

Coastal Biovillage Toolkit



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Toolkit

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Preface

M.S.Swaminathan Research Foundation (MSSRF) organized an interdisciplinary international dialogue on Biotechnology, which proposed the concept of Ecotechnology during the year 1992. The 1993 dialogue on Ecotechnology suggested Biovillage model for Job Led Economic Growth with a pro-poor, pro- women and pro-nature orientation to technology and public policy. The Biovillage activities concurrently address the twin problems of rural development viz. optimizing the use of natural resources and livelihood enhancement of the rural resource poor. In particular the Biovillage will help to produce market –driven biological softwares like biopesticides, biofertilizers etc. for sustainable agriculture.


Subsequently MSSRF started implementing Biovillage programmes at the field level in the state of Pondicherry since 1991 and later the experiences were replicated in the coastal villages located in Chidambaram and Gulf of Mannar regions in the state of Tamil Nadu.

The Coastal Biovillage movement relies on the sustainable use of natural resources and the introduction of market-driven, non-farm livelihood options as well as value addition to primary products. It also involves a paradigm shift from unskilled to skilled work, resulting in the addition of economic value to the time and labor of the coastal community. One of the important components of this programme is the establishment of aquaculture estates that can help to confer the power of scale to fisher communities in the production, processing and marketing. Seawater farming is another potential area, which could help to enhance the livelihood sources if the technology and services are environmentally sustainable.

The Tsunami killer waves caused an enormous damage to the human lives, livelihoods of the coastal villages and the coastal ecosystems. In the post tsunami scenario; extensive coverage of

fieldwork shows more scope for converting the tsunami-affected villages in to Biovillages. The economy and the ecosystems of these coastal villages can be strengthened through the Biovillage model of rural development. Actors representing several organizations and agencies with enormous social commitment and energy are now in the field working to rebuild the livelihoods and create assets to the tsunami-ravaged families with medium and long term rehabilitation programmes.

This tool kit titled 'Coastal Biovillages' is prepared based on the practical experiences gained by the MSSRF while working in the Biovillage projects for the last one and half decade in the states of Pondicherry and Tamil Nadu. The tool kit would help to facilitate the process by the planners and implementers of livelihood and natural resource management programmes such as government officials, bankers, representatives of NGOs, Panchayat Raj Institutions and Community Based Organizations.


(M.S.Swaminathan)

About this toolkit

The present toolkit on ‘Coastal Biovillages’ has been prepared based on practical experiences gained by M.S.Swaminthan Research Foundation from Biovillage projects conducted since 1991 in the villages of Pondicherry and later in the coastal villages of Pichavaram and Gulf of Mannar regions of Tamil Nadu.

In this tool kit, section one to seven gives useful guidelines covering various essential aspects for the Biovillage practitioners, followed by the annexure, which gives details of selected interventions in the areas of fisheries, agriculture and market driven microenterprises with a few illustrations. These guidelines and ideas given in the toolkit may not entirely suit to the situation of your own, but still it helps you to learn and use some of them to your own field conditions. If you have suitable examples and stories they could be also appropriately integrated in the process.

The sections presented in the toolkit are not a series of linear steps, but a spiral and cyclical process. When the process moves forward new initiatives and new processes might emerge, which may necessitate role change of the partners involved. The sections are interrelated and may have to be utilized in a different situation in a different order. Therefore they are intended only as guidelines, not as rigid rules.

We hope this toolkit will be of some help to obtain practical guidelines and to develop a framework to develop Biovillages in coastal regions.

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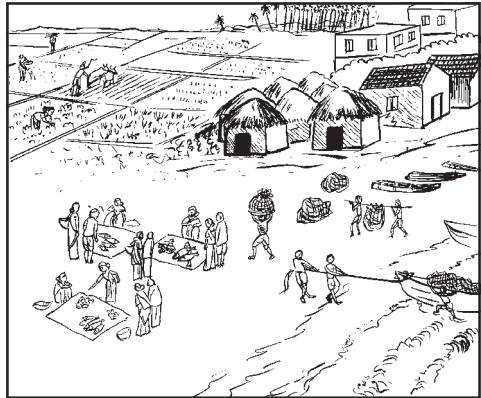
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Section 1: What is a Biovillage

The word 'Bio' means living. The term Biovillage indicates concern for all living organisms in the village - including human beings as well as natural resources such as soil, land, water and biodiversity. Biovillage proposes a human centered approach.

Mission statement

The Biovillage model of sustainable and equitable human development is based on the principles of natural resources conservation and utilization, social equity and economic well being. The disadvantaged sections can overcome poverty if they are enabled to earn their living through assorted livelihood opportunities based on on-farm, non-farm and aquatic resources by optimally utilizing the limited resources. This can be achieved through skill and knowledge empowerment.



Biovillage adopts the following approach:

- It keeps the resource poor people at the center.
- Planning is holistic keeping in mind and encompassing all relevant aspects of people's lives and livelihoods.
- It focuses on people's strength.
- Various decisions are taken to address the needs of the different sections in the society like aged, women, tribals, youths, labourers etc.
- Promotes rights/ entitlements related to social status, properties and resources.

This model promotes a job-led rather than job-less economic growth in rural areas.

Biovillage model of development focuses mainly on:

- Enabling the community to understand the potentials of sustainable natural resource management.
- Introducing various livelihood opportunities in farm, non-farm and sea side sectors blending traditional knowledge with frontier technology.
- Building grassroot institutions such as Self-Help Groups (SHGs), Federations, farmer or fishers' clubs and Biocouncils to take up the development initiatives under the framework of Biovillage.

The objectives of the Biovillage programme can be achieved through imparting knowledge, skill, information and organizational empowerment to rural communities, with priorities being accorded to women specific eco-technologies based on the blend of modern technologies with traditional wisdom and knowledge. It strengthens the capacity of the rural community to blend sustainable natural resource management with livelihood security through economically feasible, socially acceptable, ecologically viable and gender sensitive interventions. The approach encourages a value addition process within the system, to generate sustainable ecojobs and income in the village.

Gender mainstreaming is done which is not the goal, but is the means to reach the objectives of activity towards social equity. Gender as a crosscutting theme needs to be integrated in the entire project cycle, starting from situation analysis to self-sustainability of the local institutions.

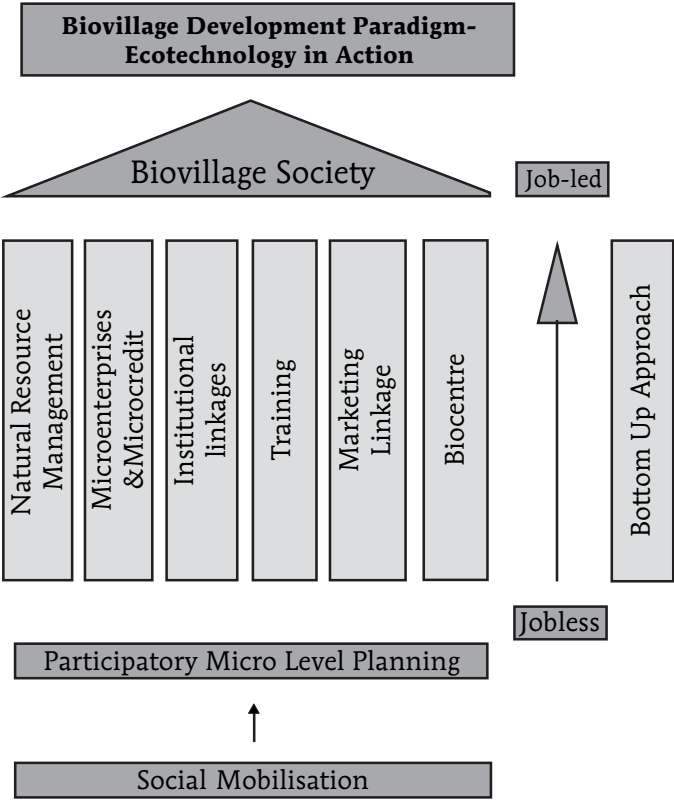
What is gender: Gender is a social construct, not the same as sex, which is biological. Gender is determined by assigned roles and responsibilities in the society both in domestic as well as in public life.

Gender relations are context/group specific, not all men and women are the same, they differ in age, caste and economic status and these differences and positions influence their respective tasks, responsibilities and statuses. The roles and responsibilities are dynamic, not static, and changes according to the prevailing situations. Gender relations are power relations.

Gender relations: Roles, responsibilities, resources and values attached to women and men in order to assess the differences and inequalities between them and their related interests, opportunities, constraints in and needs for development.

The local institutions evolved in the process manage the Biovillage activities.

Biovillage Paradigm



Section 2 Social Mobilization

What is social mobilization?

Social mobilization provides the base for a genuine participatory approach to development. It brings all rural and tribal men and women, in their various capacities, socioeconomic status and affiliations for active participation in making decisions that will affect their lives.

The output: Knowing the community and introducing oneself to the community and arriving at a consensus to work together; the facilitating agency being accepted by the community.

Rural or village community is commonly used with a very generic sense. But it is essential to understand that this encompasses several distinct social groups like different castes, religious and ethnic groups and further social subdivisions within those groups.

What we need for community mobilization is patience, mutual understanding and empathetic approach.

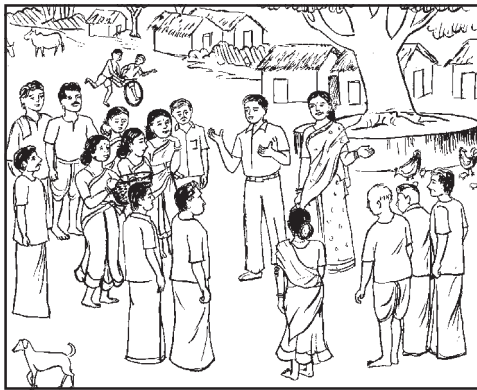
Why do we do social mobilization?

- To gain confidence and support of the community.
- To ensure the genuine participation of the members.
- Since success of the development activities as well as the effective use of available local resources depends largely on the cooperation and support of the community members.

The process of social mobilization

Step one: Introducing yourself to the village leaders (traditional and elected) to explain who you are, your background and the purpose of your visit to the village.

Step two: Common meeting with the villagers organized by the leaders based on the request from your side. Repeat again who you are, your background and the purpose of your visit to the



village and answer their queries and clarify doubts if any. If it is essential organize two or three such village level meetings. Also, repeat your visit and discuss in detail with the knowledgeable villagers and village leaders. Provide examples of your work in the nearby areas (if

any) in the form of video clippings, posters, brochures etc.

Step three: If the community agrees to work with you, prepare the community to act as a primary stakeholder. Organize sect wise awareness programmes and meetings to explain the Biovillage concept with the help of posters, video screening, exposure visits etc. It helps to gain more clarity and develop confidence among the villagers. Special care is required to mobilize women, and other socially and economically disadvantaged sections of the community.

Step four: Analyse the prevailing conflicts or disputes in the village community and how it needs to be resolved to bring them together and form groups, associations etc. The conflicts may occur at different levels:

- a) Conflict between the local communities and outside groups- between two villages/communities like sharing tank water for irrigation, traditional fishing zones, traditional rights and forest laws or coastal regulations etc.
- b) At the village level over community owned and community managed land and other resources such as fishing areas, grazing areas, community gardens, community funds, traditional community rights etc.
- c) At the micro level like interfamily, such as disputes over land boundaries, land distribution, debt distribution, sharing of

ancestral properties, share cropping, sharing the profit in fish catch etc. and at group level, like in SHGs, the subjective behaviour of leaders, lack of transparency in accounts and meeting procedures etc.

In a village situation conflict arises as a natural local phenomenon due to changes - introduced or internally induced in the domains of political, economic or physical environment. Conflict is common and inevitable part of any social life. Conflict can cause loss of time, resources and efficiency, but if managed well, conflict can result in

- Innovative and appropriate ideas
- More informed decision making, and
- Better performance

The facilitator who deals with the conflict should be aware that conflict is just not one event or one dispute, conflicts are often complex. It is essential to find out the causes of the conflict, its local cultural dimensions, the people involved, resources and decisions

Step five: The community members, especially the poor farmers, fishers and women form their own 'groups' based on common development interests and needs. The main advantage in forming group is that the group provides leverage to the members to tackle problems, which can not be handled as single individuals.



Mobilization can begin by forming small groups to address immediate problems like lack of access to credit, sharing of water, functional literacy, seed availability, local specific information needs etc., that affects the livelihoods. The details are given in Section 3.

Section 3 Community Based Groups/ Institutions

What is a community-based group/institution?

Community based groups/institutions are local informal institutions that bring together the men and women of different socio-economic categories and functions based on the common objectives and governed by collectively devolved rules and regulations.

Why we need community based groups/institutions

- Help to cope up with new changes in order to meet the needs by providing better goods and services.
- Provide scope for accommodating the process mode and help to include marginally and socially excluded groups.
- Sensitive to local complexities like caste, class, gender and age
- Act as an effective local forum for decentralized planning and action.
- They help to reduce transaction cost.

How to form: Formation of the Community based grassroot institution is a process. The process can be initiated by the facilitator explaining the benefits of participatory small groups as all the members benefit from the combined skills and pooled resources. It can be done through holding two or three meetings with them.

In these meetings discuss the need to develop a common bond among the members by providing generic examples, suitable case studies etc.

It should be followed by active discussion among members

- who have common interests and shared and realistic objectives.

- The group size (if necessary) and structure is decided at this stage.
- Selection of leaders is the next step by either nomination or election, based on individual's experience, leadership quality and social commitment.
- The final step is to develop duties, roles and responsibilities of the members and the leaders of the group.

While forming groups one should be careful to identify the members of the poor and the poorest households such as fisher labourers, fishermen using catamaran and dugout canoes, fisher women vendors, small and marginal farmers and agricultural labourers etc.

It is very vital to be democratic in all of the activities listed above.

Some of the examples of functional community based groups/institutions are Catamaran users association, Women fish vendors association, fishing labourers group, farmers association, self-help groups, youth clubs etc.

The functional group approach facilitates the community to come together, to diversify their livelihoods through ecoenterprises and bring 'economy of scale' in production and marketing of

Theme based SHGs

Mobilize the homogenous group of people with the minimum of 10 to the maximum of 20 members and organize them into informal groups like fisherwomen vendors, agricultural labourers, flower growing farmers, catamaran fishermen etc. Set specific objectives for the group, name and evolve rules for functioning, decide the frequency of the group meetings and amount of savings for a month and help to create linkages with banks and other government departments. Introduce the members to the bank officials, train them in accounts management, bank transactions, records maintenance, facilitating internal credit systems, inculcating differential interest rates for various purposes etc.

agricultural or aquaculture products. The scale also helps to set up primary value addition of the products at the village level. It also helps to get more production and income by having greater access to credit, information inputs etc, and helps to acquire new skills.

The next step is instilling confidence through training and capacity building to maintain registers, conducting meetings, planning for need based activities, reviewing the activities and managing the group etc. The best mode to initiate the process is by conducting exposure visit to other well functioning groups to see how their own counterparts in the other groups are functioning. Seeing and observing, and evaluating the others activities would help the rural men and women to get convinced and act.

Following this, efforts should be made to develop a system and institutionalize the activities for a sustained action.

The successful and profitable group may encourage self-replication by mobilizing other people in the community and help to organize groups of their own. The facilitator should promote this up scaling to form clusters and federations/associations. This helps to develop lateral linkages, to share experiences, and extend mutual support. (The details on inter-group linkages are given in Section 7).

The facilitator should help the groups to develop need based linkages with other groups, NGOs, banks and service institutions to attain sustainability. It can be done through taking the group leaders to meet the other groups and officials in institutions through such 2-3 visits.

If there exist institutions such as farmers association, fishermen association or self help groups mobilized by other NGOs or Government agencies and Panchayat Raj Institutions they could be effectively used to achieve the project objectives. This could be achieved through facilitating a dialogue on sharing of objectives, approach, resources, roles and responsibilities.

Subsequent to organizing that the members into groups, it is easy to start the Biovillage planning process. This group that acts as a forum is developed at the village level to initiate the activities.

The facilitator should encourage group members to take their own initiatives and slowly reduce the frequency of visits by the promoting agencies. The group thus can become more independent. Hereafter the role of facilitator changes from initiator and active participant to assistant and technical support provider.

When you form informal local groups, to ensure gender mainstreaming it is essential to consider the following three points. It is being done to guarantee the participation, involvement, freedom to express their problems and views and to influence the decision.

1. While forming common groups ensure equal representation for men and women (if the situation is not conducive for equal number of representatives at least guarantee one third representation for women)
2. Forming women exclusive groups (if there are already existing groups, if the purpose and approach matches with these groups work with them)
3. If the plan is to work with the existing common groups and institutions take necessary steps to incorporate the element of introducing sufficient women representation.

Obviously in any community men and women have different roles, needs, perceptions, ideas and knowledge. Similarly in most of the communities women are not allowed to participate and express their opinions and ideas in public. They are expected to follow the views of their husbands, fathers, father-in-laws. But they may come out openly in informal or in a formal gatherings of their own exclusive group.

Section 4 Planning for Biovillage Activities

In the previous sections we discussed about Biovillage and social mobilization methods and the processes for initiating developmental interventions. In this section we will concentrate on the appraisals/survey to collect appropriate primary and secondary data and planning - especially preparing action plan related to the activities of a Biovillage.

This Section is divided into three parts

1. Collection of Primary data
2. Collection of Secondary details
3. Participatory appraisals

1. Collection of primary data (socioeconomic profile)

The social infrastructure of the households in a selected village is collected (baseline data), which acts as a base for designing developmental interventions. Later the same data would be used to assess the results of the intervention in quantitative terms.

Step 1: Conduct survey to understand and carry out quantitative assessment of the situation through simple household based survey to get first hand information. It includes the family details, educational status, primary and secondary occupation, available sanitation facilities, land holding and livestock details. Based on the size of the village the facilitator either organizes stratified sampling or includes all the households.

Step 2: The collected data is analyzed by forming a master table and correlating the variables to figure out small and marginal farmers/fishermen and their proportion to total number of farmers/fishermen in the village, extent of men and women agricultural/fishing labourers and their degree of dependency on agriculture/aquaculture or both for their livelihood, situation

of farmers and agricultural labourers, fishermen and fishing labourers across caste, educational level, asset ownership, livestock holding, employment opportunities etc.

2. Collection of secondary details

Step 1: Collect the related secondary details on population, literacy rate, employment, average annual income, local industries and agencies, organizations and communication channels, community services and facilities, infant adult mortality ratio, educational institutions, health facilities, transport network, market access, access to formal financial institutions, cropping system, area under different crops, crop rotation, irrigation facilities (proportion under well/pond/canal/dryland irrigation systems), availability of agricultural, fishery and livestock extension services and location of the contact centres, livestock population, water sources (both underground and surface stored water) and also present land use system including the current fallow and grazing area, community ponds, seashore available etc.

Step 2: Based on the available livestock and the grazing area, work out the carrying capacity in terms of grazing land, water etc using the standard conversion factors. For example to sustain one goat all through out the year it needs one acre of the grazing area. Likewise milch animal need three to four liters of water to produce one litre of milk. Likewise for the agricultural crops find out the fertilizer consumption as well as pesticide consumption rates and work out the calculations related to aquaculture activities.

3. Participatory appraisals

Participatory Rural Appraisals (PRA) helps to understand the village situation through the eyes of the local men and women, creates an enabling environment and facilitates the community to define the process of development in a village. It will be helpful in the early stages of planning, consultation and engagement.

1. Since the purpose of appraisal is for participatory planning, a series of working sessions over a period of weeks is necessary

to prepare the villagers to participate in the collection and analysis of information. Based on the demographic size and other social variables like caste, gender etc. decide the number of sites to which the appraisal is going to be organized in the village.

2. With the support of local leaders and youths select the convenient place to sit and discuss, fix a suitable date and inform the entire community. Ensure that the scheduled time is suitable for both men and women to attend and some times extra or a different time allocation may be necessary for the women Cattamaran fishers and agricultural labourers to participate. Regarding the venue, public places like school or a common ground can be used.
2. Team: Ahead of time identify and inform the set of people from different disciplines - social, biological, agricultural, veterinary etc.- to form an interdisciplinary team who will help to facilitate the group while carrying out the exercises. The selected members should be familiar with the appraisal tools, be sensitive to gender issues and be willing to spend time with the villagers. It is necessary to include equal number of women members in the team, which will help to establish a comfortable rapport and conduct PRA exercises with women members. It is best that the total number of members in the team ranges from minimum of six to a maximum of ten.
3. Make arrangements for things that you may require like chart, sketch pens, colour powders etc.
4. Make arrangements for tea and snacks if possible for food.
5. Explain to the members clearly the purpose conducting PRA and motivate the people to freely express and clarify their doubts before going ahead with the exercises.
6. The participants must be divided into groups such as men, women and youth, fisher, farming and agricultural labour groups (maximum of 10-12 members) based on the village

needs. One team member can facilitate each group and her/his role is to introduce the purpose of the tool and ensure the participation of all group members and take notes on the discussion. At the end each group presents the findings and the facilitator facilitates discussions/ clarifications to arrive at a consensus.

7. In the participatory work, the behavior and attitude of the facilitators are as important as the methods being used.

Since the society is gendered, the situation analysis needs to be done to ensure women representation and space to express their voice, through common meetings (if required) and through organizing separate meetings for men and women. In the present situation the facilitator should identify the tool, based on the requirement, organize either a common group with sufficient representation of women or exclusive men and women groups. For eg. to map out the institutional linkages a common meeting could be organized, but in the case activity profile or daily routine it is necessary to organize separate groups.

The tools such as seasonal calendar, Village resources mapping, daily routine charts for women and men, access and control profile, transect analysis and venn diagram are carried out basically to understand the available natural resources, its utilization pattern, and human resources. Finally triangulation is done using tools like maps, trend lines, interviews and discussion, listening to what different people have to say on the same

topic (eg. men/women, poor/rich, young/old about livestock population). The simple methodologies to conduct aforesaid tools are given below.

Village Resources map This helps to know about the village and community and its resource base. Basically it includes the detailed land use in the village such as fishing areas, seashore, village ponds, backwaters, agricultural land (wet/garden/dryland), grazing area, waste land, forest land, water bodies, etc. as well as

agro-ecological zones like type of soils, slopes and cropping systems. It also includes other public service facilities like Primary Health Centers, schools, religious centers etc. It is a suitable tool to begin the programme with and encourages people to contribute their thoughts at an early phase of participatory process.

Process: A large open space or chart can be used. It will be easier to start by marking a central place and encouraging the participants to draw other things that are important to them and finally ask them to present it and also to describe the features represented.

Expected outcome: From this one can get information on the location of the village, available resources and its utilization pattern, utilization pattern of Common Property Resources, source of water, firewood, grazing areas, fishing areas, backwater, and constraints/potentials in each indicated resources.

Social mapping This helps to know about the social structure of a village and the criteria/ indicators used to define the differences.

Process: Form a group of 10-15 persons (giving equal importance to women) who are familiar with the village. Start the mapping either in a big sheet or on the ground. Request them to show the location of the households, subsequently discussion is held on identifying the criteria's to describe the social groups, wealth (for eg, type of the house, number of livestock etc.) and ask them to mark the location of the households using symbols.

Expected outcomes: It helps to get the demographic details, migration information, caste groups, landless households, small and marginal farming households, number of female headed households etc.

Seasonality calendar This tool helps to learn about the monthly activities and to explore the changes in economic activities, employment opportunities and the livelihood systems over a year in the village.

Process: Organise a group of 10 –15 members (men and women) separately in two groups. In the big sheet ask them to mark the list of details vertically and indicate twelve months horizontally and facilitate the discussion in each of the month on fishing practices, cropping practices, labour availability, employment opportunities, number of days they are available, type of work, village festival, rainfall distribution, food and water availability, information needs, credit requirements etc.

Outcome: Helps to understand the livelihood systems stability, food availability, the climate, cropping pattern and system across the agroecological zones, agronomic, aquaculture practices, employment opportunities over the months, income and expenditure sources, festivals and other important ceremonies pertinent to the village. The calendar could vary as per the backgrounds of the participants land holding, fishing and landless families.

Daily activity charts These help to know the workloads and time spent for each of the activities between different communities in the village as well as between men and women.

Process: organize separate group of women and men from different socioeconomic sections, find out the differences in the workload for different seasons and record the variations - accordingly ask the groups to record their activities in a day, in some cases activities that are carried out simultaneously like child care, fetching water



can be recorded within the same box.

Expected outcome: Helps to know how much time is spent on productive/ domestic activities, its variation, how it is varied among socioeconomic groups, men and women, and helps to plan to utilize the time effectively.

Venn diagram This helps to know about the importance and linkages between local groups and institutions.

Process: Organize a group of women and men with representation from different socioeconomic groups. Request the group members to list out the local groups and organizations that are important to them. Then ask the members to rank them based on their importance or represent the institutions as a circle (size of the circle indicates the relative importance and distance shows the degree of transaction).

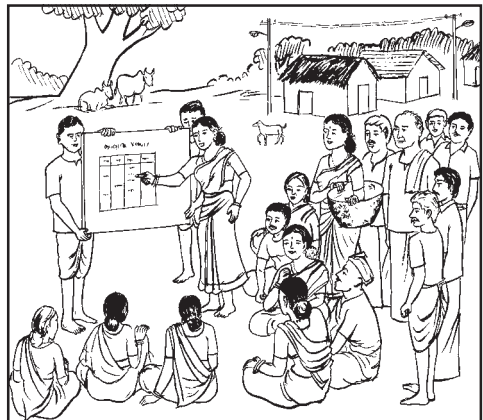
Expected Outcome: Helps us to know what the local groups feel about environmental or social or economical issues, as well as the links that exist between external institutions like NGOs and government institutions and the local community.

These PRA tools can be supported by additional field methods like direct observation, semi-structured interviews (individual/group), key informant interviews and informal group discussions to further explore and verify the learning gained.

Direct observation helps us to get first-hand information and to support and cross-check the information from other methods.

Semi-structured inter-views can be conducted either individually or also in groups. Here the questions may depend upon the ongoing discussion; also the facilitator need to have checklist and the inter-view should be relaxed and friendly manner.

Key informant interviews during the discussion if you need more information discuss separately with selected persons who posses more knowledge on the particular topic/issue.



Based on the Participatory appraisals the information on the local peoples' livelihood strategies and priorities for development will be identified. Simple household based questionnaire and secondary data helps to get more details on the social infrastructure of the village. By integrating these two modes of data and information collection prepare a framework for initiating Biovillage activities related to

- Enhancement of Integrated Natural Resource Management in terms of soil management, efficient water use, use of biological products for pest management and fishery management etc.
- Promoting multiple livelihood opportunities through ecoenterprises, which has necessary backward (bank, technical institutions, extension services), forward (marketing agencies) and lateral (with another SHG, or farmers or fishermen association) linkages.

Developing a framework for Biovillage project

Based on the earlier analysis and discussion, develop objectives to build a Biovillage. The objectives need to address strengthening and enhancement of natural resources and promote activities that help to generate skilled jobs. It should be multidimensional covering issues related to environment, economic, social and institutional aspects.

Objectives are jointly evolved by the community and facilitating agency. It is done by organizing the group leaders and active members, presenting the findings of survey and PRA and thus facilitates to evolve objectives, which cover the different socioeconomic groups requirements. Based on the objectives, possible activities are identified and prioritized.

Subsequently joint action plan (based on the group size and activities)- annual or quarterly work plans for the specified activity indicating the time, responsible persons, collaborating agencies, budget and expected outcomes are developed with the involvement of the participating group members.

For example if System of Rice Intensification (SRI) method is to be promoted to reduce the production cost and inputs (seeds and water) among the paddy growing farmers then the action plan should have the component of training/exposure visit, putting up of participatory demonstration plot and capacity building to understand the basic principles (mostly to be done through learning by doing mode). Likewise it has to be prepared for promotion of ecoenterprises.

Action plan for System of Rice Intensification (SRI)

Activities	Time	Persons responsible	Expected outcome	Mode
Exposure visit	Feb 3rd week 2005	Facilitating agency (facilitator name)	Know what is SRI	Visit to the field and discussing with practicing farmers
Identifying the constraints in paddy cultivation and planning on SRI demonstration	Feb 4th week	Facilitating agency (facilitator name)	Document and plan	Group discussion
Nursery management	1st week March 2005	Facilitating agency (facilitator name) + participants	Imparting skill on modified nursery techniques	Demonstration and practice
Planting	3rd week March 2005	Facilitating agency (facilitator name) + participants	Skill on Planting techniques	Demonstration and practice
Water management + monitoring	1st week April 2005	Facilitating agency (facilitator name) + participants	Awareness and skill on efficient water use	Demonstration
Weed management + monitoring	2nd week April 2005	Facilitating agency (facilitator name) + participants	Skill to use the improved manual weeder	Demonstration and practice
Participatory assessment	3rd week April and 1 week May 2005	Facilitating agency (facilitator name) + participants	report	Field evaluation and Group discussion
Harvesting + Evaluation	At the time of harvest	Facilitating agency (facilitator name) + participants	Report	Field evaluation and Group discussion

Action plan for developing ecoenterprises

a) Trichogramma Parasitoid

Activities	Time	Persons responsible	Expected outcome	Mode
Introduction to trichogramma egg parasitoid and its role in IPM	Feb 3rd week 2005	Facilitator	Awareness about the enterprise	Lecture, video screening and group discussion
Exposure visit	Feb 3rd week 2005	Facilitating agency (facilitator name)	Awareness	Exposure visit
Establishment of the unit and preparation of business plan				
Feed preparation				
Inoculation				
Monitoring				
Catching moths and eggs				
Parasitization				
Quality control				
Packing and evaluation				

b) Crab fattening

Activities	Time	Persons responsible	Expected outcome	Mode
Orientation about aquaculture and crab fattening	March 1st week	Facilitator	Self confident entrepreneurs (Water crab, fattened crab identification)	Lecture, Video screening, photo exhibition and group discussion
Exposure visit to a success story	March 2nd week	Facilitator	Attaining technical know-how and motivation towards crab fattening	Discussion with " <i>field trained farmer</i> " about the practice involved in crab fattening
Site selection and pond preparation	March 3rd & 4th week	Facilitator + Participants	Pond suitable for stocking	Following Pre - stocking procedures
Stocking	April 1st week	Facilitator + Participants	Seed stocking	From wild collection/purchase
Feeding				
Harvesting + Evaluation				

Section 5 Training and Capacity building

Training and Capacity building programmes are organized to enhance skill and knowledge and to develop an attitude to accept change and to make sure that the targeted audience performs to the best of their ability. This would provide them the confidence to perform to the best of their ability in relation to the available natural resources and livelihood practices.

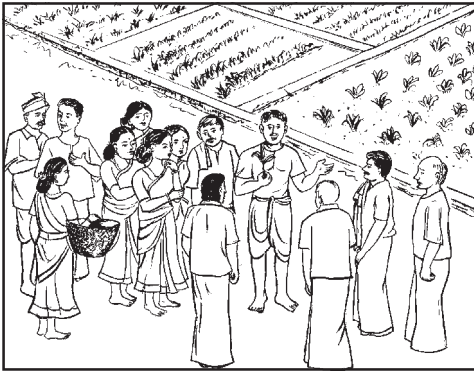
Capacity building empowers people and enables them to gain control over their own livelihood practices and environment. The long term aim is to empower the people to become self-reliant and self-sufficient.

Step one: Identification of the training needs based on the Biovillage action plan prepared for the different sections like men and women farmers, agricultural labourers, self help groups, youths, community leaders, fishermen and fish vendors etc. Needs of the groups varies, the training needs of men and women need not be the same, hence separate group discussions help to collect the list of needs by each group.

Step two: Following this exercise through focus group discussion, prioritization is done using the list of criteria identified by the group.

Step three: Preparation of a training plan- The nature of the training should be more interactive and participatory. Ensure equal number of men and women participants based on the common needs like awareness and knowledge generation and skill building (introducing new skill and strengthening the existing skills) related to Biovillage activities.

Focus Group Discussion: This is adopted within homogenous groups in terms of occupation, age, gender etc. The group comes out with the right needs and the related actions. Share the results with the larger group while preparing the training plan.



If the need is exclusive to women, organize separate programme taking in to consideration like convenience, time availability, venue, if possible identify competent women trainer etc.

Component one: Discussion on the appropriate mode

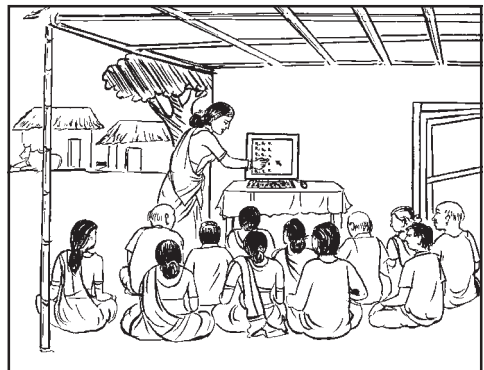
for imparting the training programme. The methods could be community meetings, meeting of the specific functional groups, exposure visits, institutional visits, classroom lecture combined with field demonstration, learning- by -doing, farmers field schools, fisherwomen field school, organizing *melas*, using modern ICT, using the best practioner in the area as resource person etc.

Component two: Identification of suitable training sources, which includes the expertise available, institutions and location etc.

Component three: Identification of mutually convenient dates for all the partners involved, individuals responsible for implementing the training and resource required.

Organize feedback sessions at the end of each training programme to assess the effectiveness of the training programme. This should cover both the content and the process of the training program.

Training and capacity building based on the changing needs and requirements is a continuous process and thus periodically observe and identify the needs and organize the programmes accordingly.



Section 6 Monitoring and Evaluation

Monitoring means checking whether the activities take place according to the work plan prepared for the specific period.

Evaluation means finding out whether the activities completed have helped achieve the objectives and identify the required possible improvement in the activities.

Why we monitor and evaluate?

- To assess whether the implemented activities are on the right track
- Help to incorporate midcourse correction- suggesting situation based changes in the plan to improve the performance
- It helps to improve the effectiveness by making them continuously assess their own performance.
- Helps to learn lessons from the past mistakes, which helps to reduce or avoid mistakes in the future.

Monitoring and Evaluation plan helps to strengthen the problem solving capacity of the rural poor and also over a period of time achieve self-reliance. Participatory Monitoring and Evaluation (PAME) tool is commonly used to practice this.

How to go about it?

Step one: Create awareness on the importance of monitoring and evaluation in the entire group (members) through organizing group meetings and presenting successful PAME case studies.

Step two: Develop a joint monitoring and evaluation plan. It should be simple and suits the skills and traditions of the participants. The plan should have the following components a) Activities b) monitoring period c) expected outputs d) Indicators (both qualitative and quantitative) e) identifies who is responsible and f) gives feedback to spell out the status of the activity

- In the Farmers Field School approach, the quantitative indicator is the number of trainee days and number of trainings organized and number of new practices demonstrated etc. and the qualitative indicators are new skills acquired, types of different training materials and methods used and so on.
- While monitoring gender- specific indicators (process and outcome) the following could be evolved
- New roles women assume outside their household context
- Women as resource persons and role models
- Number of women members in the institutions and office bearers
- Enhanced role of women in decision making within the household and public contexts

Step three: Identify suitable tools for data collection like groups registers / records, observation, open - ended interviews, Focus Group Discussions, venn diagram, case studies etc. (while selecting the tools please keep in mind that the tools should be user friendly, self instructing, simple, time and cost effective, culture sensitive etc.)

Step four: PAME could be organized at the end of the each work plan period. Organize the group meeting,

discuss and decide the set of tools to be used, data collection followed by discussion on how the actual progress and activities differ from the planned activity and make a more realistic plan.

It is important that the results of the present PAME should be effectively utilized for the next work plan as inputs.

Section 7 Biovillage council, Networking and Linkages

Why we need a Biovillage council?

When inter-linkages (horizontal) are facilitated among the functional groups operating within the village/region, they become more efficient and helps this in turn to develop need based vertical linkages with other institutions/agencies. It helps to reach the following

- Provides scope to attain economy of scale
- Would lead to better delivery of development services and reduce the transaction cost
- Increasingly the poor become more and more self-confident

The process of facilitating the biocouncil

The suitable situation for developing intergroup linkages is when the number of groups are more. When the number of groups are increased the capability of these groups to face challenges and problems increase.

Step one: The first activity is to build awareness on intergroup linkage through organizing common group meetings which could provide space for interaction among the groups and help them to get to know each other and discuss about developing relationships. The next effort could be organizing exposure visits to successful fishermen or farmers cooperatives, SHG federation etc. This results in gaining more practical knowledge and clarity on developing the next level structure.

The collective and direct marketing of fish harvest by small fisher groups, similarly group farming method of particular crop which helps the farmers and fishers to eliminate middle man with in the region with marketing agencies would help to get better price and negotiating power

Step two: Setting realistic objectives and the approach to realize them shared by all of the groups identified; the approach should be framed by the biocouncil comprising a group of committed and responsible leaders and must be done by arriving at a consensus. This is done with the help of an experienced facilitator.

Step three: Evolving organizational structure, rules, roles and responsibilities of the office bearers, and members with the support of an experienced facilitator. In this process it is necessary to promote norms and values such as tolerance, social inclusion, cooperation, equality and good practices (e.g. sound financial management). Some of the import roles of Biovillage council would be

- Planning the activities of Biovillage a) short term b) long term
- Periodical assessment of community needs
- Monitoring and evaluating the activities of Biovillage
- Identifying and mobilizing resources
- Playing active role in local conflict management
- Identification of suitable external partners and also lobbying for support
- Expanding the need based networks
- Planning for effective utilization of modern ICT

Step four: Training and capacity building on leadership quality, organizational management, conflict management and record maintenance etc (this should be an ongoing process based on the need)

It is important to develop participatory conflict management skill to biocouncil members, SHG leaders, leaders of farmers club, fisher association and cooperatives etc. This should help to develop acceptable decisions on problems of mutual concern.

Networking and Linkages with other institutions

The purpose of networking is basically to extend the outreach of the resources in different ways, in order to increase the effectiveness of the Biovillage programme. For example the biocouncil can facilitate to link the SHGs and the fishers association with the existing government programmes, organizing area wise health camps, out sourcing SHG products, organizing matching grants, developing local infrastructure, rehabilitation etc.

Need based linkages must be developed with other groups, NGOs, banks and service institutions to attain self-sustainability. The facilitator should help the groups to approach and establish relationships through facilitating dialogue and partnership among various actors in a planned manner.

The Biovillage council needs to be active as well as proactive to quickly respond to the changing needs and opportunities of the community. It should plan and work for building human resource and achieve financial self-reliance.

Annexure

I Natural Resource Management

a) Coastal Aquaculture

Coastal aquaculture is the farming of aquatic organisms in saline water, that is some form of intervention is implied in the rearing process to enhance production, (such as regular stocking, feeding, protection from predators), plus individual or corporate ownership of the stock. The total estimated brackish water area of Tamil Nadu coast of 1076 km. is about 60000 ha. Most of the brackish water area especially mud flats and saline affected areas, remain barren or with limited biological productivity due to low soil organic content, low nutrient level and hyper saline conditions in most part of the year. To utilize these resources in a productive manner appropriate knowledge dissemination process is important.

i) Mud crab fattening

As the post-moulted crabs (moulting is a biological process involved in their growth), known as “water crabs” are weak with less meat and weight, they have to be fattened in suitable rearing medium. Since the survival of “water crabs” during transport from the place of capture to export destination is very less, they are paid a very low price. To avoid this loss crab fattening is an appropriate technique. This can be practiced in fenced tide-fed or pump-fed earthen ponds or in suitable enclosures like pen and cage erected in creeks and canals adjoining brackish water areas. Mud crab species (Larger species) *Scylla tranquebarica* and *Scylla serrata* (smaller species) (which are called as “Kuzhi nandu” or “Kattu nandu” or “Kora valai nandu” in Tamil) can be used for this purpose. As the bulk of live mud crabs export is shared by larger species (*Scylla tranquebarica*) the ‘water crabs’ belonging to larger species alone are considered for fattening. When there is demand for matured female crabs, the smaller species (*Scylla serrata*) females are preferred as their ovaries get developed faster than the larger species. In Tamil Nadu estuaries in the period of 1981-98 an average annual landings of 650 tonnes mud crab has been recorded.

Objective	Crab fattening – weight gain of ‘water crabs’
Product	Fattened crab
Application/use	Live mud crab export
Technology	Water crabs are purchased and stocked in enclosures in the rate of 1-3/sq.m. They are fed with animal meat such as trash fish, bivalve and molluscan meat, choked dried fish and wastes from chicken/goat slaughter houses. Generally water crabs in the size of 350 to 500g size gain 60 to 80 g. weight, while those crabs above 1000 g added weight of 100 to 120 g within 3 to 4 weeks.
Equipment and Machinery	Fenced pond/enclosure, Bamboo baskets or perforated thermocole boxes for live transportation.
Problems	Timely availability of water crabs; Cannibalism prevailing among crabs;
Duration of one cycle	3-4 weeks
Indicative investment	Rs.50,000/-.

ii) Shrimp polyculture (Low External Input Sustainable Aquaculture-LEISA)

Shrimp industry in India is suffering due to viral disease out break. The disease out break is due to very many reasons. One among them is higher density of shrimps in one place and monoculture. In this package, we will be concentrating on the polyculture of shrimp with milkfish. The white spot viral disease infection is minimized when poyculture is practiced. The synergistic effect between the shrimp and fish safeguard the shrimp from the viral outbreak in the pond.

Objective	to manage the viral disease, to use the local feed input, sustainable ecofriendly techniques, minimum external input
Product	shrimp
Application /use	export market
Raw materials	feed trash fish probiotics
Candidate species (milk fish)	<i>Penaeus monodon</i> and <i>Chanos chanos</i>

Technology	Due to polyculture technology the viral and loose shell disease will be managed. The pond environment provides ecologically balanced system with minimum environmental effect. The effluent from the pond is less polluted than in the monoculture, or high density shrimp culture
Duration	5 months
Equipment and Machinery	Pond, feed , fish and shrimp seed
Indicative investment	3 lakh/ ha

iii) Community/Farm pond aquaculture

The fresh water community pond are the main sources of fresh water for the coastal village people for their day to day purposes. These community ponds as well as farm rainwater harvesting pond can be very well used for the composite fish culture. Most of the ponds are under the control of the state government. Theses ponds can be used for aquaculture purposes. By leasing the ponds the local panchayat will get additional income and the local people involved will get enough income from the pond. The water source for the pond is by rainwater and also from the canals. During the monsoon months it will get filled. The pond will have water for about 8 to 10 months.

Obectives	Additional income from the pond, Protein malnutrition will be managed
Product	Fish,
Application/use	Nutritious/local marketing
Raw materials	Feed and seed
Candidate species	<ol style="list-style-type: none"> 1) Catla -<i>Catla catla</i> 2) Rohu- <i>Labeo rohita</i> 3) Mirigal- <i>Cirrhinus mrigala</i> 4) Grass carp- <i>Ctenopharyngodon idella</i> 5) Silver carp- <i>Hypophthalmichthys molitrix</i> 6) Common carp <i>Cyprinus carpio</i> Composite fish culture (Indian and Chinese carps)
Technology	Composite fish culture using Indian and Chinese carps. The stocking density would be one fish per 2m ² (5000/Ha). In the case of predator incidence the stocking density can be increased
Equipment and machinery	nets and raw materials
Duration of the culture	8-10 months
Indicative investment	25,000/- (1ha) for community pond and Rs. 5000/- (900 m ²) for farm rainwater harvesting pond

II) Agriculture

Coastal areas in Tamil Nadu and Pondicherry have diverse agro-ecosystems. Canal irrigated low land paddy is the major ecosystem followed by rainfed system and garden land using ground water. The major soils are alluvial soil, laterite soil and sandy soils and the predominant soil types are clay, silty clay, sandy clay, and sandy loam and sandy soils. The soil fertility map of Tamil Nadu in most of the tail end region indicates that it is low in nitrogen, phosphorus and medium in potassium and low in many of the micronutrients like zinc, boron etc. In some areas, especially south of Nagapattinam, the soil is rich in potassium but medium in nitrogen and phosphorus. Invariably the soil organic carbon content is very poor along this region. Organic residues or manures are not frequently applied with sufficient quantities.

Major crops and cropping system

Cropping system	Crops
Lowland (using canal water)	Paddy – blackgram/greengram – fallow Paddy – gingelly- fallow Paddy – rice fallow cotton
Dry land (rainfed)	Groundnut – fallow Coconut groves Mango Cashew
Dryland (ground water)	Floriculture/vegetables

In the agricultural fields the main management issues in the coastal areas are related to inefficient use of factors of production like water, fertilizers, pesticides etc. that causes increase in the unit cost of production as well as degradation of the natural resources. Thus, the integrated approach applies system thinking in carrying out these activities in a way that productivity enhancement goals can be achieved without compromising the capacity of the natural resource base and its underlying ecological processes.

The main objectives are

1. To increase the input use efficiency through Integrated Crop Management strategies.
2. To improve the soil fertility and health to sustain the resource base.
3. To disseminate the knowledge by facilitating horizontal transfer of knowledge.

i) Integrated Crop Management

With the increasing water scarcity situation and changing global trade and policies there is a need to introduce crop diversification and integrated farming approaches in these coastal regions. Apart from this, the main strategy in Integrated Crop Management (ICM) is to enhance the input use efficiency and conserve natural resources. ICM approach is an important shift in the direction of Integrated Natural Resource Management at the field level. In paddy System of Rice Intensification (SRI) is a method to conserve the inputs like seeds, fertilizers and natural resources such as water and soil. Increasingly there is a need to bring in the additional benefits of integrating component technologies as a package. For eg in SRI five systems such as nursery and transplantation, Spacing, Weed management, Nutrient Management and Water Management are integrated and disseminated as package. Following table shows how the package differs from the conventional practice.

SRI	Conventional
Nursery mgt Raised bed; need less resources like area, seed, water and labour	Need more area and management intensive
Planting technique Younger seedlings (8-14 days) Planting method – root should be placed straight Single or two seedlings Wider spacing	30 –40 days old seedlings Multiple (4-6) seedlings Planting L shaped placement of roots Close spacing

<p>Weed management Early and frequent weeding – four Rotary weeder (Konai) to incorporate the weed into the soil as green manure and to remove the aged roots (kind of root pruning)</p> <p>Water management Aerated soil – maintain 1-2cm thin film of water during tillering, flowering and grain filling stage. In other stages alternate wetting and drying is necessary</p> <p>Nutrient management Application of more compost or FYM to enrich microbial activity, use of real time need based nutrient management like leaf colour charts for N management, site specific nutrient management for Phosphorus and critical micro nutrients</p>	<p>Late weeding – two to three Manual weeding or use of herbicide</p> <p>Continuous wetting and treating rice as aquatic plant</p> <p>Application of inorganic fertilizers, and normally FYM or compost is used in limited amount</p>
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ii) Critical practices in Integrated Crop Management of selected crops

a) Paddy

The crop is cultivated in different ecosystem like upland paddy, direct seeding, lowland transplanted paddy and *Kullankar* paddy in selected pockets of coastal areas

- Selecting suitable variety for the season as well as salt tolerant/ flood tolerant local varieties like *Kunthali*, *Kallurundai*, *Kuzhivedichan*, *Soorakuruvai*, *Katchakombalai*, *Vellakudavalai* etc
- Adopting seed rate of 60 kg for short duration, 40 kg of medium duration and 30 kg for long duration varieties per ha. By adopting SRI method of paddy cultivation the required seed rate for the raised bed nursery is 7-10 kgs depending upon the duration of the varieties. In case of rainfed rice the required seed rate is 75-100 kg per ha and following line sowing.
- In case of direct seeding, the suitable varieties are Ponmani, Co 43, IR20, Ponni, White ponni, TKM 9, ADT 36,37,38, and

39 and preparing field with fine tilth with application of 5t of FYM or compost or 750 kg of enriched FYM with 50 kg of rock phosphate and adopting seed rate of 80-100 kg per ha.

- Dry seed treatment with *Trichoderma viride* @ 4 g/kg of seeds 24 hrs before water soaking and 600 g each of *Azospirillum* and *Pseudomonas fluorescens* with sufficient quantity of water and soaked overnight and pre-germinated seeds are broadcasted in nursery.
- Applying 40 kg of Di Ammonium Phosphate (DAP) @ 2kg/cent in the nursery for the healthy seedling growth as well as to avoid root snapping at the time of pulling.
- Summer ploughing to reduce water requirement for initial land preparation and preparing a good puddle soil to prevent loss of water through seepage and percolation and to reduce the incidence of weeds.
- *In situ* ploughing of green manures like dhaincha (*Sesbania aculeata*)/sunhemp (*Crotalaria juncea*)/manila agathi (*Sesbania rostrata*) which gives 10-15t of green matter or applying 10 – 12.5 t of FYM or compost
- Maintaining the population density of 80 seedlings, 50 seedlings and 33 seedlings per M² for short, medium and long duration varieties respectively
- Adopting water saving technologies like proper land leveling to reduce the amount of water needed to keep fields uniformly wet and alternate wetting and drying. The critical stages for irrigation are primordial initiation, booting, heading, flowering and grain formation.
- Applying 2kg of salt tolerant strains of *Azospirillum* and Phospho-bacteria on the soil and broadcast 10 kg of Blue-Green Algae flakes after transplanting and following soil test based nutrient application. Applying Nitrogen in split doses (basal and top dressing at the time of tillering, flowering and grain formation).
- Mixing urea with gypsum and neem cake in the ratio of 5:4:1 and keeping it for 24 hrs prior to application in a rice soil, had

slowed down the dissolution rate of urea granules and reduced the losses of nitrogen by about 8 kg/ha.

- Applying ZnSo₄ @ 25 kg per ha as surface application after transplanting or foliar spray of 0.5 % at 30th and 40th day after transplanting.
- Adopting Integrated Pest Management methods with need based pesticides use, based on the Economic Threshold Level.
- For effective control of blast – spraying *Pseudomonas fluorescens* @ 500g per ha with 500 liters of water.

b) Blackgram/Greengram/Cowpea

- Preparing the field to get good tilth without clods and apply 12.5 t of FYM or compost per ha.
- Applying seed rate of about 20 kg per ha.
- Seed treatment with 4g /kg of seeds with *Trichoderma viride* and 600g of multistrain *Rhizobium*.
- Maintaining population density of 33 plants/sq.m with a spacing of 30 x 10 cm.
- Adopting soil test based nutrient application or 25: 50: 50 kg of NPK per ha for irrigated crop and 12.5: 25:25 kg of NPK for rainfed crop.
- Spraying 2% DAP foliar spray at the time of flower initiation (two times) with 15 days interval.
- Spraying NAA 40 ppm twice at the first appearance of flowers and after 15 days of first application.
- Adopting Integrated Pest Management methods.

c) Gingelly (*Sesamum indicum*)

- Preparing soil with good tilth and applying 12.5 t of FYM or compost per ha. evenly on the field before the last ploughing
- Adopting seed rate of 5 kg /ha
- Treating the seeds with *Trichoderma viride* 4g/kg of seeds and 600 grams of Azosprillum before sowing

- Shallow sowing of seeds in lines
- Soil test based nutrient application or follow blanket recommendation of 17: 13:13 kg of NPK per ha for rainfed crops and 21: 23: 23 kg per ha for irrigated crops along with the soil application of *Azospirillum* @2 kg per ha
- Critical stages for irrigations are sowing, life saving irrigation, flowering and pod formation phase (35th-45th days after sowing)

d). Cotton (*Gossypium hirsutum*)

- Preparing the soil to get good tilth and applying 12.5 t of enriched FYM or compost
- Adopting seed rate of 7.5 kg delinted seeds per ha or 15kgs of fuzz seed per ha
- Treating the seeds with *Trichoderma viride* 4g/kg of seeds and 600 grams of *Azospirillum* before sowing
- Sowing seeds with a spacing of 60 x 30 cm in ridges
- Soil test based nutrient application or follow blanket recommendation of 45: 30:30 kg of NPK per ha along with the soil application of *Azospirillum* @2 kg per ha. Applying N fertilizers in splits (basal and top dressing at the time of flowering)
- Application of 12.5 kg/ha of micronutrient mixtures
- Topping on 45th day to arrest terminal growth by nipping 10-12th node if necessary
- Adopting Integrated Pest Management methods to control white fly, stem weevil, spotoptera and boll worms.

e). Groundnut (*Arachis hypogia*)

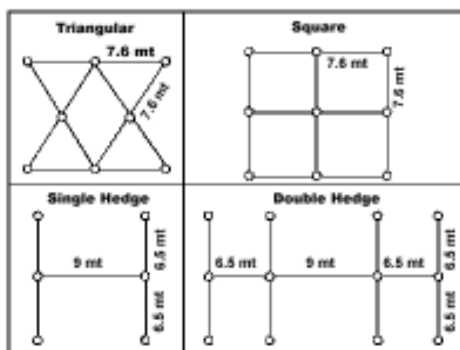
- Preparing the soil to fine tilth with application of 12.5 t of FYM or Coir pith compost per ha.
- Adopting seed rate of 140 kg of kernels per ha. for the rainfed crops and 125 Kg per ha. for irrigated crops.
- Treating the seeds with *Trichoderma viride* 4g/kg of seeds and

600 grams of Rhizobial culture TNAU 14 before sowing

- Adopting line sowing using seed drills under rainfed conditions and dibbling in irrigated situations with a spacing of 30 x 10 cm.
- Following soil test based nutrient application or blanket application of NPK @ 17.5: 35: 35 kg per ha for irrigated conditions and 10: 10: 35 kg /ha for rainfed conditions and 2 kg of Rhizobium followed by application of Gypsum 200kg / ha on 45 days after sowing
- Applying 12.5 kg/ha of micronutrient mixtures on soil surface after sowing to overcome the iron, zinc and boron deficiencies
- Critical stages for irrigation are sowing/presowing, life irrigation, flowering, pegging and pod development phase
- Adopting Integrated Pest and Disease management practices

f) Coconut (*Cocos nucifera*)

- Select seedlings from suitable variety/ reputed nursery, 9 to 12 month old seedlings with 6-8 leaves and early splitting leaves is a preferred criteria for selection
- Pitting size is 1m³ filled with FYM/compost and top soil for 60 cm height, and plant the seedling inside this pit and fill up with soil, press well to avoid water stagnation, bbyr 25 to 30 coconut husks per pit in layers is useful for moisture conservation.
- Follow any of any one of the planting pattern given in the figure
- Transplanting during the monsoon season and in heavy inundated areas preferable period would be after the heavy rainfall
- Provide stake during windy seasons and



Ref: Coconut Development Board website

shade during summer months for the younger seedlings (up to 1-2 years)

- Apply 50 kg of compost/organic manure to each tree every year during month seasons and apply nutrients based on the soil test crop response during the crop growth
- Husk burial around the trees and raising green manure crops like Sunhemp (*Crotalaria juncea*) or Kolingi (*Tehrosia purpurea*) can be sown using pre-monsoon rain and incorporated in the soil at the stage of 50% flowering
- Adopt integrate pest management practices especially for rhinoceros beetle and black headed caterpillar and wilt disease.

iii) Management of Saline and Alkaline soil

Saline soils: In most of the coastal regions salinity is either due to water quality, irrigation practices, occurrence of salt layer, seawater intrusions and poor drainage. After the Tsunami, the intensity of salinization in agricultural fields is much higher due to sea water intrusion. Combination of agronomic, cultural and biological reclamation methods needs to be followed to cope up with the increased levels of salinity. Selection of appropriate crop species and judicious combination of special management practices helps to minimize salinity levels.

Cultural methods

1. Deep tillage:
 - deep ploughing once in three to four years helps to better water percolation which is essential for salinity control.
 - subsoiling and chiseling helps for the free drainage temporarily.
2. Land leveling/smoothing/grading: proper land leveling helps to uniform water distribution and infiltration.
3. Leaching: application of pre planting water upto 10-20 cm of water (as a pre-plant irrigation) with light irrigation following the sowing/planting helps for better germination based on

the salinity levels. Leaching during cool season helps to increase the efficiency and ease of leaching since the ET losses are lower.

4. Drainage: With adequate surface and subsurface drainage, surface soil salinity can be effectively through irrigation practices.
5. Irrigation practices: Localized irrigation systems (drip, trickle and sprinkler) keeps the soil moist and gives good short term salinity control, increase the frequency of irrigation, increases the depth of water in the furrows and leads to improved germination.
6. Planting pattern: Making appropriate adjustments in planting procedures and bed shapes(sloping seedbeds) helps to avoid salt concentration near the root zone. Double row planting on the ridges and planting near the shoulder of the ridges helps to reduce salt accumulation.

Agronomic and biological methods

1. *Selection of crops and varieties*: Planting more salt tolerant crop species which need lower leaching requirement and thus a lower water demand (see following table), as well as, several salinity tolerant varieties in each crops is available that can be grown.

Relative salt tolerant crop species

Highly tolerant crops	Moderately tolerant
Paddy	Cowpea
Cotton	Sorghum
Cashew	Papaya
Nerium	Pomegranate
Coconut	Tomato
Casuarina	Onion
Subapul	Sunflower
Mango	Castor
	Jasmine

2. *Application of organic residues /green manures:* *In situ* ploughing of the green manure species like dhaincha, sunhemp, manila agathi, kolingi help to increase the organic matter content of the soil and during decomposition releases organic acids helps to reduce the salinity. 20-25 kg of seeds are required for one ha, broadcast the seeds and incorporation in the soil before flowering helps for easy decomposition. Also green leaf manuring using the species like vadanarayan, pungan, neem, etc. helps to increase the soil organic matter.
3. *Application of salt sequestering and tolerant biofertilisers:* The improved strains of salt sequestering microbes are applied at an appropriate quantity
4. *Methods of fertilizer application:* Timings and method of application helps to reduce the salt intensity. Applying small quantity of fertilizers before planting and the remaining during the critical stages; lower salt index fertilizers like ammonium sulphate can be applied instead of urea and DAP.
5. *Avoiding fallow periods:* Fallow periods are during hot periods where secondary salinization occurs due to high water table.
6. *Residue management:* Both organic crop residues and plastic mulches at the soil surface helps to reduce evaporative water losses, limiting upward movement of salts.

Alkaline soil: In addition there is a considerable amount of cultivable area under sodic soils. The main reason is poor drainage with accumulation of salts particularly CO_3 and HCO_3 of Sodium. Similar to saline soil reclamation, a combination of agronomic, biological and chemical methods can be used.

Tolerant varieties: Medium tolerant varieties of paddy such as TRY 1, Co 43 can be grown

Chemical method: application of gypsum based on the sodicity levels and leaching of sodium sulphate.

Nutrient management: Application of 25 % more nitrogen, split applications, use of fertilizers like ammonium sulphate, ammonium chloride along with green manuring using *sesbania*, *crotalaria* species.

III Sustainable Enterprise Opportunities

The microenterprises should lend themselves for decentralized production and centralized marketing services. The microenterprises should be chosen on market demand with proper technical support and should be supported by micro-credit arrangements through commercial banks; govt. departments such as District Rural Development Department (DRDA). The appropriate micro-enterprises should be identified based on the Village Resource Profiles (VRP) prepared through participatory mode. The enterprises should be economically viable, environmentally sustainable and address social equity issues in terms of class, caste and gender. It should also have the potential for self replication to ensure scale advantage over a period of time.

Feasible enterprises

Aquatic based Enterprises	On-farm Enterprises	Non-farm Enterprises
Edible Oyster Culture Ornamental Fish Breeding Fish by-products (Pickle)	Scientific Dairy Farming Calf rearing Ram and Lamb fattening Goat rearing Poultry Farming Duckery and Turkey Ornamental Nursery Vermicompost Low cost Tissue Culture	Bio-fertilizers Production of Mushroom Bio-pesticide Desiccated Coconut powder Iodized Salt Coir based Product

Some of the examples

a) *Production of Oyster Mushroom*

Mushroom production has been identified as an income generating micro enterprise for landless women in the rural communities. The economic importance of mushroom lies primarily in their use as food for human consumption. The exotic flavor and taste and fleshiness of mushroom have made it an important delicacy in human diet. Nutritionally, it is rich in proteins, vitamins (B, C and D) and minerals.

Application:	Culinary preparation
Raw Materials:	Paddy straw, Mother culture, calcium ammonium nitrate, Urea, Muriate potash, Gypsum, etc.
Process / Technology:	Mother spawn preparation. Bed spawn preparation, Paddy chaff soaked in water, paddy chaff filled in alternative layers with bed spawn in polythene bags, kept in incubation chamber, quality check and harvesting and packing.
Machinery:	Autoclave, Polythene, Alluminium vessels, firewood,
Production Cycle:	45 days
Economics:	Cost of cultivation varies from place to place depending upon the cost of raw materials, labour, site conditions, marketing opportunities, etc. On an average, production cost is between Rs. 10-15 per Kg. The produce is sold at about Rs. 30-50 per Kg depending upon the season and location of market.

b) Edible Oyster Culture

Rack and ren method. The racks are constructed at 1 to 1.25 m. depth. Rack is a fixed structure, comprising several wooden poles vertically driven into the substratum over which a wooden frame is made at a height of 0.5 m, above the water level. The shell rings are suspended from racks. A rack covering 80 sq.m. area holds 90 strings and 125 racks in a ha. At the end of 12 months, each string may weigh 7 to 7.5 kg. and the production of oyster is estimated at 80 t / ha. The mortality is about 45 per cent.

Farm management practices involve periodic cleaning of the oyster, oyster rearing trays, farm structure like racks and manual removal of predators and foulers. Oysters are harvested when the condition of the meat reaches high value, which in case of *C.madrasensis* is found to be good. Harvesting is done manually and oysters are transported to shore in boats.

Product: Oyster Meat, Edible Grade

Process: The edible oyster is an estuarine species living in estuaries, backwaters, lagoons and shallow coastal regions. Its meat which forms about 8 % of the total weight is a highly valued, nutritionally balanced food. The oyster farm is simple structure erected in the shallow area. The Rack and Ren method is economical. Flows of casuarina poles are driven into the ground and long horizontal poles are tied to the top of the vertical poles. Sapt collected on shells are attached to strings (Rens) and these rens are tied to the horizontal poles in such manner that oysters remain in the water column. The oysters feed upon the phytoplankton in the sea and no artificial food is required. They reach harvestable size 8cm in about 10 months.

Inputs: The baby oysters may be procured from CMFRI

Marketing: Assured source is the Integrated Fisheries Project of Govt. of India, Cochin.

Benefits: Oyster culture is a simple technology, which can be adopted by fishermen/women with some basic training.

c) Low cost Tissue Culture

Propagation by tissue culture offers good commercial prospect in ornamental plants, vegetables and also fruit plants, where value of the products is high. The technique has reportedly been

successful in more than 100 species of plants. It has been estimated that more than 350 million Tissue Culture Plants(TCPs) are being produced annually. Tissue culture method of propagation is highly labour intensive, 55-60% of the cost is on account of labour. The domestic market for TCPs, though nascent at present, is likely to develop, since tissue culture method of propagation can multiply an elite plant very rapidly. It may not be possible to meet this requirement by conventional nurseries. It would, therefore, be desirable to encourage commercial tissue culture labs to supplement the production of planting material by conventional means.

Application:	Mass propagation of desired clones
Raw Materials:	Chemicals-ethanol, formalin, cotton, rubber bands, gloves, soap, etc.
Process:	Identification of elite germplasm explants culture from cell/tissue/organ, Inoculation in different growth of tissues, differentiation and production of identifiable plants and hardening.
Production Cycle:	3 – 4 months
Economy:	For small-scale community based tissue culture unit Rs. 1,90,000 (Including infrastructure, equipments, chemicals, two man Powers etc) required for construction. Annual rotation can be achieved Rs. 2 to 3 lakhs for first year and Rs 3 to 5 lakhs second year onwards.

d) Ornamental Fish Breeding

Ornamental fish keeping is one of the most popular hobbies in the world today. The growing interest in aquarium fishes has resulted in steady increase in aquarium fish trade globally. India's share in ornamental fish trade is estimated to be Rs 158.23 lakh, which is only 0.008% of the global trade. The major part of the export trade is based on wild collection. There is very good domestic market too, which is mainly based on domestically bred exotic species. The earning potential of this sector has hardly been understood and the same is not being exploited in a technology driven manner. Considering the relatively simple technique involved, this activity has the potential to create substantial job opportunities, besides helping export earnings.

Product: Ornamental fishes like black, red and white molly

Application/Use: Ornamental fishes – sold in aquarium

Process/technology: Release of fingerlings in cement tanks, regular feeding and changing waters, harvesting, cleaning and filling the tank, packing and transporting.

Equipment /

Machinery: Cement tanks, Fish fingerlings, fish feed, small nets

Investment: Rs. 750 per tank

e) Vermicompost

There is a growing realization that Vermicompost provides the nutrients and growth enhancing hormones necessary for plant growth. The fruits, flowers and vegetables and other plant products grown using Vermicompost are reported to have better

keeping quality. This is an environmental friendly technique where indigenous species of earthworms are systematically used to turn farm waste into valuable form which is known as Vermicompost.

Application: Organic Manure

Raw Materials: Organic degradable waste, earthworms

Process/Technology: Collection of local variety of earthworms, preparation of Drainage layer in pit, waste materials arranged in layers, Earthworms released, closed with straw, manure obtained after 30/ 45 days, sieving and packing.

Machinery: Digging Instruments, Meter stick, sieve, baskets, packaging Machine

Production Cycle: 90-100 Days

Indicative

Investment: Rs. 25000 for 1 ton of compost

f) Biofertilizer Unit

Biofertilizers enhance the nutrient availability of crop plants and also impart better health to plants and soil thereby enhancing crop yields in a moderate way. In the vast areas of low input agriculture These products will be of much use to give sustainability to production.

Application: Ecofriendly fertilizer for enhancing productivity of soil by fixing Atmospheric nitrogen/solublishing soil phosphors/ stimulating plant growth through synthesis of growth promoting substances.

Raw materials:	Vermicultures, lignite, peat, microorganisms, chemicals, packing materials, etc.
Equipment and Machinery:	Autoclave, blender, packing machine and glass vessel
Process:	The manufacturing process consists of collection of bacterial strains, preparation of mother culture, multiplication, blending of the bacterial culture into sterile carrier materials such as peat, lignite or charcoal and packing in plastic bags.
Economic:	12 tonnes per year
Initial Investment:	Rs. 2 Lacks

g) Fish pickle production

Product:	Fish Pickle in bottle/packet
Process:	Fish and seafood items will be procured from the fish landing centers. Fishes will be de-scaled, de-gilled and gutted and washed thoroughly. Dressed fishes will be filleted or hot blanched depending on species. Fillets will be cut into cubes. From the hot blanched fishmeat will be separated from the skin and bones. Meat will be fried in refined oil. Masala items and vinegar will be boiled in oil. Fried meat will be added, mixed and cooked. After cooling to 40 ⁰ C, sodium benzoate will be added. The pickle will be allowed to mature for a day at room temperature.

Pickle will be packed in sterile glass bottles/packets and the exposed top solids will be covered with a layer of hot oil.

Market:

Tie-up with reputed brands