourage and assist the diverse and often competing users of land resources in selecting land-use and management options that increase their productivity, support sustainable agriculture and food systems, promote governance over land and water resources and meet the needs of society.

Ownership of land is vested with individuals, community and national and state governments. There are multiple stakeholders. Therefore, land governance plays important role to transit to sustainable land resource management practices and demand management. It covers policy, strategy, land tenure, property rights, land market, institutional mechanism to implement land use policies and facilitate appropriate land use practices following change in societal aspirations. Besides, governance is expected to create ample space for public participation in land management.

Land resource management plan may use a set of sustainability indicators to assess viability of the plan to achieve sustainable land resource development. These indicators may include both biophysical and socio-economic parameters. Useful indicators may be identified based

on eco-regional characteristics of the area concerned.

### **KERALA'S INITIATIVES IN LAND USE PLANNING**

Introduction of land reforms bill in 1957 has profound impact on land management in Kerala. It not only provided access to land a large section of people it catalysed a social-cultural change and empowered people. Character of land utilisation started changing since then as all the new owners turned to be the decision makers in the matter of land use. The 1960s witnessed intensive agriculture development programme along with green revolution. With the first attempt to plan cropping pattern according to agro-climatic characteristics began in 1974, when a committee on Agro-climatic Zones and Cropping Pattern constituted by the Government of Kerala at the behest of Planning Commission, Government of India. In 1987, the State Government decided to set up Krishi Bhavans in each local body mainly to facilitate agricultural development. With the implementation of the Kunda river valley project in 1965, a scientific approach was brought into the land use management through the formulation of an elementary watershed based development plan. The Kabini project initiated in 1972 too followed suit. Aerial photographs of the state were prepared in 1965 at the scale of 1: 50,000 and again in 1978 this was further scaled up to 1: 15,000. Soil Survey and Soil Conservation Department and Kerala State Land Use Board established in 1962 and 1978 respectively started preparing land use maps. The Land use of Idukki district prepared by KSLUB based on Air Photo of 1:15,000 scale was a pioneering attempt. Soils Survey and Soil Conservation Department conducts soil and land use survey based on watersheds under the Western Ghats development programme. Besides the major departments of agriculture, animal husbandry and fisheries, a few others were also established by the government. Some of these are directly involved in the soil and land use planning while others are indirectly involved in these activities.

Research Institutes like CESS, CWRDM, KFRI, TBGRI conducted research activities relate to land, water and forest management. One of the impactful programme was Panchayat Resource Mapping initiated by CESS in collaboration with KSLUB and KSSP.

### **PANCHAYAT RESOURCE MAPPING PROGRAMME (PRM)**

Panchayat Resource Mapping programme (PRM) was formulated by the CESS in 1991 on experimental basis covering the former Ulloor Grama panchayath as study area. It was envisaged as a new initiative for land use planning through the convergence of line departments, R & D centres and peoples' science organisations. Research and development aspect was taken up by the CESS, while the Kerala Sasthra Sahithya Parishad (KSSP) ensured success of the programme through peoples' participation. KSSP is the largest voluntary organization in the State, led by social science professionals and peoples' science movement volunteers. The PRM infused a new awakening and kindled a new thought process into the resource base of planning. Through PRM, the philosophy, methodology and techniques of spatial planning could be disseminated among the grassroots.

Kalliassery in Kannur district became the first Panchayath to complete resource mapping by the CESS and KSSP. Kalliassery Development Society was formed to spearhead the development of the panchayath on the basis of PRM. The Ulloor and Kalliassery experience

inspired much of Kerala's decentralised planning efforts in the subsequent years. The PRM now stand completed for all Panchayaths in Kerala, under the guidance of the Kerala Land use Board (KSLUB) and the Panchayath Resource Maps, available in digital form, is the first spatial repository for local bodies.

### **The People's Plan Campaign in 1996**

Kerala initiated the People's Plan Campaign in 1996 following the 73<sup>rd</sup> and 74<sup>th</sup> amendments to the Constitution in 1994, which redefined the role of Panchayats. A number of local activities and responsibilities related to agriculture were transferred to the local bodies. It was also specified that 40 per cent of the Plan expenditure of the panchayaths should be in the production sector, of which agriculture constituted a significant area. This was later revised to 30 per cent. There were high expectations about the impact of decentralised planning on agricultural growth in the State.

For the first time, the local leadership and the people got an opportunity to prepare their own plan for local level development. This threw open a new world of opportunities before them, which necessitated a thorough understanding of surroundings and locally available resources for judicious preparation of their own development plan. Agricultural programmes continued to be crop-specific, yet land and water management remained critical, necessitating local spatial and non-spatial data for the formulation of plan. This urged many local bodies to prepare their own local database of resources. Spatial information is essential for the successful implementation of the Mahatma Gandhi National Rural Employment Guarantee Programme (MGNREGP). A spatial record of activities is being maintained under this programme.

### **Objectives of Land Use Planning**

Land use planning ensures efficient and sustainable use of resources. The main goal of land use planning is to ensure that land resources are efficiently utilized for all kinds of activities ranging from residential uses to agricultural uses. The use of the land must adhere to the development goals. With growing population, land use planning is necessary to optimally combine various development projects such as residential, commercial, transportation, recreational, retail, and public uses. Land use planning is an emergent need (i) to achieve land management in a dynamic environment satisfying the socio-economic needs and preserving production potential, (ii) to plan and manage all uses of land aiming at sustainability and supporting human wellbeing, and (iii) to suggest optimum use of limited resources. A land use plan is expected to address the following issues:

- a) Present and future demands of the land for the benefit of the society.
- b) Capacity of land to meet these demands by assessing on-site potential of land and water.
- c) Reduction of over exploitation of natural resources and restoring ecosystem imbalance.
- d) Existing production level and conflict among the competing uses and trade-off among the uses.
- e) Individual and community needs.
- f) Changing trend of land use, sketching out road map for alternative uses and incremental

changes to a desired goal of enhancing efficiency, sustainability, and equity.

- g) Provisioning for disaster management/ mitigation.
- h) Lessons from experiences and best practices .
- i) Contributing to local, social, and economic profiling.

### **Steps in Land Use Planning**

Steps required for preparation of land use plan depends on the prevailing situation of the area concerned. FAO has suggested 10 steps beginning with setting up goals and ending with monitoring and revision of plans. Given the situation in Kerala with well-established decentralised process and active Gram panchayats the following steps are suggested:

- a) Setting of an institutional platform at the Gram panchayat level to initiate the work, coordinate, ensuring convergence of the concerned departments and involving locally available experts (Retired professionals, University/ College/ Professional College teachers and interested students). The Land use planning involves three groups of people: farmers and actual land users, decision makers and planning team. Proper coordination is the key to undertake land use planning.
- b) Building local groups/ sub-groups at the ground level for analysis of the problems and identification of opportunities for change
- c) Ensuring technical inputs for land evaluation, analysis of landscape ecology, changing trend of land use and land suitability assessment. Land is not uniform everywhere. Its characteristics vary spatially. Micro level diversity of land in Kerala is the foundation of biodiversity including agro-biodiversity and contributes to livelihood security. Land evaluation forms the first step in land use planning as it spells out the ecological determinants, production potential of land, usability of land, crop suitability, and limitation to the type of use that a piece of land can be assigned. Identification and delineation of landscape ecological units (LEU) based on physio-biotic characteristics is important. It helps to understand inherent quality of land. Matching inherent quality of land and land use requirement constitutes the basic matrix to plan for sustainable use of land.
- d) Household level survey for economic and social analysis
- e) Preparation of land use plan involving local people, departments and experts
- f) Presentation of the plan at the GP and Gram Sabha level
- g) Projectisation for implementation and economic analysis
- h) Implementation
- i) Monitoring and revision

### **Land Use Plan and Spatial Plan**

Traditionally, land use planning used to be an exercise focusing on land resource use without much attention given to how they might be used. With increasing competing use of land, soil suitability alone is not the sole criterion in designing land use. The other factors like demand for a particular use to meet present and future socio-economic aspirations, alternative use, state and national priorities for land based activities, environmental criticality of an area for a given use, demand of land for ecosystem preservation, carbon credit and buffering impacts of climate change are now emerging issues and warrant due

consideration. Land-use planning is not a sectoral exercise. Even where a particular plan focuses on one sector, an integrated approach is necessary in the line of strategic planning linking with regional development plan. In the final analysis a land use plan should embody a proposal how land should be productively used in accordance with the policy. This is a complex exercise as it deals with varieties of actions and actors involved both in the past and in the present, not necessarily carrying the same value system, and attempts to guide future course of events and processes that may not unfold as being anticipated. Land use planning is therefore a multi-disciplinary exercise and calls for inputs from a wide range of specialists apart from local people and actual land users.

There is also a change in planning perspective from ‘an appropriate future action through a sequence of choices’ proposed in 1970s to ‘a conscious effort to define systematically and think through a problem to improve quality of decision making’ as envisaged now. Strategic planning function integrates land use planning with planning of other sectors including transport, employment growth, environmental conservation and restoration and more generally in planning for sustainable development and improving quality of life in the long run.

### **Land Use Planning and Watershed**

Watershed is a terrestrial ecosystem consisting of intricately connected biotic and abiotic components. The entire earth surface can be taxonomically classified into watersheds. Mountainous, non-mountainous areas, low lands and even agricultural lands all adhere to the principles of watersheds. It is a geo-hydrological unit governing distribution of land and water and has definite determining impact on dispensation of natural resources like, plants, animals and minerals. As an integrated and functional unit watersheds provide water, food, fodder, fibre, timber and non-timber products and influence several human activities.

Land use planning and watershed management are interdependent. Both has the common goal of sustainable land management, conservation of soil resources for long term productivity, optimum production of various goods and services, eradication of poverty and environmental stabilisation. Land use acts as control system of a watershed by influencing the hydrological cycles, more particularly, water and sediment movement. Water quality and nutrient flux from a watershed also carry the imprint of land use within the watersheds. Human intervention in the form of land use can seriously alter sediment and water balance and biogeochemical cycles. Land use plans, watershed management and agricultural development should be considered together.

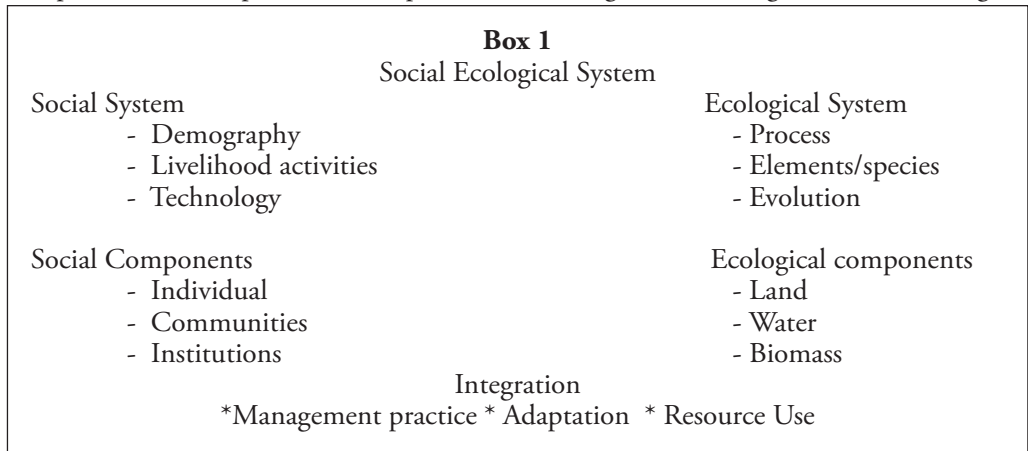
### **Land Use Planning and Agricultural Development**

Agricultural development is the principal concern of land use plan in the rural areas. Stagnation of crop productivity, declining natural fertility of soil, and lack of water availability are some of the emerging problems hindering agricultural growth. Land use planning is important to retain the natural fertility of the soil, selection of appropriate crops, ensure the production of food and fibre supplies and to suggest use of renewable natural resources on a long-term basis. It implies that the natural resources should be treated and managed in such a way that the cycles and energy fluxes among the soil, bodies of water

and atmosphere are considered, preserved or restored. A scientific approach to quantifying the land evaluation would ensure targeted production of the best suitable crop in a well-defined land use planning system. Soil site characteristics are important determinants of crop productivity. Site specific soil evaluation will be a part of land use plan. It is also possible to use crop yield model to determine productivity. The scope of land use plan may be enlarged to link farming activities with the market through cooperative supply chain within the local bodies. The importance and role of institutional strengthening, sound financial and managerial frameworks, availability of human resources involved, research thrust, technology transfer and improvement of networking necessary for agricultural development form part of a strategic land use plan and integrate it with spatial plan.

**Social ecological system approach for Land Use Plan and Agricultural Development**

Agricultural land expansion and intensification necessary to cater to the needs of societal demand are among the major threats causing environmental degradation and biodiversity loss. Degradation of the natural environment leads to declining ecosystem services thereby agricultural production is hampered with serious societal and economic consequences. Agricultural productivity strongly depends on ecosystem services like pollination, nutrient cycling, pest control and such other that the surrounding natural environment provides. Agricultural development plan is not just limited to cropping pattern, yield and out turn. Proper land management allying agricultural and non-agricultural use of land within the natural environment is the key to future agricultural growth and to avoid potential social and ecological collapse. Therefore land use plan for agriculture development should be strategically conceptualised to include agricultural and non-agricultural use of land along with identification of area appropriate for a crop, evolving cropping pattern and allied activities contributing to enhanced farm income and to create opportunities for employment generation, and evolving best management practices. Best management practices includes the application of agro-technology including watershed management practices, flood management, landslide management, selection of best cultivars, and best nutrient management. Best management practices also include raising of fish and duck in the farm ponds, poultry on the farm lands, and rearing livestock with the support of growing fodder in the fallow lands and in the non-arable areas. Conservation is an essential component of this plan. Such a plan can be designed following the social ecological



system approach which helps analysing coupled dynamics of social variables and landscape composition (Box 1).

The social ecological system (SES) approach recognizes interconnections and interdependence of social systems and ecological systems, both of which consist of dynamic and nested subsystems operating at multiple scales. Understanding of such networks helps formulation of strategic land use plan and evolving adaptive and co-management practices. Elements of this framework involve assessment of natural resource base, identification of drivers of change, communities' capacity and assets, technical and institutional capacity, governance system, accountability, dedicated financial resources, and enabling environment. Besides, there is a need for boundary organizations and institutional changes that will increase the transfer of knowledge among science, policy, and practice.

### **Agro –climatic zones to Agro- Ecological Zones**

Importance of planning for agriculture development based on natural units is realised since long. Perhaps the first attempt was made in 1974, when a committee on Agro-climatic Zones and Cropping Pattern constituted by the Government of Kerala at the behest of Planning Commission, Government of India, identified 13 agro-climatic zones based on four principal parameters, namely, altitude, rainfall, soil type and topography. Cropping pattern was worked out according to these zones. Distribution of Community Development Blocks according to the agro-climatic zones was also worked out.

The Planning Commission, consequent to a mid-term appraisal of the planning targets of the VII Plan (1985-1990), divided the country into 15 broad agro-climatic zones based on physiography and climate. Under this scheme, the entire Kerala State formed part of zone 12: West Coast Plains and Ghats region. The state of Kerala was divided into 8 zone viz Northern Zone, Southern Zone, Central Zone, High Altitude Zone, Onattukkara Zone, Kuttanad and Kole Zone , Pokkali Zone and Low Rainfall Zone by the State Agricultural Universities under the National Agricultural Research Project (NARP).

The National Bureau of Soil Survey and Land Use Planning (NBSS&LUP) generated a map of Agro-ecological Regions of the country (1992) by integrating climate, physiography, length of growing period and soils, which is an improvement on the agro-climatic zone map of the Planning Commission that considered only physiography and climate for delineation of zones. The agro-ecological regions (AER) map of NBSS&LUP had 20 regions and the entire state of Kerala formed part of region 19: Western Ghats and Coastal Plains, hot humid-per humid eco-region, with red, laterite and alluvium-derived soils and growing period of 210+days.

The delineation by both Planning Commission and NBSS&LUP fell short of fully characterising the agro-ecological variability in the state. To overcome this limitation by generating an agro-ecological unit map of the state, the Kerala State Planning Board commissioned a project to the National Bureau of Soil Survey and Land Use Planning in 2008. The analysis of agro-ecology of the Kerala State based primarily on climate, geomorphology, land use and soil variability resulted in delineation of five agro-ecological zones and twenty three agro-ecological units and ninety eight agro-ecological subunits.

## **Landscape Ecological Unit**

Developing land use plan at the gram panchayat level based on landscape ecological units following the hierarchic frame of agro-ecological zones (AEZ) and agro-ecological units (AEU) is proposed to apply SES approach in strategic land use plan. By definition, Landscape Ecological Unit (LEU), is an area or land unit which is ecologically homogenous at the scale of operation. Land form, soil and vegetation/land use are the three most obvious land attributes significant for identification of LEU. These units are developed by combining land form, digital elevation model and soil. Data on soil series and other related attributes like slope, soil depth, soil texture etc., are used to build soil-landscape ecological unit relationship. Present land use and suggested land use and best management practices can be developed for each of the LEUs. Soil and water conservation plans can also be worked out for all these units. This approach of LEU to prepare land use plan is being advocated for the Aspirational District programme launched by Government of India.

The LEU based plans consolidated at micro-watershed level within the Panchayats will help arresting soil erosion, in-situ soil moisture conservation, ground water recharging, extending and ensuring irrigation for dry season cultivation and addressing dry spell during erratic monsoon years. These plans will increase farm productivity by considering multiple components of agriculture like adopting various cropping system, increasing fodder, livestock, fishery, and forestry. Harvested rainwater will enhance water resource availability at the micro level. It is expected that additional water resource will help farmers, local people and planners. Intensification of agriculture can be proposed through horticulture and vegetable cultivation. Livestock and poultry based land use can be strengthened with the support of woody trees and raising grasses in fallow lands. A comprehensive land use plan may also include information related to flood and landslide and other infrastructure development for disaster management. Advancement of geospatial technology both in acquiring and analysis of satellite based data product and integration of spatial and non-spatial data has opened a great opportunity for preparing multidimensional land use plan as envisaged here. With this technology there is also a great scope now to use land use and crop yield modes for spatial planning as a part of well-designed Planning Support System (PSS).

## **GEO- SPATIAL TECHNOLOGY, SPATIAL PLANNING, LAND USE PLAN AND AGRICULTURE**

Geospatial Technology includes Geographic Information System (GIS), Remote Sensing (RS) and Global Positioning System (GPS). It is an enabling technology that helps acquire data that is referenced to the earth and use it for analysis, modelling, simulations and visualization. While remote sensing helps us acquiring time series satellite and air photo based spatial information, GIS is an analytical tool for data analysis and data integration. The GPS helps locating objects on earth surface. Geospatial Technology is widely used in land use planning for its capability to handle spatial data as well as to integrate the spatial and non-spatial data and for monitoring the land.

Spatial planning is an essential prerequisite for the deployment of modern technologies in agriculture. Selection of crop and crop productivity is directly influenced by local characteristics such as water availability, soil and climate. Hence development of spatial

planning at the microlevel that accounts for the limited natural resources and the changing but unpredictable climate is a challenging task. Our infrastructure and inputs in farming also face crucial constraints. Hence we should overcome the current stagnation in agriculture through the judicious use of natural resources and scientific interventions in production and marketing. Through deployment of geo-spatial technology, optimisation of natural resources and controlled management of farming systems for enhanced production and reduced input cost can be achieved. Geo-spatial technology can also be used for efficient marketing of agricultural commodities. It is also the back bone of Precision Agriculture (Box 2)

### **Box 2 : What is Precision Agriculture**

Precision agriculture, or precision farming utilizes geographical information to determine field variability to ensure optimal use of inputs and maximize the output from a farm (ESRI, 2008). Large tracts of land usually have spatial variations of soil types, moisture content, nutrient availability and so on. Therefore, with the use of Remote Sensing, Geographical Information Systems (GIS) and Global Positioning Systems (GPS), farmers can more precisely determine what inputs to put exactly where and in what quantities. This information helps farmers to effectively use inputs such as fertilizers, pesticides and herbicides, and water resources. Finally, farmers who adopt precision farming not only maximize their yields but also reduce their operating expenses, thus increasing their profits.



## 4. LAND USE PLANNING OF MAYYIL GRAMA PANCHAYATH

Discussion in the foregoing chapters has brought out that land use planning for agricultural development requires micro level data, institutional support, involvement of actual land users, synergy of various ongoing programmes and a proper leadership to coordinate all the activities. Considering these issues it was decided to take up Mayyil Gram Panchayat, which has already initiated some activities and is always in the fore front to initiate new programmes. The purpose is to demonstrate the process of data generation covering biophysical components and social aspects in a Gram Panchayat and examine the scope of up-scaling this attempt to cover all the Gram Panchayats in the State.

### **Mayyil Grama panchayat and its settings**

Mayyil Grama panchayath with a total area of 33.08 sq.km is a Special Grade Panchayath under Irrikur block and Taliparamba Taluk in Kannur district. This Grama panchayath falls under Taliparamba Legislative Assembly Constituency and the Parliament Constituency of Kasargod. The Valapattanam river flows along the parts of eastern, northern and parts of the western boundary of this Panchayat. Kuttiattoor Grama Panchayat forms parts of the eastern and southern boundary. Kolachery Grama Panchayat borders the parts of the western boundary (Fig 1). Mayyil village was a part of Chirakkal Taluk of Malabar District of Madras Presidency prior to the Independence. The Mayyil village Panchayat was formed along with Kayaralam and Kandakkai village panchayats in 1954 following the Madras Village Panchayath Act of 1950. Subsequently, these three village Panchayats were merged to form Mayyil Grama Pachayath in 1962 as per the Kerala Panchayath Act of 1960.

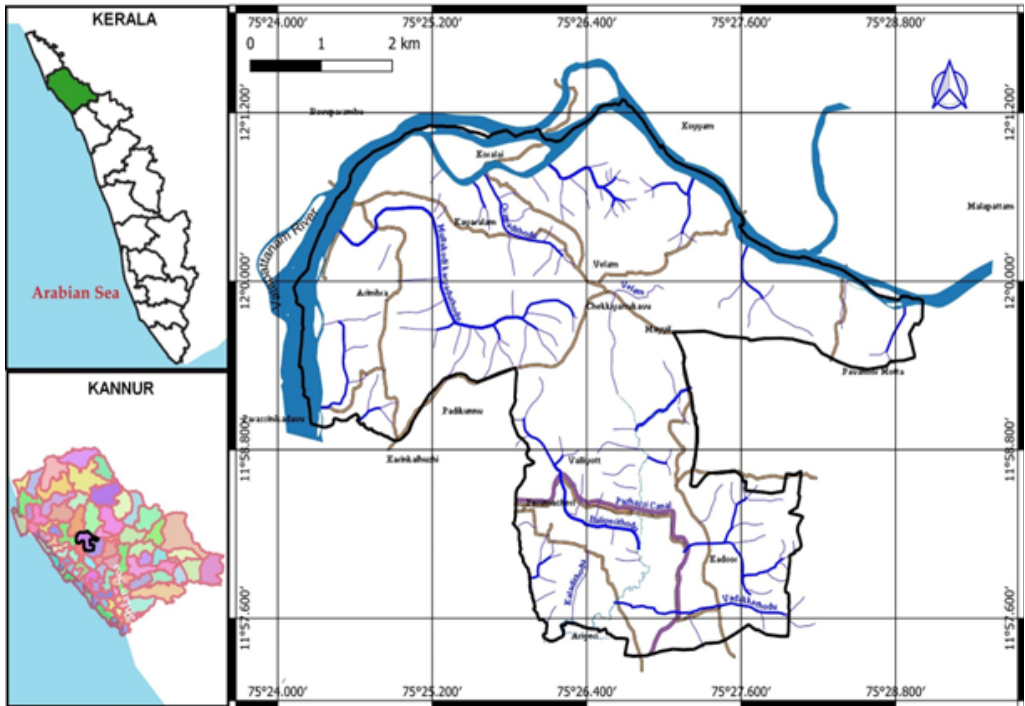
Due to location beside one of the major rivers in Kerala and having both highlands and lowlands this Gram Panchayat was one of the favoured places for early settlement concentration including that of the antiquity of Aryan settlements in Kerala as evident from remnants of old temples and presence of Brahmin settlements.

### **Population**

Located about 20 km North East of Kannur Municipal area this panchayat is well connected with surrounding areas. There are 18 wards spreading over the villages of Mayyil and Kayaralam (Fig 1). According to 2011 Census the total population of this Panchayath was 29649 composed of 15839 females and 13810 males living in 6387 households. Population density of Mayyil GP was 896 persons/ sq. km against the district average of 852 persons/sq.km and state average of 860 persons/sq.km. The panchayat has recorded an average annual population growth rate of 0.88% (1991-2011) while the state average is 0.98% during the same period. Sex ratio of the panchayat was 1147 females per 1000 males. The average sex ratio (number of females per 1000 males) of Kannur district and Kerala state was 1136 and 1084 respectively.

Mayyil is a typical midland panchayat dominated by laterite topography covering around 58% of total geographical area. Narrow alluvial valleys have developed cutting across the laterite landscape. Flood plains of the Vallapatnam river is marked in patches. The highest point reaches at an altitude of 85m in the Niramthodu Ward in the south-eastern part of

## INDEX MAP OF MAYYIL PANCHAYATH



the panchayat. The Panchayat is well drained with 64 km long drainage lines. Drainage density is 1.94Km/sq.km. This does not include the Vallapatnam river.

### GENERATION OF DATA FOR LAND USE PLANNING

Land use plan preparation requires data for social as well as ecological data specially related to land and water. The social data covers detail information on demography, asset, and information on land ownership, institutions and organisations aspects. The discussion here will cover the present status and also the type of data being generated. On ecological aspects the discussion will cover the type of maps generated using satellite data product and field mapping especially for soil related data

### SOCIAL COMPONENTS: INSTITUTIONAL ARRANGEMENT AND ORGANISATION BUILDING

Following the tradition of social movements, innovative developmental activities and the Socio-Political conditions prevailing in this Panchayath a good organisational set up was developed as part of Samrudhi Programme in Taliparamba Legislative Assembly Constituency. This is significant and can form the organisational foundation to initiate this programme of Panchayat Land use Planning for Agricultural Development (PLPAD). The details are briefly discussed here.

1. Nano Cluster: This is the ground level organisation at the bottom. It includes 10 to 20 families for each nano cluster. One person from each family will be a member of

Nano-Cluster . There will be 3 Office bearers for each Nano-Cluster.

2. Micro Cluster: It is formed by incorporating the office bearers of 8-10 Nano Clusters. There will be Chairman, Vice-Chairman, Convenor, Joint Convenor and Treasurer for each Micro cluster.
3. Macro cluster: It is formed at ward level in the Panchayath by incorporating the Office bearers of all micro clusters in that particular ward. There will be Chairman (Ward member), Vice –Chairman, Convenor, Joint Convenor and Treasurer for each Macro cluster.
4. Panchayath level Committee: This Committee includes panchayath President, Secretary, Elected members, Implementing Officers, 10 representatives from Macro Clusters and representatives of Political parties.

So, a very strong organisational set up is already available in the Panchayath. This can be utilised very effectively for the present purpose.

### **SOCIAL SYSTEM ANALYSIS: SOCIO-ECONOMIC SURVEY**

A detailed and comprehensive socio-economic Survey has been conducted in the panchayath covering the following details:

1. Name, Address, Mobile No., Details of family members
2. Panchayath, ward, Location
3. Aadhar, PAN, Voter ID, Ration Card Nos,
4. Area, Survey No.
5. Present farming activities
6. Source of drinking water, distance to the source, availability
7. Irrigation Status, Type of irrigation, Source, availability of irrigation water.
8. Occupation, field of expertise.
9. Problems in farming
10. Type of Soil & Water Conservation measures adopted, to be done.

Data covering 60 such parameters have been collected. These data can be utilised for identification of problem, assessment of present state of land use and farming practices, irrigation facilities, nature of occupation, future requirements and similar other issues.

### **LAND AND WATER RESOURCE INVENTORY**

Land and water resource inventory forms the foundation of sustainable land use plan. Satellite data product, Survey of India topographic maps, other relevant thematic maps and cadastral map (1: 5000 scale) provide the basic inputs. The Open source GIS software has been utilised and the database has been prepared using Quantum GIS software. The basic database required for plan formulation are terrain map, digital elevation model, contour map, slope maps, soil map, land use/ land cover map river/ stream network, road network, apart from socio-economic database. Soil data base has been developed through field investigation.

The primary thematic maps are prepared using Survey of India Topographic sheet ( 1: 25000 scale- 48P/8/SE & 49 M/5/NE) with cadastral information from cadastral survey

map ( 1: 4000) collected from Survey and Land records, Government of Kerala. Various information obtained from the Open source library and detailed survey have also been amended into the database for refurbishing the current scenario. Landscape ecological data base is developed to integrate terrain data and soil information. Existing and proposed land use may be developed based on Landscape Ecological Units (LEU). The type of data generated for this panchayat are given below. Most of these data are in form of maps. There are 13 thematic maps covering various parameters as listed here.

- i. Index map
- ii. Base map with drainage network
- iii. Cadastral boundary
- iv. Village boundary
- v. Warm boundary
- vi. Contour map
- vii. Digital Elevation Model (DTM)
- viii. Slope
- ix. Soil type
- x. Soil series
- xi. Soil texture
- xii. Soil depth
- xiii. Land use/ land cover

## **Description of land resource**

### **Landform/ terrain**

Analysis of terrain is based on the PRM survey conducted in 1991 for the first batch of 25 panchayats. Mayyil GP is characterised by two types of landform based on specific geomorphic processes: denudational landform and aggradational landform. Denudational landform is the local source zone for sediments and water. The aggradational landform is the sink zone that receives sediment and water from the source zones. The Vallapatnam river also brings sediments and water from its provenance. The flood plain deposits are enriched regularly. The denudational landform dominated by erosion can be divided into two landform types: Lateritic Summit and Lateritic slope. The aggradational landform is the lowlands/ plains. Each of these three landform classes consists of several landform units. All together, 13 landform units are marked in this panchayat (Table 1).

Lateritic summits consist of four mapping units. The ridge crest is the topmost unit of toposequence and it is broad and elongated. The hill crest is isolated and is limited in extent. The third unit is the mesa. It represents lateritic duricrust, a common feature marked in north Kerala. All these landforms are dry and sometimes barren. The duricrusts are hard crusts with little or no soil cover. This laterite cap may be more than 10m in some places, however, in general it is 2-3m thick. Below this hard crust there is soft clay, which, if exposed solidifies and hardens. In the east central part at Velam Soup Plates are marked. It is a very special feature in the lateritic duricrust areas. They are generally saucer shaped and sagged in the middle and characterised by alluvial soils.

Lateritic slopes are intermediate topographic units connecting summits and valleys. There are six units under this category. However, from management point of view there are two classes: moderate to steep slopes with  $> 10^{\circ}$  slope and gentle to moderate slopes with angle of inclination  $<10^{\circ}$ . Since landscaping function acts intensely along the slope, erosion is normally high in these land units. Rate of erosion increase towards upper parts of the slopes bordering the summits. The upper slopes are dry with low water availability.

The aggradational plain or lowlands are composed of three units: flood plains, levees and valley floors. These are depositional landforms. Natural levees are formed along the Vallapatnam river. Material is coarse grained with high water availability. A braided bar named Kandakaithuruthu is a conspicuous feature in this panchayat. The valley floors are marked along the small streams scattered within the panchayat. The up-stream part and the periphery adjoining the slope receive colluvial materials.

**Table 1:** Landform/ terrain units

Landform class	Landform unit	Surface material	Slope	Area (ha) (%)
Summit (Top surface)	Ridge crest	Laterite	<5	695 (21.1)
	Hill crest	Laterite	<5	95 (2.8)
	Mesa	Laterite- duricrust	<5	314 (9.5)
	Soup plate	Laterite, alluvium	<5	85 (2.6)
Denudational slope	Very steep	Laterite	>27	113 (3.4)
	Steep	Laterite	18-27	224 (6.8)
	Moderately steep	Laterite	10-18	249 (7.6)
	Moderate	Laterite	5-10	325 (9.8)
	Gentle	Laterite	<5	44 (1.3)
	Foot slope	Laterite, colluvium, alluvium		279 ((8.4)
Aggradational plain (Lowlands)	Narrow Valleys	Alluvium, colluvium	<5	279 (8.4)
	Flood plain	Alluvium	<5	509 (15.4)
	Levee	Alluvium	<5	97 (2.9)
Total area				3308

### River / Stream network

River and stream network map has been prepared from the survey of India topographic sheet at 1: 25000 scale and updated through limited field surveys. All the information from the Open base layers library with reference to the streams and water bodies are also appended to the database. Table 2 shows the details of the various order of streams in the panchayath with their length. These drainages have been locally developed within the

panchayat and surrounding areas.

**Table 2:** Stream network details

Sl.No.	Drainage Order	Stream Length_km
1	I order stream	39.61 km
2	II order stream	15.84 km
3	III order stream	8.56 km
4	Pazhassi canal (defunct)	4.89 km

### Digital Elevation Model and Contour Network

Digital Elevation model or DEM , is a model of earth surface in a digital format with gridded elevation values which helps to generate the shape and profile of the earth surface and an in-depth analysis of the profile for further planning. Cartosat -1 DEM with 2.5 m spatial resolution and vertical resolution of 7.5 m which is freely available from Bhuvan website has been used for generation of derivative maps like contour and slope maps using the raster analysis option in QGIS software. DEM is raster representation of continuous surface used for generation of surficial parameters.

### Slope

Degree of inclination or slope of land is perhaps the most important geomorphic element influencing the land use of an area. It controls movement of sediments and water. The effect of slope on agriculture may be both direct and indirect. The most obvious direct influence of slope is in the form of the restrictions on cultivation and accessibility. The indirect effect of slope manifests itself in pedological and climatic modification including the position of water table, development of soils, air drainage. Table 3 shows the slope classes and area covered under each of the categories.

**Table 3:** Slope Category

Slope Category	Slope Class	Area in Hectares
Nearly level to Very gently Sloping	0-3%	1319.63
Gently Sloping	3-8%	1302.36
Strongly Sloping	8-15%	606.56
Moderately Steep to Steep	15-35%	73.81

### Soil Resources Data Base

Soil resources data base are prepared in the form of soil map published by Department of Soil Survey and Soil Conservation. Auger boring was carried out to examine the morphology of soils at frequent intervals. Soil profiles and excavations were studied for determining the soil characteristics. The observations were made on heterogeneity in the soils, slope of the terrain, relief, drainage, vegetation, parent material, soil depth, soil texture, soil structure, moisture condition of the soil, irrigability of the soil, evidence of erosion and presence of salt and human influence, land capabilities, consistency and nutrient status etc. The results of these observations which were furnished in the Detailed Soil Survey report ( 1: 10,000

scale) along with a soil map depicting the boundary of soil family and associations has been used for preparation of Soil Resource Database.

### **Soil Depth Phases**

Soil depth phases are distinguished for variations in the total depth of the soil profile including the C horizon, if present, which are significant to soil use and management over bedrock. The mean depth of the soil layer is assessed by studying conditions in the terrain, both on the test area and in its immediate vicinity. Soil depth shows how thick the soil cover is. The exact soil depth is difficult to assess and is very variable. Three depth class associations were identified in the Panchayath. The depth phases are as follows:

1. Moderately Deep Phase: The part of the soil unit with 75-100cm depth.
2. Deep Phase: The part of the soil unit typically deeper with 100 –150cm depth
3. Very Deep Phase: The part of the soil unit, which is more than 150cm deep

### **Surface Soil Texture**

The surface layer of soils down to a depth of about 25cm is the portion of the soil column most used by crop plants. The texture of the surface soil covers a wide range from sand to clay. Classes of soil texture are based on different combinations of sand, silt and clay. Soil is a major part of the natural environment, alongside air and water, and is vital to the existence of life on the planet. Soil is the result of the process of the gradual breakdown of rock - the solid rock that makes up the earth and leaching process. As rocks break down through a variety of processes, such as weathering and erosion, the particles become ground smaller and smaller. As a whole, soil is composed of four constituents: mineral, organic material, air and water. There are three main mineral parts to soil: 'sand', 'silt' and 'clay'. Soil texture is determined considering composition of these three mineral parts. Nine soil series have been identified based on landform and soil variations in this panchayat (Table 4).

### **Land Use/ Land Cover**

Land utilization pattern of Mayyil Panchayath has been obtained by digitally processing the LISS IV image of IRS P6 satellite acquired recently. In Mayyil Panchayath, five main land use/ land cover classes have been delineated: urban/ built-up, vegetation, barren land, wasteland, and water bodies which has been further categorised into different land use subclasses according to land utilization pattern with coverage. A spectral based strategy with supervised classification was undertaken with the assistance of visual analysis of a displayed colour composite of Google Earth image has been used. Ground data collection is conducted to study land use patterns and characteristics in relation to their spectral response pattern on the satellite image. Later for scaling up the map information, the derived maps have been refurbished with the information from Google earth along with extensive ground truthing. Mixed tree crops cover the maximum area. Sizable area under paddy has been reclaimed. It is also found that paddy lands are kept fallow. Data obtained during PRM in 1991 indicated that there were around 383 ha of land where paddy was cultivated three times in a year. Double crop paddy land was 140 ha and single paddy covered 146ha. Growing paddy three times was possible due to availability of irrigation water from the Vallapatam river and ponds. Cashew plantation which used to cover substantial area earlier

has recorded reduction in coverage. There is substantial change in land use pattern in all categories.

**Table 4. Soil Characteristics of Mayyil Panchayath**

Sl. No	Soil Series	Texture Classes	Origin	Depth	Permeability	Soil Type	Area in Hectares
1	Arathil	Gravelly Clay Loam, Gravelly clay, Gravelly Silty Clay Loam, Gravelly Silty Clay,	laterite	Deep 100 to 150 cm	moderate to moderately slow	Laterite	723.4
2	Kadambur	Gravelly Sandy Clay Loam, Gravelly Clay, Gravelly Silty Clay	Laterite	Deep 100 to 150 cm	moderate to rapid	Laterite	633.6
3	Kandakkayi	Sandy Clay Loam, Sandy Loam	Alluvium	Very deep >150cm	moderately rapid	Riverine Alluvial	107.5
4	Muthathy	Sandy Clay Loam	Colluvium	Very deep >150cm	varies	Colluvio-alluvial	28.8
5	Nadapuram	Clay loam, sandy clay loam, silty clay	Colluvium	Deep 100 to 150 cm	very slow	Colluvio-alluvial	242.0
6	Narikot	Silt Loam, Sandy Clay Loam	Alluvium	Very deep >150cm	moderately slow to slow	Riverine Alluvial	337.0
7	Pilathara	Gravelly Clay Loam, Gravelly loam, Gravelly Sandy Clay Loam, Gravelly silty Clay Loam	Laterite	modrately deep 75 to 100 cm	moderately rapid	Laterite	541.0
8	Pudukkai	Gravelly Silty Clay, Gravelly Clay Loam, Gravelly Silt Loam, Gravelly Silty Clay, Gravelly Sandy Clay Loam	Colluvium	Very deep >150cm	moderately slow	Colluvial	268.3
9	Miscellaneous		Wetland conversions and water bodies				425.1

### **INTEGRATION AND PLAN PREPARATION: THE TASK AHEAD**

Mayyil panchayat has succeeded to generate all basic data required for soil and land use planning in cadastral scale (1:5,000). Some additional information may be gathered as and when required. It is now important to integrate these data and work out plans for actions. This may be approached as discussed below.

#### **Identification of Landscape Ecological Units (LEU) and action plan**

Identification of landscape ecological units (LEU) is an exercise to combine landform/ terrain and soil data for integrating all land and water related information. Landform units may be identified based on high resolution satellite image and DEM as base maps. Soil series and phase data available from the Soil survey department can be used. Using expert knowledge of existing soil landform relationship soil series may be allocated to the different LEUs. Other morphometric and soil data like, soil depth, surface texture, erosion, gravelliness etc can be

computed for each LEUs to have a detailed land resource inventory. The panchayats for which all the data like that of Mayyil panchayat are available this method of integration will be useful. In case, there is a need for new data generation the approach may be first to identify landform units using DEM followed by gathering of soil information for each of these landform units.

LEU is more or less homogeneous spatial units and acts as the operating units for evaluation and proposed activities. Once LEU are identified, their characteristics may be tabulated covering all land resource information, water availability, land use, the problem and suggested land use as indicated in the table 5.

**Table 5:** Landscape Ecological Units (LEU) and their characteristics

Landform	Soil profile	LEU	Area	Survey plots	Water availability	Existing land use	Environmental hazards	Remarks

### PREPARATION OF ACTION PLAN

Preparation of soil and land use plan is both a technical and organisation exercise, especially in case of private property. Once the LEUs are identified and problems and potentialities are analysed the next step is to work out plans to address the problems and proper use of the potentialities. The Gram Panchayats and the various clusters that it has organised till the grass root level may iterate about the future use of land with due provision for conservation. Panchayat needs expert support to develop the alternative plans and also to implement them. Further LEUs may be linked with the micro-watersheds and micro watershed wise data may be computed for action plan and implementation as given in table 6. Overlaying cadastral map on LEU map status of each survey plot may be worked out and Cadastral Information System may be developed (Table 7).

**Table 6:** Micro watersheds and their characteristics

Micro watershed	LEU	Area	Existing use	Suggested use/action plan	Implementation of actions	Indicator to monitor	Remarks

**Table 7.** Cadastral Information System (CIS)

Survey no	Ownership	Household details	LEU	Micro-watershed	Existing Land use	Status of water	Suggested use/action	Remarks

### FUTURE WORK

Mayyil panchayat has succeeded to generate all necessary baseline data and organise grass root level household clusters necessary for land use planning and agricultural development. The next step is to plan for specific use of land and water. Following is a tentative list of activities that may be taken up:

- i) Land use plan- identification of proper use for various land scape ecological units.

- ii) Suitability analysis for agricultural development, settlement, infrastructure development etc
- iii) Suggested crops for the agricultural land
- iv) Possibilities of new areas bringing under cultivation
- v) Use of wastelands
- vi) Sites for new constructions
- vii) Plan for water resource development, details of availability of water for irrigation and other purposes
- viii) Bank protection of Vallapatnam river-riparian vegetation development
- ix) Pond rejuvenation and pond catchment management,
- x) Rejuvenation of streams/ springs
- xi) Recharging of wells, water harvesting,
- xii) Selection of sites for soil conservation, gully plugging,

It is necessary for Mayyil panchayat to take next step for planning, devising action plans and execution of action plans. These lessons are important for up-scaling this programme and introduce it to all the panchayats in the State.

## 5. SUGGESTIONS FOR INTEGRATION AND CONVERGENCE OF GOVERNMENT AGENCIES AND MODALITIES TO INITIATE LAND USE PLANNING

The activities in Mayyil panchayat has brought out the importance of building household cluster at the ground level and the necessity of involving various line departments, especially, Soil Survey and Soil Conservation Departments, KSLUB, and KSREC who are custodians and mandated to generate data related to land, water and land use. This section proposes to discuss the modalities to integrate and converge activities of various government departments to facilitate preparation and updating of land use plans prepared by the LSGs.

### **Integration and convergence at the state level**

The unit of a micro level, farmer-oriented development process is a land parcel on earth surface with its own uniqueness. The owner of the land parcel may be a crop raising or cattle rearing or a fish farmer or an integrated farmer practicing multiple but allied activities. He solicits services of multiple agencies such as agriculture, animal husbandry, fisheries, soil survey and conservation, irrigation, revenue and ground water departments besides finance institutions and the local body. Irrespective of the requirement of the farmer, whether it is single or multiple, he or she is bound to approach multiple departments for the farming needs. From the planners' and implementers' perspective, the issues lie at a single point, however, the solutions are disseminated through several departments. The farming community, including the farm workers and labourers, should be treated as a single unit while formulating the remedies. A technology driven, farmer-oriented, integrated approach alone can resolve the farming crisis and enhance the production through sustainable growth and protect and conserve the natural resources for posterity. This warrants proper organisation support with proper institutional mechanism. Necessary interventions are required in the following areas:

### **Convergence of schemes of Government of India and Government of Kerala**

There are 22 programmes related to agriculture and water resources under Ministry of Agriculture and Farmers' Welfare and Ministry of Rural Development (MGNREGA), Government of India. A complete listing of all these programmes is necessary to assess the communality and unit of operation. A State level empowered committee may be formed to oversee the programme and facilitate convergence of these schemes.

### **Departmental Collaboration**

At the LSGI level, there's no convergence of departments which handle land use related data. Revenue, Agriculture and allied departments and others work in silos and there is hardly any interaction to share data or to converge schemes. A watershed based master plan would reduce the discordance between departments as they are expected to work collectively. The strategy and land use related policies of different departments vary according to the schemes available with each of them. However, this lack of coordination can also be addressed in the master plan itself. Currently the Block level mechanism is very weak as the role of Block Panchayath is limited in the watershed programmes. However, the Block Panchayaths can be strengthened through a regional integration programme of watershed development, having a major role in monitoring and data updating. The Agriculture department has an

excellent network for implementation of programmes in the state. The technical personnel of the Information Kerala Mission, available at the block level, can be judiciously integrated with the programmes of the Agriculture Department to successfully formulate the plans using spatial data. Joint programmes of the district panchayath, Block panchayath and Grama panchayath are not based on scientific spatial and non-spatial data. At the District level, geo-spatial technical personnel can be included as an interdepartmental unit for the implementation and monitoring of Geo-spatial technology.

### **Coordinating/ Nodal department**

Data generated by various departments may be brought under one umbrella for sharing and making it available to the LSGs. To accomplish this task it is necessary to issue Government directives to all Departments / Agencies. This can be taken as part of the activities envisaged for the empowered committee at the State level. The Web based MISSK (Micro-level Soil Information System on Soils of Kerala) data developed on cadastral scale by the Department of Soil Survey and Soil Conservation is one of the most comprehensive data base for land use planning and agricultural development at the Panchayat level. These data, wherever available, may be shared with other departments, engaged in land and water management at the panchayat level and may be supplied to the LSG. It is important to cover all panchayats in Kerala under MISSK.

Department of Soil Survey and Soil Conservation (SS& SC) have professionals with ample experience and expertise. Some of their officers have undergone training at IIS & WCRT, Dehradun, one of the pioneer institute in this field. The SS & SC department can be the nodal agency to co-ordinate with other departments and pool the data.

### **Re-orientation of Programmes**

Similarly, KSREC may be advised to produce DEM, contour and slope data at the panchayat level corresponding to MISSK data. KSLUB can supply PRM data and other land use related information. Programmes of these three organisations (SS&SC, KSLUB, and KSREC) may be reoriented to share, complement and user friendly at the LSG level.

### **Training and skill development**

The field level employees should be amply trained on handling and effectively using the available data. The format in which the data will be made available is important and hence has to be chosen carefully. For land use-based planning at the LSG level, an officer needs a specific set of tools and skills. A GIS trained agriculture officer can use geo- spatial data for watershed planning as well as preparation and implementation of farm plan, crop calendar etc. Use of spatial data will also enhance their professional skills. There is a need for trained experts available in each LSG to handle all these data. Agricultural Officers, Technical Assistant from IKM etc. can be trained and capacitated to use and interpret these data. Technical Assistance to the LSGs should be provided by all department /Agencies.

Training may also be imparted to upgrade skill in planning and map integration. Preparation of landscape ecological unit (LEU) map requires skill for landform analysis and integrate it with soil series. Data from different agencies are essential to prepare land use plan. From the geo referenced base map to the socio-economic status of the people in the Panchayat, there

is a requirement for both spatial and non-spatial data. Annually updated family register is available with the Anganavadies and health centres. This register contains information on the socio-economic status of each family within their jurisdiction. On digitization, this data can be directly used and the gaps can be filled through a primary survey. At present the non-spatial data is scattered between various development departments. The scattered data has to be pooled and organized into a structured database necessary for planning.

A systematic training programme can be developed for skill development. This should also include expertise for handling RS & GIS software and spatial analysis. The IWDM-K, Chadayamangalam, the only Training centre exclusively for watershed management and related activities can be used as the nodal training centre for this purpose. Apart from SS & SC department, professionals from KSLUB, Agriculture Department, KSLUB and KSREC can be drawn and trained to train LSG level officers. Developing trained manpower is very important for Panchayat level capacity building and to carry forward this programme. If necessary, KILA may also be properly equipped for this purpose.

### **Integration**

Integration is an important component of strategic land use plan. Present day land use plan needs to focus on competing uses of land and what is the best option given the prevailing socio-economic situations. There is also now scope of trade off in deciding a particular type of land. Land suitability is not the sole criterion for land-use decisions any more. The demand for products and the extent to which the use of a particular area is critical for a particular purpose are important considerations. A strategic land use plan has to integrate information about the suitability of the land, the demands for alternative products or uses and the opportunities for satisfying those demands on the available land for the present and in the future. Therefore, land-use planning is not a sectoral exercise. Even where a particular plan is focused on one sector, e.g. rice farming or coconut gardening an integrated approach has to be followed in the line of strategic planning.

### **Planning at different levels**

Land-use planning can be applied at the local, district and state level corresponding to the levels of government at which decisions about land use are taken. The method of planning and kind of plan and corresponding decisions may not be the same at all these levels. At each of these levels there a need to develop land use strategy, policies that indicate planning priorities, projects that tackle these priorities and operational planning to get the work done. Interactions among these three levels, both bottom up and top down, should be strengthened for flow of information, better coordination and exchange of ideas. Scope of participation of people increases as one goes down the hierarchy. Gram Panchayat based plans should be integrated at the Block and District level, finally to conform to the state land use plan. This multi-level planning approach is necessary to integrate Panchayat level land use with watershed-based development by treating micro watershed as the basic unit. A cluster of micro watersheds – micro catchment – may be considered as the basic unit for the plan preparation. The Agro Ecological Zone and Agro Ecological Unit based approach should be merged with the watershed-based model in a hierarchic order. Micro watershed and catchment area may also fall under one or two Agro Ecological Units. This issue also

deserve attention for multi-level planning.

### **Planning team**

An essential feature of land-use planning is the treatment of land and land use as a whole. This involves multidisciplinary team drawn from a wide disciplinary spectrum covering natural resource, engineering, agricultural and social sciences. Ideally, a team needs a wide range of specialists- a soil surveyor, a land evaluation specialist, an agronomist, a forester, a range and livestock specialist, an engineer, an economist and a sociologist. Such a range may only be available at the state or district level. At the local level, a more typical planning team may consist of a land-use planner and one or two assistants. Each must tackle a wide range of jobs and will consequently need specialist advice. Government agency staff, universities, colleges and locally available retired government employees may be useful sources of assistance. Land use planning is a multi-sectoral as well as sectoral exercise. Planning teams should be organised accordingly.

### **Use of Agricultural Technology**

Execution of land use plan needs technological support related to agronomy, silviculture, livestock husbandry and other means by which land is used. It is important to consider the capital, skills and other necessary resources that a land user has access to use new technologies, which may also have social and environmental implications. Land use planners should take note of all these issues.

### **Land Use policy**

Constant change in land use, especially resulting from the conversion of paddy land is an important issue. Lack of a proper land use policy has led to wrong land use culminating in disasters. Lacunae in the enforcement of laws and rules connected with land use pose a serious challenge. Implementation of the Paddy and Wetland Conservation Act of 2008, The Forest Rights Act of 2006, The Environment Protection Act of 1986 etc are examples.

### **Co-ordination with R & D Centres**

Government of Kerala has established several R & D centres like CWRDM, KFRI, TBGRI, NATPAC, who produce/ use land and water use related data. CESS, which initiated the PRM programme in the State is now taken over by the Government of India. It is necessary to coordinate with these institutions to avail their services and specialised interventions as and when required. KSCSTE may be brought into the picture. Coordination with Educational Institutions: IITM-K (Digital University), University departments, Colleges and Engineering colleges can be brought into the picture to involve teachers and students in this endeavour.

## **DISTRICT, BLOCK AND PANCHAYAT LEVEL INITIATIVES**

### **District level Committe**

Many line departments have offices up to the district level. More over the final plan preparation should be at the river basin level, which can be conveniently done at the district level. District level committee should be constituted for the integration of all the local bodies and development departments. This is inevitable for the formulation as well as successful implementation and realization of the plan. The District Planning Officer may be

the Nodal Officer to coordinate the activities at the district level. DPO may work in tandem with District Collectorate and may interact with district officers of all the line departments to facilitate the process.

### **Block level committee**

Block panchayats are the intermediate level in the three tier panchayati raj system. Moreover there are actions required at the Block level. Sub-watershed based land use plans may be evolved at the block level. A conglomeration of different agencies, at the sub-watershed basis is also necessary, so that scattering of the data can be minimised while adopting effective plan preparation and implementation strategies. Hence a committee at the block level can be formed for monitoring and evaluation of watershed based land use plans and spatial planning.

### **Panchayat level activities**

The most critical input in the preparation of the land use plan is data at the Panchayat level, both spatial and non-spatial data. Integration of different departments is inevitable for collation of data, however, many departments lack an operational plan at the Panchayat level. Important agencies which are directly involved in land use based activities at the Panchayat level are LSGIs, MGNREGS, Departments of Agriculture, Animal husbandry and Revenue. Departments such as Irrigation, Soil survey & Soil conservation Department have no functional units at the level of the local body. Formation of an apex committee at the Panchayath level, through integration of these departments, is important for the preparation of land use-based plans.

### **Strengthening of Krishi Bhavans**

Krishi bhavans at the Gram Panchayat level is an important grass root level organisation. At present their functions are limited to administrative activities. This institution may be developed as the technical institution to actively coordinate land use plan preparation and to work in tandem with the Gram Panchayats for implementing the land use plans. Krishi Bhavans should be the nodal points at the GP level and can be the repository of all the data at the ground level. It should function as the technical arm of the GP.

## **DATA MANAGEMENT AND INFORMATION SYSTEM**

### **Data base**

A good information base is essential for land use planning. There were various attempts to generate land use data beginning with PRM in 1991. It was an exercise involving professionals and volunteers at the panchayat level and the documentation was on cadastral scale. Priority should be placed on updating of land use data either through the updating of PRM with available data or by generation of new high resolution remote sensed data. PRM can be updated with 2020-21 high resolution Cartosat-2, LISS-IV scanner remote sensing data. This data is useful for watershed planning and project preparation. It is expected that Cartosat-3 data with panchromatic resolution of 0.28m and multispectral resolution of 1.2m will be available shortly. Data can be generated afresh through the use of Unmanned Aerial Vehicle/Drone image (UAV image). The UAV remote sensing technology is useful for crop surveillance and management. A geo-referenced cadastral based GIS base map for

local bodies has to be prepared before updating of data. This GIS base map should form the basis of all geo spatial activities or updating. GIS maps are also useful for Industry, Tourism, Infrastructure, Local Governance, Urbanization, Education, Healthcare etc. Data from other organisation may be collected.

Global Position System (GPS), Geo-Informatics System (GIS) and Remote Sensing (RS), jointly called Geo- spatial technology, when combined with Internet operating technologies (IoT) will help to integrate data, project formulation, implementation, monitoring and evaluation across multiple departments. Technology can create geo-spatial data which is directly correlated with the real world situation. This data can be used for creating realistic farm plan and production calendar to enhance productivity. The higher level Remote sensing data is useful in plant health surveillance and crop management, however, this needs development of further expertise through research. The list of maps needed for base line exercise is given in the Table 8. The exercise conducted for Mayyil Gram Panchayat is a good example.

### Uploading Land Use Plans

Once the Land Use Plans are prepared, it may be uploaded in the Land use plan web site and be made available in the public domain.

### Updating and Storage

Land use is dynamic. More over there may be requirement of new data generation over the time. A system has to be devised for regular updating of data base and supply updated data to the LSGs. Quality of data is also an issue to be addressed. The Government has to identify/ designate a nodal agency at the state level, who will be the custodian of all data, spatial and non-spatial, required for land use planning at the micro level. Proper storage and preservation of data is also an important issue. Web based data as is being developed now by different departments may be coordinated through a common format. The selection of variables may be worked out through larger consultation among the departments producing the data, outside professionals and subject experts and the data users. A data supply chain may be worked out for regular supply of data to the LSGs and receiving feed backs. The data base should be interactive, so that People at the panchayat level may be in a position to use the data and also update as and when required.

### Cadastral Information System

Finally the state has to develop Cadastral Information System where all data, biophysical, demography, socio-economic etc are linked to the cadastre. This can be part of the spatial data structure of the State.

**Table 8:** Tentative list of maps required for Agriculture land use planning and sources

Phase	List of maps required	Source/ Actors
Phase I: Baseline maps and data		
	Administrative division	SLR
	Topographic map/ contour map	KSLUB
	Digital Elevation Model	KSRSEC

Landform and Slope	KSRSEC
Soil series	SS & SC
Landscape Ecological Unit	SS&SC, KSLUB
Land use/ land cover	KSLUB/ Panchayat
Change in land use	KSLUB/ Panchayat
Water source, drainage with micro watershed boundary	KSLUB/ Panchayat
Cadastre	SLR/ IKM
Assets including roads & railways	KSLUB/ Panchayat
Population distribution (Ward wise)	Census of India
Settlement distribution	KSLUB/ KSREC
Land tenure	Revenue Department

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Supporting information

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Rainfall and temperature, water balance, ground water	IMD, SGWB, CGWB
Irrigation	WRD
Agro-ecological zone/ subzone	Agriculture Dept.
Soil health card	SS&SC
Market information and linkage	DES
Government and non-government organisations present in the panchayat	

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Phase II: Preparation of Plans with action points

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Agricultural land use plan	
Suitability for crop production	
Suitability for plantation crops	
Use of Fallow lands	
Suitability for livestock rearing	
Suitability of water bodies for fish farming	Multidisciplinary Technical Group including Departments and other professionals
Suitability for backyard poultry	
Watershed management	
Wasteland use/ reforestation	
Biodiversity conservation including sacred grove use	
Soil conservation/ erosion control	
Drainage line and water source conservation	

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Phase III: Planning for Risk management

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Flood  
Landslide  
Climate change

KSDMA, ILDM & Multidisciplinary  
Technical Group

Phase IV: Implementation of plan

Project formulation  
Project execution

Panchayat, Line departments and  
professionals

Phase V: Monitoring and evaluation

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Achievements	Panchayats and Professional organisations
Lessons	

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## 6. ROAD MAP FOR PREPARATION OF LAND USE PLAN BY THE GRAM PANCHAYATS

Preparation of land use plan is a task which require convergence of top down and bottom up approaches. While specific Government directives are required (i) to coordinate among various departments producing spatial and non-spatial data related to land and water, and make these data available to the LSGs, (ii) to set the institutional mechanism for taking up the work of land use planning in a time bound manner, (iii) to strengthen Krishi Bhavans (iv) to organise training programme for skill up-gradation to use RS-GIS data and maps and use map based data for planning (v) to adopt land use policy, and (vi) to technically equip LSGs for preparing land use plan, there are a set of activities that a Gram Panchayat can take up towards preparing land use plan. This section proposes to present a broad outline of the activities that a GP can take up to accomplish the task of preparing land use plan. This exercise is not one time affair, it requires periodic updating as land use changes over time due to several interacting social and ecological forces. The activities are listed below.

- i) Awareness campaign and mass mobilisation to spread the message of importance of land use plan, need for people's participation in data collection, plan formulation and programme execution. A sub-committee of the panchayat may be formed to lead this activity.
- ii) Setting of an institutional platform at the Gram panchayat level to initiate the work, coordinate, ensuring convergence of the concerned departments and involving locally available experts (Retired professionals, University/ College/ Professional College teachers and interested students).
- iii) The Land use planning involves three groups of people: farmers and actual land users, decision makers and planning team. Proper coordination is the key to undertake land use planning.
- iv) All the politically oriented organisations in Agricultural sector (Karshaka Sangham, Karshaka Thozhilali Union etc) should be involved in this campaign.
- v) The panchayat may prepare a hand book providing details of the panchayat, briefly covering its general features, the problems of the panchayat and need for local action. This hand book may be used for awareness campaign and mass mobilisation.
- vi) Setting up Panchayath level Committee for land use planning. This committee will include panchayath President, Secretary, Elected members, Implementing Officers, and representatives of Political parties. Representatives from Macro Clusters will also be included after formation of the clusters.
- vii) Formation of nano, micro and macro clusters:
  - a) Nano Cluster: This is the ground level organisation at the bottom. It includes 10 to 20 families for each nano cluster. One person from each family will be a member of Nano-Cluster . There will be 3 Office bearers for each Nano-Cluster.
  - b) Micro Cluster: It may be formed by incorporating the office bearers of 8-10 Nano Clusters. There will be Chairman, Vice-Chairman, Convenor, Joint Convenor and Treasurer for each Micro cluster.

- c) Macro cluster: It may be formed at ward level in the Panchayath by incorporating the Office bearers of all micro clusters in that particular ward. There will be Chairman (Ward member), Vice –Chairman, Convenor, Joint Convenor and Treasurer for each Macro cluster.
- viii) Organise household level survey to collect data covering land, land use, water resource, water use and related data in a prescribed format.
- ix) Collect PRM maps and other land, land use, soil and water related data including DEM, Soil Series and MISSK information from KSLUB, KSREC and Department of Soil Survey and Soil Conservation (SS & SC)
- x) Initiate cadastral level mapping to update existing PRM maps and filling up the gap including preparation of a change map in cadastral scale using macro, micro and nano cluster groups with support of NGOs and Higher Secondary and College/ University students and local volunteers. Mobile based App may be used for map updating purposes.
- xi) Identify resource persons from the locality including local schools/ colleges and constitute a local technical support group (LTSG) for soliciting support for data collection, mapping and data assimilation. Ensuring support of locally active NGOs may also be considered in these activities.
- xii) In due course, panchayats may consider to set up Multi-tasking co-operatives for continuous technical support and other related activities for land use planning
- xiii) Procure cadastral map from the Survey and Land Records/ IKM and demarcate ward boundary and micro watershed boundary in the cadastral map with the help of LTSG.
- xiv) Krishi Bhavan should play a significant role in preparation of land use plan and execution of projects. Panchayat should closely interact with the Krishi Bhavans and all associated line departments to work out land use plan.
- xv) Organise workshops (i) to assess data availability, (ii) to initiate the work, (iii) to analyse data and (iv) to discuss the land use plan
- xvi) Validation of the land use plan at the ground level with the support of Cluster groups. Services of Padasekhara Samithis and other crop based peoples committees available at LSG level may be used for checking ground truth in this regard.
- xvii) Comparing and sharing the land use plans of the panchayats with that of the adjoining panchayats for continuity and to consolidate land use plans at the watershed level. This activity will help panchayat level coordination and propose joint activities finally to contribute in Block and District level land use plans.
- xviii) Link Land Use Plan with the watershed management activities. All land use activities should be proposed and coordinated according to micro watersheds within the Panchayat.
- xix) Preparation of action plan and link it with ongoing Government schemes. All land use plans chalked out by the Agriculture Department, Irrigation Department, Dairy Development Department etc, should be converged to the LSG landuse plans. MGNREGA programmes and Ayyankali Labour Assurance scheme should be linked

with watershed based landuse management plans with the help of line departments and LTSG.

- xx) Projectisation of the action plans and working out modalities for implementation
- xxi) Document good land and water use management practices within the Panchayat, if any, and assess feasibility of upgrading the practices.
- xxii) Consolidation and finalisation of land use plan, action plan and programme implementation plan with the help of LTSG. Arrange for digitisation and storing of all information at the panchayat level.
- xxiii) Setting up a mechanism for regular monitoring of the programme. A set of indicators may be worked out for this purpose
- xxiv) Grama Panchayat should maintain a close link with the Blocks and Districts for necessary support and share experiences.

## APPENDIX-1

### PROCEEDINGS OF THE MEMBER SECRETARY STATE PLANNING BOARD

(Present: Sri. Teeka Ram Meena IAS)

Sub: - Formulation of Fourteenth Five Year Plan (2022-27) – Constitution of Working Group on Agriculture and Cooperation – Revised Proceedings - reg.

Read: 1. Note No. 297/2021/PCD/SPB dated: 27/08/2021  
2. Guidelines on Working Groups  
3. This Office order of even number dated 08.09.2021

#### **ORDER No. SPB/342/2021-Agri(1) Dated:14.09.2021**

As part of the formulation of Fourteenth Five Year Plan, it has been decided to constitute various Working Groups under the priority sectors. Accordingly, the Working Group on **Agriculture and Cooperation sector** is constituted. For the smooth functioning of the Sectoral Working Group (SWG), it is decided to split the Working Groups into Expert Sub Groups (ESG). Hence the Working Group is categorized into eleven Expert Sub Groups as indicated in the proceedings. The names of the members of the SWG are indicated under each ESG. The Working Group shall also take into consideration the guidelines read 2<sup>nd</sup> above in fulfilling the tasks outlined in the ToR for the Working Group.

#### **1. A PLAN TO IMPROVE THE EFFICIENCY OF WORKING OF KRISHI BHAVANS**

##### ***Co-chairperson***

- Dr C. Bhaskaran, Professor of Agricultural Extension (Retd), Kerala Agricultural University
- Mr T. V. Subash IAS, Director, Agriculture

##### ***Members***

- Dr P. Jayaraj, Programme Coordinator, KVK, Kannur
- Dr Sreevalsan J. Menon, Associate Director of Extension, Directorate of Extension, KAU
- Mr V. G. Sunil, Assistant Professor, Agricultural Extension, Communication Centre, Kerala Agricultural University
- Mr P. V. Jinraj, Assistant Director, Agmark Laboratory, Thiruvananthapuram
- Ms Asha K. Raj, Assistant Director of Agriculture, Small Farmers Agribusiness Consortium, Thiruvananthapuram
- Mr Kariyam Ravi, 115 Journalist colony, NCC Nagar, Peroorkada
- Mr G. K. Manivarnan, Agricultural Officer, Pallikkal Grama Panchayath
- Mr R. Ajith Kumar, Assistant Professor, IIITM-K

- Mr Joy Sebastian, MD, VCONSOL
- Mr Sidharthan A.K, Assistant Director of Agriculture (Q C),Kozhikkodu

### ***Terms of Reference***

- To assess the present functioning of Krishi Bhavans in Kerala and suggest how to improve their effectiveness.
- To identify advanced technologies for use in Krishi Bhavans to ensure better delivery of services and their convergence with LSGIs, Cooperatives, FPOs, and KAU.

## **2. A PLAN TO EXPAND AND MODERNIZE SUPPLY CHAINS IN AGRICULTURE**

### ***Co-chairperson***

- Dr Poornima Varma, Faculty, Centre for Management in Agriculture, IIM-Ahmedabad
- Dr A. Prema, Professor & Head, Department of Agricultural Economics, College of Horticulture, Vellanikkara, Thrissur

### ***Members***

- Ms L. R. Arathi IES, Mission Director, State Horticulture Mission, Kerala
- Dr A. Suresh, Principal Scientist, CIFT, Kochi
- Dr S. Jayasekhar, Senior Scientist, Social Science Division, CPCRI, Kasaragod
- Mr Valsan Panoli, Kerala Karshaka Sangham, Vapushas, Koothuparamba, Kannur
- Mr.V. P. Unnikrishnan, MFH Flat No.2003, Vrindavan Garden, Pattom Palace P O Thiruvananthapuram
- Ms Deepthi S. Nair, Deputy Director, Marketing, Coconut Development Board, Kochi
- Dr S. Asharaf, Professor, IITMK
- Mr Mathew Abraham, Assistant Director, Marketing, Department of Agriculture
- Dr Sangeetha K. Prathap, Assistant Professor, School of Management Studies, Cochin University of Science and Technology, Kochi.
- Ms Chitra K. Pillai, Assistant Director of Agriculture, Agricultural Urban and Wholesale Market, Maradu
- Mr L. Subhash Babu, Deputy Director (Retd.), Department of Agriculture and Farmer's Welfare
- Mr Joy Sebastian, MD, VCONSOL
- Mr Ashar Thattarath, PGP IIM, Ahmedabad
- Mr Manu K.G, Public Relations Officer, Directorate of AD & FW

### ***Terms of Reference***

- To suggest a design of a unified supply chain for farm inputs and outputs with specific reference to aggregation/procurement, storage, and marketing.

- To suggest a framework where LSGIs, Cooperatives and FPCs can be effectively integrated into the unified supply chain.
- To suggest ways to ensure that the supply chains are integrated with the objectives of trade, value addition and processing - domestic and global – as well as agricultural finance institutions.
- To suggest ways in which the private agencies in procurement, trade and marketing are integrated with the supply chains.
- To ensure that the supply chains meet the requirements of *niche* sectors, such as organic farming, in certification and traceability.
- To suggest the major technological changes and infrastructural investments required to equip the State’s supply chain systems to meet the needs of the farming community as well as domestic and international trade.

### **3. HOW CAN KERALA DOUBLE ITS VEGETABLE PRODUCTION IN THE NEXT FIVE YEARS?**

#### ***Co-chairperson***

- Ms C. A. Letha. IAS, Secretary, Agriculture, Government of Kerala
- Dr T. Pradeep Kumar, Director (Planning), Kerala Agricultural University, Thrissur

#### ***Members***

- Dr P. Rajasekharan, Chairperson, State Agricultural Prices Board
- Mr V. Sivaramakrishnan, CEO, VFPC
- Mr J Sajeew, Managing Director, HortiCorp
- Ms L. R. Arathi IES, Mission Director, State Horticulture Mission
- Dr K. M. Sreekumar, Professor of Entomology, College of Agriculture, Padannakkad
- Mr Sridhar Radhakrishnan, Thirunelly Agri Producer Company (TAPCo)
- Mr Reghulal, Deputy Director of Agriculture (Rtd)
- Dr K. Mini, Deputy Manager, VFPC, Idukki
- Mr Prakash Puthanmadathil, Assistant Director of Agriculture, Vengara
- Ms S. K. Preeja, Kerala Karshaka Sangham, Pallichal, Nemom, Trivandrum
- Mr R Balachandran, Chithiramangalam, Ulloor Medical CollegePO, Thiruvananthapuram,
- Mr Reji Jacob, Kunnamkodu House, Nediassala PO, Thodupuzha, Idukki
- Ms Bindu.J, Assistant Engineer, Office of the Assistant Executive Engineer, Malampuzha, Palakkad

#### ***Terms of Reference***

- To assess the progress achieved in increasing area, production, and productivity of vegetables in Kerala over the past five years.
- To suggest a roadmap to double vegetable production in Kerala over the next five years with special focus on increasing productivity and farmer’s income.

- To examine the ways in which the institutions of LSGIs, Cooperatives and FPCs can be utilised to participate in vegetable production efforts.
- To suggest ways in which existing systems of vegetable production are modernised and integrated with the different schemes of the government as well as post-production activities.
- To review the existing procurement and distribution systems, including government initiatives, and suggest a transparent, technology-driven platform with the active support of LSGIs, Cooperatives and FPCs.
- To suggest ways to reform the existing government schemes to support vegetable production.

#### **4. CONSTRAINTS TO TECHNOLOGY ADOPTION AND THE POTENTIAL TO RAISE PRODUCTIVITY IN KERALA AGRICULTURE**

##### **Co-chairperson**

- Dr C. Chandra Babu, Vice Chancellor, Kerala Agricultural University
- Dr K. C. Bansal, Former Director, National Bureau of Plant Genetic Resources, Indian Council of Agricultural Research (ICAR), New Delhi

##### ***Members***

- Dr M.N. Sheela, Director, CTCRI, Sreekaryam
- Dr C. Thampan, Principal Scientist, CPCRI, Kasargod
- Dr Madhu Subramonian, Director of Research, KAU
- Dr Jacob John, Professor & Head, Integrated Farming Systems Research Station, Karamana, KAU
- Dr P. Indira Devi, Director of Research (Retd), KAU
- Dr R. Beena, Assistant Professor, College of Agriculture, Vellayani
- Dr Archana Sathyan, Assistant Professor, Agricultural Extension, CoA, Vellayani, KAU
- Dr P. Rajeev, Principal Scientist, IISR
- Adv. Thomas V T, Varacheriyil, Pala PO, Kottayam
- Dr Nishanth K. Raman, Assistant Professor, CoA, Padannakkad, KAU
- Mr Rijish Rajan, CEO, Simplified Enterprises Management, Palakkad
- Dr Thomas Aneesh Johnson, Soil Survey Officer, Office of the Deputy Director and Soil Survey, Thrissur (North)

##### ***Terms of reference***

- To assess the status of productivity of major crops of Kerala and estimate yield gaps.
- To identify linkages between the adoption and use of modern technology and the gaps in yield in major crops.

- To examine the potential for raising productivity in major crops with the existing technologies.
- To identify gap in the availability of technology and suggest measures to hasten the development of these technologies.
- To suggest measures to improve the research-extension linkages in Kerala's agriculture.
- To suggest a policy framework to transform homesteads into profit centres through the practice of technology-driven agriculture.

## **5. PREPARATION OF SOIL AND LAND USE PLANS IN LSGIs FOR AGRICULTURAL GROWTH**

### *Co-chairperson*

- Dr Srikumar Chattopadhyay, Faculty, GIFT
- Mr S. Subramanian IIS, Director, Soil Survey & Soil Conservation, Trivandrum

### *Members*

- Mr T. Gangadharan, Extension Faculty, KILA, KSSP
- Mr K. S. Hiroshkumar, Scientific Officer, IFSRS, Karamana, KAU
- Mr B. P. Murali, Member, Nagaroor, Kilimanoor Block (KBPA)
- Mr R. Sukhalal, Swararagam, Cherthala South PO, Alappuzha
- Mr A. Nizamudeen, Land Use Commissioner, Kerala State Land Use Board
- Mr K.P. Abdussamad, District Soil Conservation Officer, Kannur
- Mr Anand Vishnu Prakash, Agricultural Officer, Manakkad Krishibhavan, Idukki

### *Terms of reference*

- To critically assess the status of preparation of land use plans by LSGIs in Kerala over the past five years and identify the reasons for the poor performance of LSGIs in this regard.
- To suggest and prepare a guidance note for the effective preparation and development of land use plans, and its integration with watershed plans and agricultural production systems.
- To suggest ways to integrate and converge the objectives and activities of multiple government agencies possessing data on land ownership, land use and agriculture to facilitate regular updating of land use plans prepared by LSGIs.
- To suggest a road map for a State-level people's campaign to complete the preparation of land use plans at the LSGI-level over a period of six months.

## 6. WATERSHED-BASED PLANNING AND AGRICULTURE: THE POTENTIAL IN KERALA

### *Co-chairperson*

- Dr Ishita Roy IAS, Agriculture Production Commissioner
- Mr I. B. Satheesh, MLA, Kattakada Constituency

### *Members*

- Dr K. K. Sathiyam, Dean, KCAET, Thavanur
- Dr Celine George, Senior Principal Scientist & Head, CWRDM, Manimalakunnu
- Dr Anu Mary C. Philip, Assistant Director, Soil Conservation; IWDMK, Chadayamangalam
- Mr S. U. Sanjeev, Assistant Director of Agriculture (Rtd.)
- Mr U. Janardanan, CEO, Mayyil Rice Producer Company Ltd., Kannur
- Dr A. R. Durga, Assistant Professor, Department of Agricultural Economics, College of Agriculture, Vellayani, KAU
- Mr M. Prakasan Master, Kerala Karshaka Sangham, Pranavam, Azheekode South, Kannur
- Mr T. K. Rajan Master, Nini Nivas, Edachery PO, Kozhikode
- Mr Jo Jose, Assistant Principal Agricultural Officer, PAO Office, Kottayam
- Mr Mohanachandran, Deputy Director (Retd), Kollam

### *Terms of reference*

- To critically assess the status of preparation of watershed plans by LSGIs in Kerala over the past five years and identify the reasons for the poor performance of LSGIs in this regard.
- To suggest and prepare a guidance note for the effective preparation and development of watershed plans, and its integration with land use plans and agricultural production systems with active support of geospatial technologies.
- To suggest ways to integrate and converge the objectives and activities of multiple government agencies possessing data on water, water use, land use and agriculture to facilitate regular updating of watershed plans prepared by LSGIs.
- To suggest a road map for a State-level people's campaign to complete the preparation of watershed plans at the LSGI-level over a specified minimum period.
- To study the different successful models of watershed plans prepared by LSGIs in the State and study the possibilities of replications, and preparation of a set of best practices.
- To provide guidance on linking the existing schemes of the government with a broader watershed-based strategy of development planning.

## **7. A PROGRAMME TO MODERNIZE AND UPDATE STATISTICAL DATABASES IN AGRICULTURE**

### ***Co-chairperson***

- Dr Madhura Swaminathan, Professor, Indian Statistical Institute, Bengaluru
- Mr P. V. Babu, Director, Dept of Economics & Statistics

### ***Members***

- Dr U. S. Mishra, Professor, Centre for Development Studies, Trivandrum
- Ms L. R. Arathi IES, Mission Director, State Horticulture Mission
- Dr Brigit Joseph, Professor, Dept of Agricultural Statistics, CoA, Vellayani
- Dr K. P. Chandran, Senior Scientist, CPCRI, Kasargod
- Mr T. Paul Lazarus, Assistant Professor, Agricultural Economics, CoA, Vellayani
- Dr Pratheesh Gopinath, Assistant Professor, Agricultural Statistics, CoA, Vellayani
- Mr Deepak Mercy Johnson, Senior Fellow, Indian Statistical Institute, Bangalore
- Mr S. Ajayghosh, Vrindavan, Vadakkan Mainagapally PO, Kollam
- Mr Ramesh P K, TA to Director of Agriculture, Directorate of AD and FW

### ***Terms of reference***

- To critically assess the status and robustness of Kerala's statistical databases in agriculture and identify areas of concern.
- To suggest measures to improve the design, collection, analysis and dissemination of statistical data, such as area, production, yield, costs of cultivation, trade, farm harvest prices, wholesale prices, retail prices, market arrivals and so on, related to agriculture.
- To provide a framework for a better use of new technologies to improve the statistical system related to agriculture.
- To suggest ways in which Kerala's statistical system in agriculture should be geared towards meeting the challenges posed by integrated multiple-/inter-cropping based in homesteads and garden lands, apart from wetlands.
- To examine the possibilities of integrating all data on agriculture collected by different agencies in a single electronic platform.

## **8. A PLAN FOR VALUE ADDITION AND INDUSTRIAL INVESTMENT IN KERALA'S POST-HARVEST AGRICULTURE**

### ***Co-chairperson***

- Dr K. P. Sudheer, Professor & Head, Department of Agricultural Engineering, College of Horticulture, KAU
- Mr Manu George, Strategist, Agency for the Development of Food Processing Industries in Kerala (ADFIK), KINFRA

## ***Members***

- Mr Rajeev Bhushan Prasad, Chief Coconut Development Officer, Coconut Development Board
- Dr E. Jayashree, Senior Scientist, ICAR-Indian Institute of Spices Research (IISR), Kozhikode
- Dr Lijo Thomas, Senior Scientist, ICAR-Indian Institute of Spices Research (IISR), Kozhikode
- Dr M. R. Manikantan, Principal Scientist, Harvest & Post Harvest Technology, CPCRI, Kasargod
- Mr K. K. Rajendrababu, Kunnath Veedu, Alappad PO, Thrissur
- Mr R. Manikuttan, Santhivila, Vandanmedu PO, Idukki,
- Dr V. R. Sinija, Professor & Head, Business Incubation Unit, IIFPT, Thanjavur
- Dr M. S. Sajeev, Principal Scientist & Head Crop Utilization Division, CTCRI, Sreekaryam
- Dr P. R. Geethalakshmi, Assistant Professor, Department of Post-Harvest Technology, College of Agriculture, Vellayani
- Ms K. Thulasi, Kerala Karshaka Sangham, Novelty, Mator, Kalady, Ernakulam
- Dr P. Nisha, Principal Scientist, CSIR-National Institute for Interdisciplinary Science and Technology, Trivandrum
- Mr Abraham John Tharakan, Chairman, Amalgam Foods
- Mr Madathiveetil Ramesh, Director, Brahma Indic Nutriment Private Limited
- Mr Appu Anitha Muraleedharan, Theeram Agro World
- Ms Mini Srinivasan, Annam Flour and Batter Solutions, Coimbatore
- Mr Ajoy Sukumaran, Assistant Director of Agriculture, Directorate of AD and FW

## ***Terms of reference***

- To prepare a roadmap for the development of an entrepreneurship-driven system post-harvest value addition in agriculture while ensuring the generation of employment and skills.
- To suggest measures to effectively integrate the functioning of LSGIs, Cooperative institutions, including FPCs, and line departments towards the development of value chains in post-harvest agriculture.
- To suggest measures to ensure facilities for investment, quality control, traceability, logistics and export, including the necessary arrangements for payment systems.
- To suggest measures to augment Kerala's export of processed products, particularly in high value and *niche* segments.

## **9. EASE OF ENTREPRENEURSHIP IN AGRICULTURE: REFORMS IN POLICY AND ADMINISTRATION**

### ***Co-chairperson***

- Mr S. Harikishore IAS, Director, Industries & Commerce Department
- Dr K. J. Joseph, Director, Gulati Institute of Finance and Taxation, Trivandrum

### ***Members***

- Dr Binoo P. Bonny, Professor & Head, Department of Agricultural Extension, CoA, Vellanikkara, KAU
- Dr K. P. Sudheer, Professor & Head, Department of Agricultural Engineering, College of Horticulture, KAU
- Mr G Prakash, Joint Director, MSME Institute, Thrissur
- Mr Roshan Kynadi, Agripreneur, Kynadi Plantations
- Mr T. Thulasidasa Menon, Krishnakripa, Thrithalangode PO, Malappuram,
- Mr M. Ramesh, Industry Expert, RABI-KAU Incubation Committee
- Mr Saji George, CEO, BIONEST
- Mr Shan Kadavil, MD, Fresh to Home Foods Private Ltd
- Mr Jamsheed, Agricultural Officer, Kannamangalam, Malappuram

### ***Terms of reference***

- To suggest a broad quantitative framework to regularly assess ease of entrepreneurship in agriculture in Kerala.
- To identify the constraints to the flow of entrepreneurial capital into the processing and value addition segments in agriculture.
- To suggest short-term, medium-term, and long-term measures to improve the ease of entrepreneurship in agriculture.
- To suggest legal and administrative measures to be initiated at different levels of governance, including LSGIs, to improve the ease of entrepreneurship in agriculture.

## **10. HOW CAN KERALA USE THE POWER OF COOPERATION TO RAISE AGRICULTURAL GROWTH?**

### ***Co-chairperson***

- Mr P B Nooh IAS, RCS, Kerala
- Mr James Mathew, Ex- MLA, Taliparamba

### ***Members***

- Dr P. S. Geethakutty, Professor (Retd.), KAU
- Mr Salin Thapasi, Project Leader, SFAC

- Mr Paleri Ramesan, Chairman, ULCCS
- Mr James, Perambra Coconut FPC
- Fr John Choorapuzhayil, Chairman, BLOWIN, Mananthavady, Wayanad
- Dr J. Thomas, PDS Organic Spices, Kuttikanam, Idukki
- Mr G. R Rajeev, Kollam
- Mr Bimalghosh, MD, Aralam Farming Corporation
- Ms Rema K. Nair, Deputy Director of Agriculture (Retd.), Department of Agriculture
- Mr V Ravindran, Senior Manager, Kerala Bank

#### *Terms of reference*

- To critically assess the role and position of Cooperative institutions in Kerala's agricultural development pattern.
- To identify weaknesses in the cooperative institutional framework with respect to their contribution to the agricultural production processes.
- To chart out a pathway to effectively leverage Kerala's historical strengths in cooperative action – including both cooperatives and farmer producer companies (FPC) – to improve agricultural growth and farmer's income.
- To critically assess the performance of Kerala's cooperative credit system to finance agricultural activities.
- To suggest measures to modernise the functioning of Cooperatives in the State.
- To suggest measures on how cooperatives can contribute to the development of supply chains and value addition in agriculture.
- To suggest measures to improve coordination across line departments, LSGIs, Cooperatives and FPCs to contribute to agricultural growth.
- To suggest measures for transforming Kerala Bank to support the resource needs of the productive sector of the State.

### **11. COOPERATIVE BANKING IN KERALA: REVAMPING THE ROLE OF KERALA BANK**

#### *Chairperson*

- Ms Mini Antony IAS, Secretary, Corporation

#### *Co-Chairperson*

- Dr Pallavi Chavan, Director, Reserve Bank of India, Mumbai

#### *Members*

- Mr Sasikumar M V, Director, Institute of Co-operative Management, Parasinikkadavu, Kannur
- Mr Jose T Abraham, Additional Private Secretary to the Finance Minister

- Mr K. C. Sahadevan, Chief General Manager, Kerala Bank
- Mr V. Raveendran, Senior Manager, PACS Development Department, Kerala Bank
- Mr Raja Kurup, Board Member, Kadirur PACS, Kannur
- Mr Anoop Kishore, Development Standing Committee Chairman, Wadakkanchery Municipality and District Facilitator of Decentralised plan
- Mr Romio Kattapana, President, Thankamony Service Co-operative Bank
- Mr K.C.S Nambiar, Director, Ancharakandy FSC Bank and Sahakari Coconut Processing facility
- Mr P. R. Sanjeev, Managing Director (Retd.), MILMA
- Mr R K Bhoo des Pillai, Chairman, Federation of Indian Cashew Industries, Former CEPCI
- Mr Sudheer K, Additional Director of Industries and Commerce
- Mr Damodhar, President, Kerala State Small Industries Association

#### ***Terms of reference***

- To suggest broad measures to deepen and expand the participation of the cooperative sector in the process of economic growth of the State, and to involve youth in the cooperative movement in the State.
- To suggest measures to upgrade the use of technology in the functioning of primary cooperatives, such as the introduction of unified software.
- To suggest measures to improve professionalism in the functioning of cooperative societies in the State.
- To prepare a guidance note on Business Process Reengineering of the Kerala Bank to serve as a key provider of resources to the productive sectors, such as agriculture and MSMEs as well as tourism.

#### **Convener**

Sri. S S Nagesh, Chief, Agriculture Division, State Planning Board

#### **Co- Convener**

Smt. G C Roshini, Agronomist, State Planning Board

#### **Terms of Reference (General)**

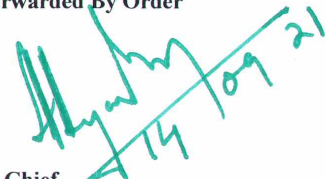
1. The non-official members (and invitees) of the Working Group will be entitled to travelling allowances as per existing government norms. The Class I Officers of GoI will be entitled to TA as per rules if reimbursement is not allowed from Departments.

2. The expenditure towards TA, DA and Honorarium will be met from the following Head of Account of the State Planning Board "3451-00-101-93"- Preparation of Plans and Conduct of Surveys and Studies.

*The order read as reference 3 is modified to this extent.*

(Sd/-)  
Member Secretary

Forwarded By Order

  
Chief,  
Agriculture Division

To

The Members concerned

Copy to

PS to Vice Chairperson  
PA to Member Secretary  
CA to Member (Dr.Ramakumar.R)  
Economic Advisor to VC  
Chief, PCD,SPB  
Sr. A.O, SPB  
The Accountant General, Kerala  
Finance Officer, SPB  
Publication Officer, SPB  
Sub Treasury, Vellayambalam  
Accounts Section  
File/Stock File