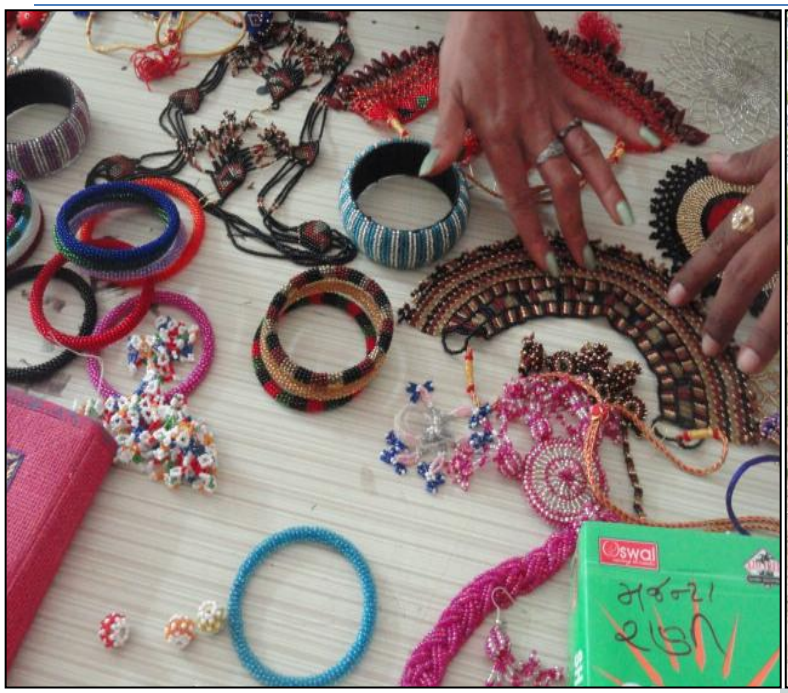
GUJARAT STATE WATERSHED MANAGEMENT AGENCY

LIVELIHOOD MANUAL

INTEGRATED WATERSHED MANAGEMENT PROGRAMME (IWMP)



Gujarat State Watershed Management Agency

Commissionrate of Rural Development
Block No 16/3, Dr. J.M Bhavan
Government of Gujarat

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Chapter-1: Introduction

1.1 Background

Developmental schemes adopt specific strategy and employ resources with the main, if not sole, objective of enhancing the quality of the people by ensuring the livelihood security. Such schemes become all the more focussed towards such objective if they are meant for socially disadvantaged and economically backward inhabitant of ecologically degraded and fragile region. Watershed programmes are based on one such approach of ensuring livelihood security through participatory and scientific management of natural resources.

Watershed is defined as "a geo-hydrological unit for an area that drains at a common point" and mostly used interchangeably with terms like 'catchment' and 'drainage basin'. The area of watershed is inhabited by people and the interventions in such area directly or indirectly impact their life. Watershed development involves conservation and management of the entire catchment area of a drainage line through different mechanical and vegetative measures to enhance sustainable livelihoods.

1.2 Livelihood Perspective under IWMP

Historically, the watershed programme has focussed upon techno-managerial management with least concern for livelihood security. The efforts under this direction like institution development (SHGs formation) have been limited to kind of thrift groups. To some extent, less emphasis on livelihood has been responsible for lowered participation and empathy towards the programme. To compound the matter, the ill conceived measures like stopping grazing has further impacted livelihood of the cattle rearing poor adversely and made them disinterested if not inimical towards our programme. The situation has become tragically humorous where people have started equating watershed programmes with construction of certain structures like check dam. Nothing in the earlier programme helped break this perception. Thanks to the recommendation of the technical committee and new common guidelines. The shift has been visible towards a livelihood oriented approach where natural resources are conserved and enhanced not for the sake of nature itself but for its inhabitants too. The technical committee has also called for major improvements for appropriate End-uses of Harvested Water for Sustainable Livelihoods in India's watershed development

programme. One of the most important arguments for this Committee is to suggest a 2-year Phase III in the watershed programme to enable livelihood support initiatives that can take care of the interests of the landless. And with this came the real application of watershed plus approach. Watershed plus approach is an advanced and progressive form of watershed management where emphasis transcends beyond technical measures and constructions and encompasses drinking water security, livelihood security, sanitation facilities, credit availability, micro enterprise activities and other allied activities based on natural resources.

Integrated Watershed Management Programme (IWMP) has been designed and being implemented in India on watershed plus approach where emphasis is on people and their aspirations, capabilities and livelihood as shown in the figure given below:

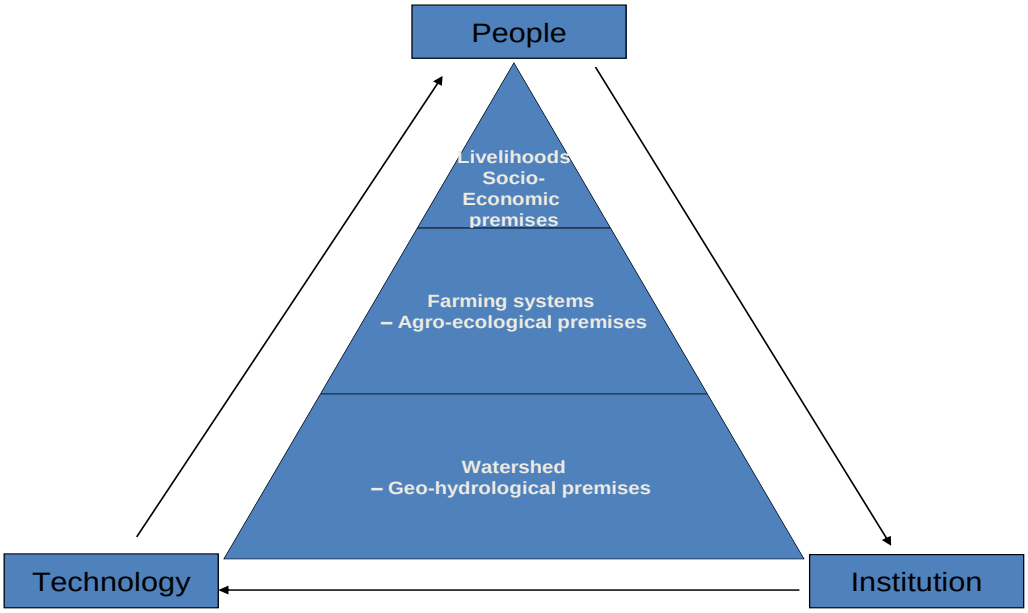


Figure 1: Livelihood in Watershed Management Programme

23 percent of total project budget has been earmarked for essentially livelihood related activities. In Gujarat state alone, considerable amount is available under livelihood segment which can be seen in the table given below:

Table 1:Year-wise budgetary allocation for livelihood

Sr. No.	Year of sanction	Amount available (in crores)
1	2009-10	215
2	2010-11	180
3	2011-12	185

In Gujarat state, Gujarat State Watershed Management Agency (GSWMA) is the nodal agency to implement the IWMP with the vision of "enhancing the quality of life of the rural populace through sustainable, equitable and participatory Natural Resource Management". Following is the mission statement:

"We work towards creating sustainable rural livelihoods in Gujarat through scientific and integrated watershed development approach. We manage local natural resources like land, water and vegetation with active participation of the people and their institutions in a way that enhances employment and income opportunities for all, and the asset-less in particular. We focus both on preservation of our natural environment and socio-economic development of the people."

One can observe that both vision and mission put people and their participation in the centre with overt emphasis on enhancing their quality of life through natural resource management thereby generating employment and income opportunities.

To develop a practical livelihood strategy, one has to consider the agro climatic scenario of the particular region. Gujarat has been divided into twelve zones on the basis of their regional agro climatic similarities. There have been some conspicuous problems of those zones. The zones and their specific problems have been shown in table 1 given below:

Table 2: Zones of Gujarat

Sr. No.	Zone	Districts	Zone wise problems
1	Zone I-Maize Zone	Dahod , Panchmahal, Sabarkantha	Undulating land, low rainfall
2	Zone II-Cotton Zone	Narmada, Vadodara	Stony soil, low productivity
3	Zone III-Paddy Zone	Tapi, Dang, Valsad, Navsari	Depleting ground water table
4	Zone IV-Cotton Zone	Bharuch, Surat, Vadodara	Soil salinity, erosion
5	Zone V-Bajra, Tobacco	Kheda, Anand	Ravenous area

	Zone		
6	Zone VI-Bajra, Cotton Zone	Mehsana, Sabarkantha, Gandhinagar	Ground water crisis, salinity,, low productivity
7	Zone VII-Bajra, Pulse Zone	Kutch , Patan, Banaskantha	Semi arid zone, low rainfall, salinity ingress
8	Zone VIII-Cotton, Dry Wheat Zone	Surendranagar, Patan, Ahmedabad	Salinity ingress, erratic rainfall
9	Zone IX- Groundnut Zone	Jamnagar, Rajkot, Surendranagar, Amreli, Bhavnagar, Junagadh, Porbandar	Soil salinity
10	Zone X- Cotton, Dry Wheat Zone	Bharuch, Surat	Wind erosion, crop diseases,
11	Zone XI- Paddy Wal Zone	Navsari, Valsad	High rainfall, soil erosion
12	Zone XII-Groundnut, Bajra Zone	Bhavnagar, Jamnagar, Porbandar, Junagadh	Unsuitable croppping pattern, erratic raingall

Every zone has got its own specific strengths and peculiar problems. Agriculture being the backbone of rural economy and livelihood, one has to harness those strengths and eradicate prevailing problems to facilitate the local community earn and enhance their livelihood. The coming chapters elaborate upon the strategies, policies and other necessary tools needed in this direction.

1.3 Need & Objective the Manual

- Livelihood interventions are important as:
  - They ensure realization of benefits of watershed activities
  - They will eventually lead to equity in benefit sharing
- Need for giving direction to all livelihood activities
- Procedures and mode of operation need to be clarified
- Ready reference material for micro-planning

Chapter-2
Sustainable livelihood Augmentation in Watershed areas- Concepts, Approaches and Framework

Rainfed livelihood systems are complex and shock-prone. The principal rural livelihood options in a typical rainfed area are agriculture and animal husbandry. As these activities depend on rainfall, the risks are always high. Besides, the activities never become economically profitable on a sustainable basis.

A number of agencies- government and non-government have tried out different approaches to augment rural livelihoods in these areas. Some of the approaches have been successful. To start with, we need to understand the different approaches and then chose sectors and sub-sectors to work upon.

2.1 Approaches:

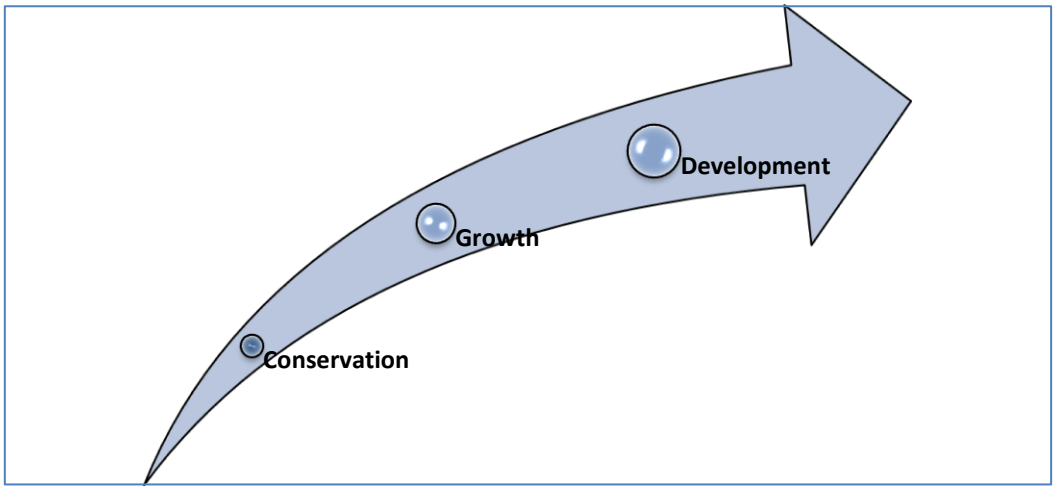
A few well known approaches[1] are discussed below:

- *Spatial*: LA in a geographical area such as command area, region, or watershed.
- *Segmental*: LA for vulnerable segment of society e.g. landless, tribals, women, disabled
- *Sectoral*: LA along a sector of the economy such as agriculture, or sub-sector like cotton etc.
- *Holistic*: LA that includes a whole range of services including welfare services like drinking water, sanitation and health.

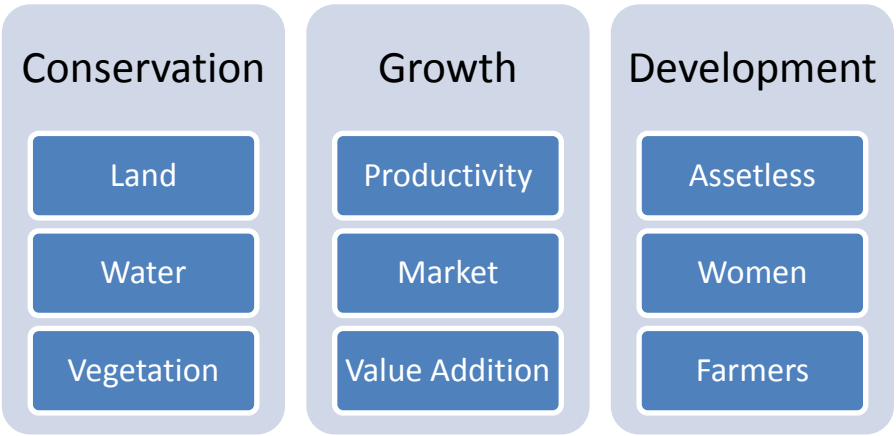
	Spatial	**Segmental**
Sectoral	**Cluster development for organic cotton growers**	**Kolhapuri leather workers**
Holistic	**Watershed Development**	**Dalit watershed**

Thus, it can be seen from the above matrix that Watershed Development Programme, by design, follows a Holistic-Spatial approach. However, to make things clear, GSWMA's approach in this regard can be depicted in the following diagram:

[1] From a presentation by Dr. Astad Pastakia during a workshop at Saputara on 21st July, 2011

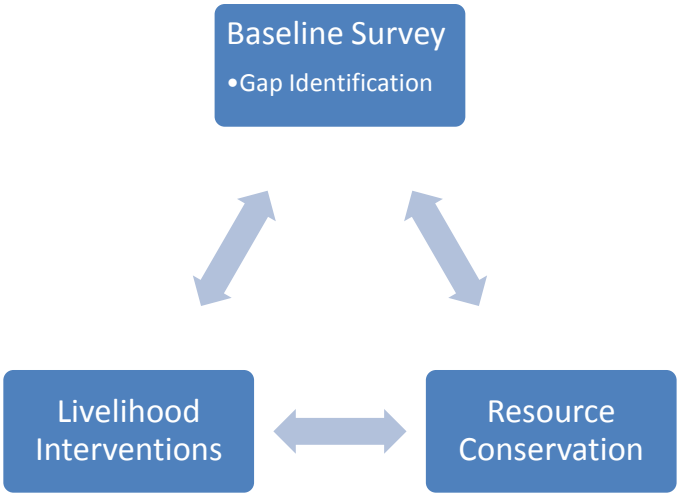


Livelihoods approach under watershed development must start with conservation and gradually lead to growth in specific targeted sectors/subsectors, which ultimately must ensure development of all the sections of the society. Further analysis of these steps is done below with the help of a diagram.

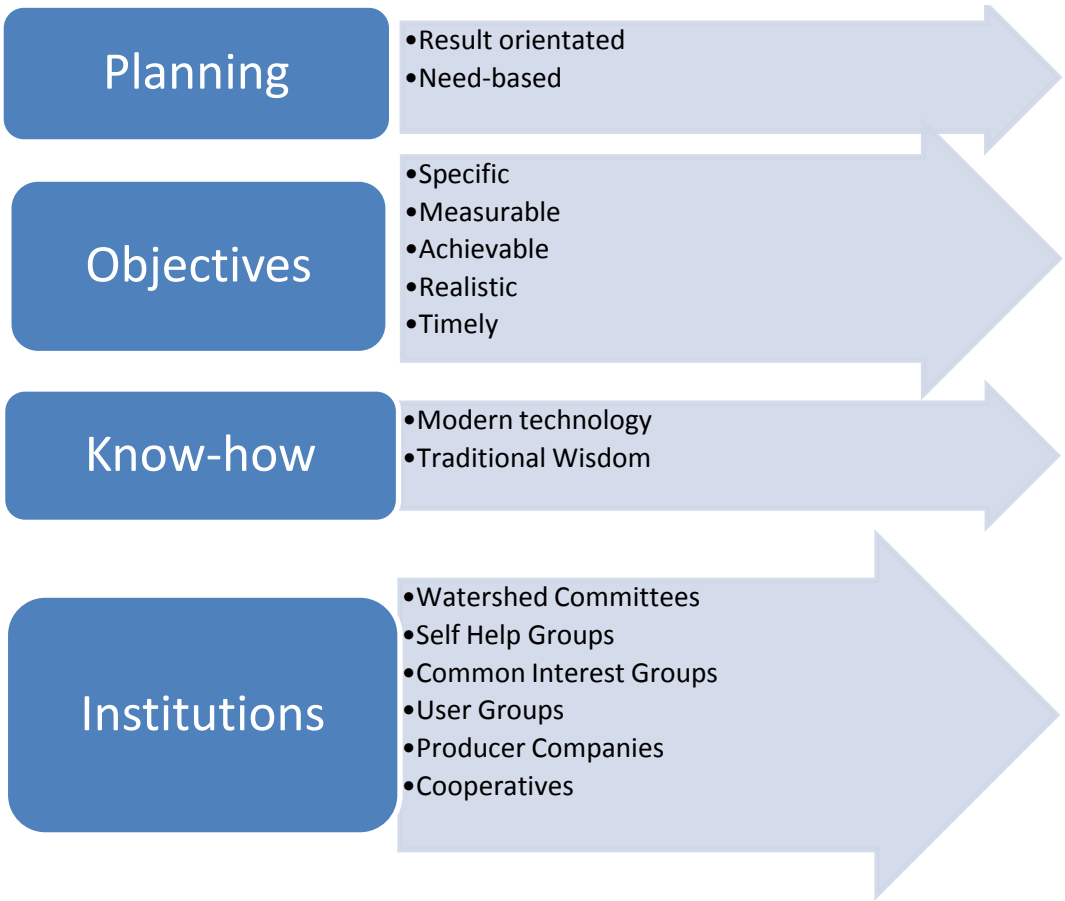


2.2 Strategy:

The strategy of GSWMA for livelihood enhancement is designed keeping the sustainability factor in mind. The first and foremost thing is identifying the most suitable livelihood activities for a particular project. This can be done with an appropriate baseline survey. The survey would provide enough inputs to find out the gaps or constraints in the livelihoods of the local populace. The resource conservation should be designed keeping in mind the livelihood needs of the project area and the livelihood interventions have to be designed accordingly. Resource conservation activities and livelihood interventions should go hand in hand; they have to be planned in an integrated manner, and not independent of each other.



Once major livelihood interventions are identified, a clear strategy has to be in place so that the stated objectives are achieved at the end of the project period. The strategy is explained in a logarithmic sense below:



2.3 Framework:

Various popular frameworks of livelihood augmentation are:

1. Contingency Framework:

This framework gives emphasis on finding out the particular constraint (among various constraints under which the local people operate) that is ailing the most and work towards wiping out that constraint.

2. DFID's model framework:

DFID puts emphasis on various types of capitals like natural capital, human capital, social capital, physical capital and financial capital. It works towards providing these capitals to the poor and strengthen them to face the shocks.

3. Basix's polygon of farmer's needs:

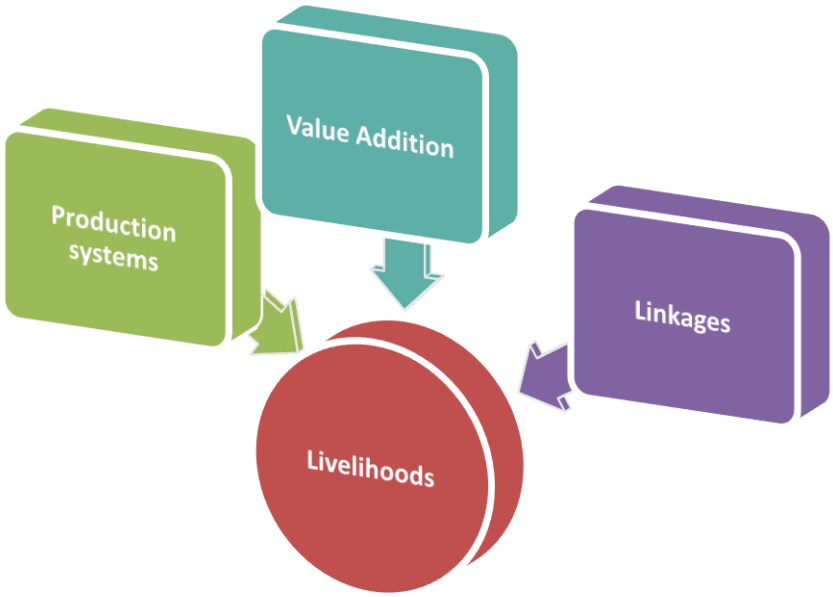
Basix has developed a framework based on farmers' needs, like financial services, input supply, extension, market, technology and collective activity. This model seeks to provide the farmers what they need at their doorsteps at reasonable prices.

4. LARA framework:

The framework developed by DSC is more holistic in nature: it integrates NRM strategies to ICT, social capital and entrepreneurship. It advocates three kinds of interventions: directly impacting, providing support services and providing governance support, whichever is necessary whatever case.

2.3.1 GSWMA's framework:

After a close look at the above frameworks, and studying its own project areas, GSWMA has come up with a framework that can work for its projects in an efficient manner. This framework seeks to augment livelihoods by working upon three important features of rural livelihoods: Production systems, value addition and linkages. The framework is represented in a diagram below:



2.4 How to Identify Livelihood Activities (Process):

A step-by-step process to identify the livelihood activities in the IWMP watershed areas of Gujarat state is outlined below.

Steps to identify the livelihood activities:

Step 1: Collect the baseline primary data
Step 2: Identify the target stakeholders
Step 3: Rapport Building
Step 4: Participatory Rural Appraisal (PRA)
Step 5: Collect secondary data
Step 6: Initial assessment
Step 7: Analysing the information
Step 8: Identifying the Alternative Livelihood activities
Step 9: Reflection, vision and prioritisation
Step 10: Activity design and appraisal
Step 11: Preparation of Annual action plan of identified activity
Step 12: Programme or project implementation

The above steps are described below briefly to give an understanding to the watershed development team:

Step 1: Collect the baseline primary data: Baseline data can be collected through the structure household questionnaire to know the socio-economic profile of the area. It will give a brief idea about the present scenario of the watershed area. It will be done through socio-economic survey.

Step 2: Identify the target stakeholders: The second most important step in the process is to identify the target beneficiaries or stakeholders. It is very necessary to identify the stakeholder for which the activities are going to be planned. The stakeholders may be assetless, marginal farmers, exploited section of that area, artisans' etc.

Step 3: Rapport Building: After deciding the beneficiaries, it is very important to make a good, honest and candid relation with the target beneficiaries. Regular visit, truthfulness and positive attitude help the watershed development team to make a good rapport wit them.

Step 4: Participatory Rural Appraisal (PRA): PRA is a tool which helps to make the team aware about the local resources and helps to identify the problems of the present livelihood of the area. The tools which are help to identify the problems are as follows:

i. **Timeline:** It helped the team to understand the history of the village, major events, and misfortunes. It helped the team in identifying the major events of the village and how the event affects the community.

ii. **Seasonality:** Seasonality helps the team to give an idea of the livelihood activities with respect to seasonal variation. It helps the team to understand the seasonality pattern of the corps, non timber forest produce and other livelihood prevails in the area. The trend analysis will help the team to know the changes with time in livelihood pattern.

iii. **Focus Group Discussion (FGD):** FGD with the beneficiary will help watershed development team to identify the present livelihood and the problems.

Step 5: Collect secondary data. Once the primary data collected, the collection and summation of secondary data - information from reports, development plans and census data - will help the team build up knowledge about the areas in which they will be doing planning. This can be done simulations with the Participatory Rural Appraisal

Step 6: Initial assessment. This is likely to involve a combination of different participatory methods and activities. These help the team - and participants:

- Develop a historical understanding of the area and different forces that have shaped it
- Identify the local present livelihood
- Identify issues of gender, age and power and how these are reflected in local institutional arrangements
- Discover how local people define well-being
- Understand the range of assets, activities and capabilities that create different livelihood strategies
- Develop categories of well-being and rank sample households
- Assess the key aspects of the vulnerability context - risks, hazards and trends
- Identify connections between local level issues and factors which affect them that originate in the broader environment

Step 7: Analysing the information. This is about making sense of the information collected through different participatory activities. The team brings together secondary data and information from fieldwork to see key trends and the connections between different issues. At this stage the team needs to be particularly aware of its biases. It needs to re-examine how it saw the issue and problems at the beginning of the process. The team must make sure it reflects the assessment findings back to the community in an open-ended way so that local analysis can take place.

Step 8: Identifying the Alternative Livelihood activities: The best livelihood option need to be identified among all the livelihood options. The alternative livelihoods opportunity can be identified through following points

I. Economic Analysis of all activities or cost-benefit analysis
II. Availability of Local inputs
III. Post produce analysis (Market)
IV. Less risk
V. Sustainability

After analysing the above points, the preferable activity would be:

i. Less risk and beneficial
ii. Availability of inputs and markets
iii. Sustainable

It's very important that to finalize one which will be benefited the stakeholders and give a sustainable income to the target participants.

Step 9: Reflection, vision and prioritisation. This is about reflecting back and analysing the information that has been synthesised from fieldwork and secondary data with local people again to make sure that the activity which is identified, is going to provide maximum benefit to the target person. Vision of the team should be clear when the activities is finalised or prioritise, it need to be emphasized on the economic analysis, local recourses, market and sustainability.

Step 10: Activity design and appraisal. This involves carrying forward the analysis, reflection and prioritisation undertaken into activity design and appraisal. More information on the livelihoods situation of households and individuals, through a baseline study that includes household profiles, can be helpful. Furthermore, this stage will entail more in-depth information on, and the analysis of, the specific priorities that have been identified. Depending on these priorities, the identified activity can be analysed/ planed properly through answering the 10 questions of the checklist given in the box 2.1. Once you analysis the 10 questions, the team will able to implement the activities in that area.

Step 11: Preparation of Annual action plan of identified activity: This involves a preparing of annual action plan to see the area and the breakeven point of the activities as per the annexure1

Step 12: Programme or project implementation. Once the team prepare the annual action plan, the project need implement as per the plan.

BOX-2.1: Checklist for planning and designing livelihood activities:

(1.) List of activities that you have selected for livelihoods – in your watershed areas.
What was the basis for selection of each?

(2.) Pick up any one activity in your watershed area which will have maximum impact on livelihoods in your area and prepare a plan on the basis of the following parameters :-

(i) How will you increase the productivity of the existing activity?
(ii) How will you reduce the cost of production?
(iii) What will you do to improve the price realization for the producer?
- **Value additions?**
- **Market linkages?**

(iv) How will you reduce the production as well as Marketing risk for the primary producer?
(v) What will be number and type of people's institutions that will need to be facilitated at the group / village/ watershed level?
(vi) What will be the capacity building requirements for the primary producers and their institutions?
(vii) What linkages will need to be established to improve access of the poor to technology, credit & markets?
(viii) How will you bring about convergence with other government programmes?
(ix) Which natural resource (land / water) will you require to what extent for carrying out this activity?

	Private	Panchayat	Government
Land			
Water			
Biomass			

(x) What the percentage (%) is of excluded social groups (Landless / Marginals / Women etc.) and how will any of these involved in the activity?

2.5 Value and Supply Chains:

The Value Chain concept was developed and popularized in 1985 by Michael Porter, in "Competitive Advantage," a seminal work on the implementation of competitive strategy to achieve superior business performance. Porter defined value as the amount buyers are willing to pay for what a firm provides, and he conceived the "value chain" as the combination of nine generic value added activities operating within a firm – activities that work together to provide value to customers. Porter linked up the value chains between firms to form what he called a Value System; however, in the present era of greater outsourcing and collaboration the linkage between multiple firms' value creating processes has more commonly become called the "value chain." As this name implies, the primary focus in value chains is on the benefits that accrue to customers, the interdependent processes that generate value, and the resulting demand and funds flows that are created. Effective value chains generate profits.

Many views of Value Chains can be created. Examples of Value Chains are

- One that takes an order from a customer
- One that fulfills a customer requirement
- One that defines a product or service
- And many others

A key distinction in defining value is whether the exchange that generates value is between firms – i.e., Business to Business (B2B) – or between a firm and a consumer – i.e., Business to Consumer (B2C).

There are three forms of value that occur in B2B commercial transactions.

- Technical (Resource Value);
- Organizational (Business Context); and
- Personal (Career and Idiosyncratic)

Technical value is intrinsic to the resource being provided and occurs in virtually all exchanges. For the thirsty man, the water has a technical value regardless of the source or any other consideration. The cup can be used or even dirty, the man providing it a criminal, and the water will still have the same technical value.

Organizational value is built upon the context of the exchange, and may derive from a range of factors such as ethical standards, prestige, reliability, and association. Brand image may build organizational value, as well as company reputation. When at a fine dining establishment, the label on the water bottle generates value far in excess of the bottle's content.

Personal value is derived from the personal experiences and relationships involved in the exchange of resources and the benefits provided. While technical and organizational value accrues to the firms involved in a commercial exchange, personal value accrues to the individual.

Supply Chain Management (SCM) emerged in the 1980s as a new, integrative philosophy to manage the total flow of goods from suppliers to the ultimate user, and evolved to consider a broad integration of business processes along the chain of supply. Supply chain is a term "now commonly used internationally – to encompass every effort involved in producing and delivering a final product or service, from the supplier's supplier to the customer's customer". As the name implies, the primary focus in supply chains is on the costs and efficiencies of supply, and the flow of materials from their various sources to their final destinations. Efficient supply chains reduce costs.

2.5.1 Similarities and Differences Between a Supply Chain and a Value Chain

In common parlance, a supply chain and a value chain are complementary views of an extended enterprise with integrated business processes enabling the flows of products and services in one direction, and of value as represented by demand and cash flow in the other. Both chains overlay the same network of companies. Both are made up of companies that interact to provide goods and services. When we talk about supply chains, however, we usually talk about a downstream flow of goods and supplies from the source to the customer. Value flows the other way. The customer is the source of value, and value flows from the customer, in the form of demand, to the supplier. That flow of demand, sometimes referred to as a "demand chain", is manifested in the flows of orders and cash that parallel the flow of value, and flow in the opposite direction to the flow of supply. Thus, the primary difference between a supply chain and a value chain is a fundamental shift in focus from the supply base to the customer. Supply chains focus upstream on integrating supplier and producer processes, improving efficiency and reducing waste, while value chains focus downstream, on creating value in the eyes of the customer. This distinction is often lost in the language used in the business and research literature.

(Source: Value Chains Versus Supply Chains, by Andrew Feller, Dr. Dan Shunk, and Dr. Tom Callarman)

Chapter-3
Production System Development

Livelihoods initiatives are increasingly being promoted for the rural poor and drought prone area through different watershed schemes like DDP, DPAP & IWDP in Gujarat state. The effect of these programme towards the rural people's livelihood were not much appreciated by many studies as these projects emphasis mainly on technical aspects concerning surface hydrology and conserving water. Thus the Integrated Watershed Management Programme (IWMP) aims at improving agricultural productivity, promote judicious use of water, and enhance agriculture based other livelihood options as it is well known that the primary livelihood option of rural folks is agriculture, animal husbandry and allied activities. 23% of the total funds under IWMP are to be spent for activities like agriculture, horticulture, forestry, animal husbandry and allied micro-enterprises. To enhance the efficiency, transparency, accountability and effectiveness of the programme and maximize the impact, GSWMA is trying to automate the systems and procedures and focusing on the proper procedure to be followed in step of implementation phase.

This chapter explains the physical characteristics of Gujarat, Agriculture scenario of Gujarat, Promotion of judicious use of water through various methods, methods of increase productivity of main agriculture and horticulture crops.

3.1 Agriculture Scenario of Gujarat

Agriculture production will depends upon the biological phenomenon of the area like climate, rainfall and temperature, thus the procedure should not be same in every zone, need to be different to analysing the local situation. A brief glance of Gujarat agricultural scenario[2] is given as below:

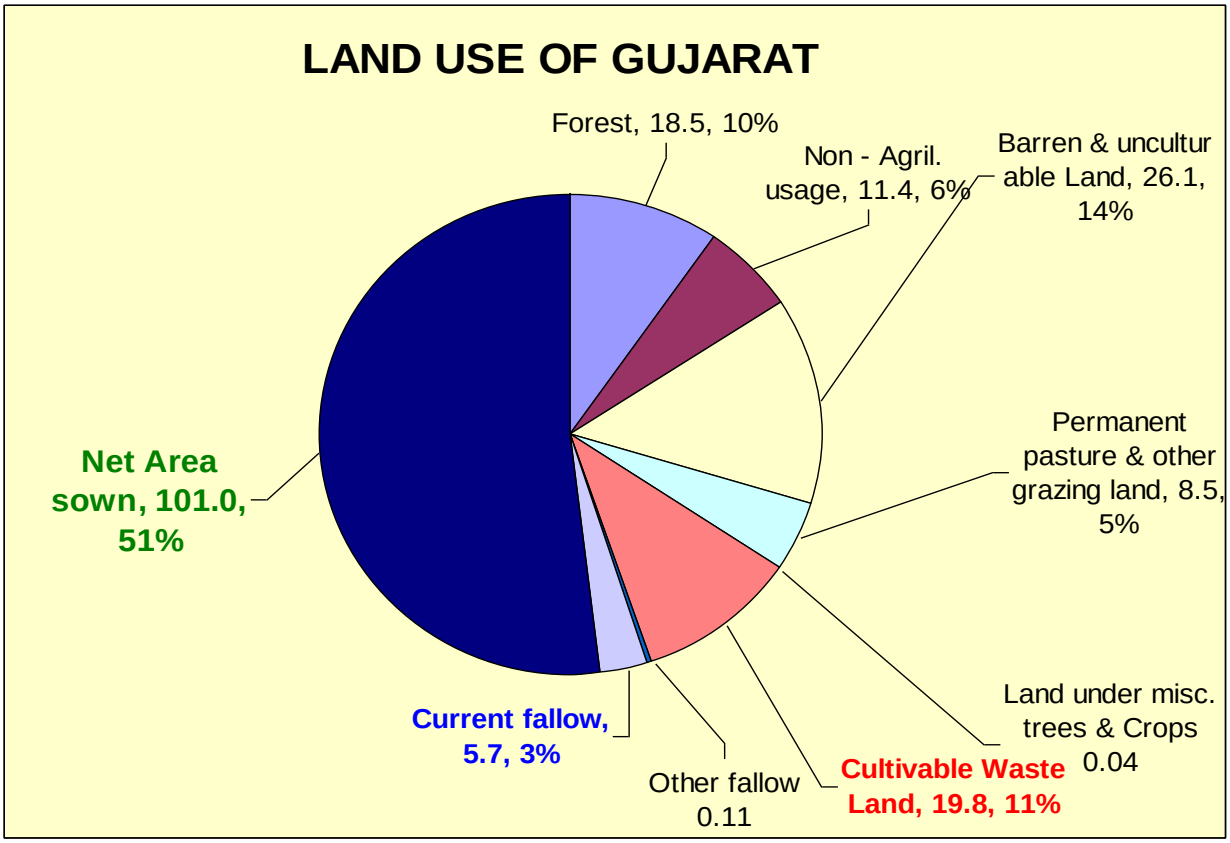
- The total geographical area of the state is *196.12* lakh hectares
- Reported area is 188.12 lakh hectares
- The net cultivated area is about *94.99 lakh* hectares and out of which about 36.27 lakh hectares are under irrigation.
- Agro-Climatic Zones is eight

Table: Agro-climatic Zones of Gujarat According to Rainfall and Soil Type

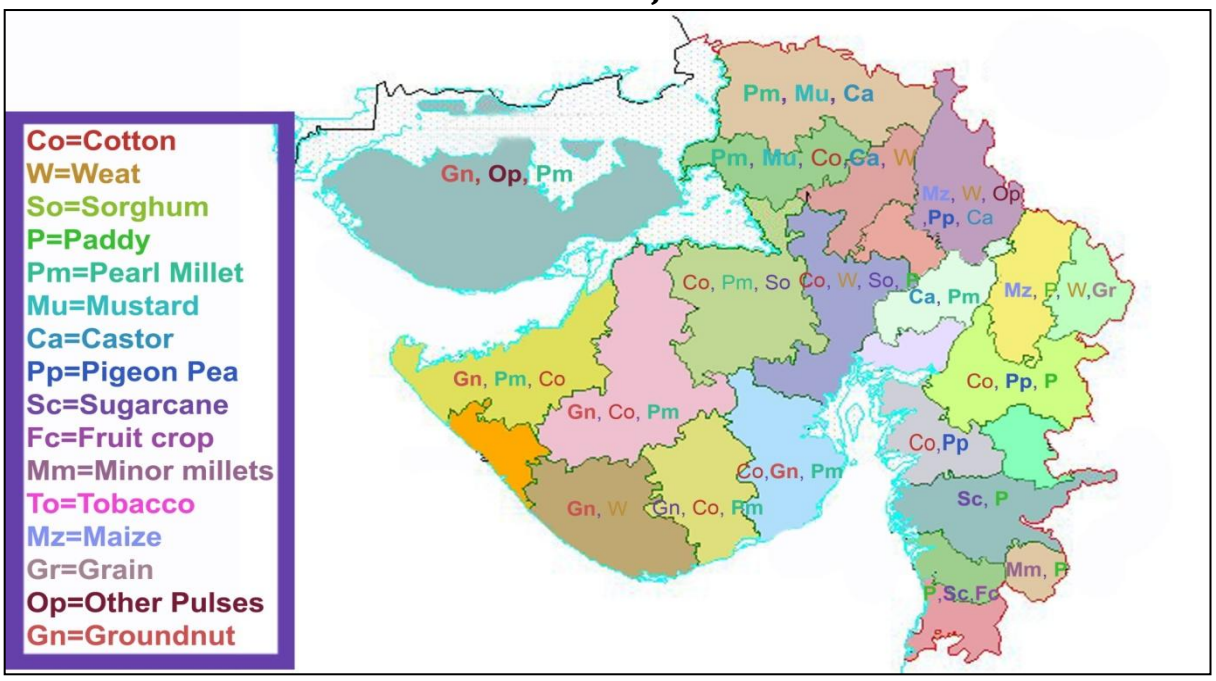
Sr	Sub-region	Rainfall (mm)	Types of Soil
1	Southern Hills	1500 and above	Deep black with patches of coastal alkali lateritic and medium black soil
2	South Gujarat	1000 to1500	Deep black clayey soils
3	Middle Gujarat	800 to1000	Deep black to loamy sand
4	North Gujarat	400 to 700	Medium black
5	North Arid Zone	250 to 500	Sandy and saline soils
6	North Saurashtra	400 to 700	Shallow medium black soils
7	South Saurashtra	645 to 700	Shallow medium black & calcareous soils
8	Bhal & Coastal Area	625 to 1000	Medium black poorly drained and saline soils

[2] As per the Department of Agriculture and Co-operation

- Major Crops: Wheat, Bajra, Rice, Maize, Groundnut, Mustard, Sesame, Pigeon pea, Green Gram, Gram, Cotton, Sugarcane.
- Gujarat is the largest producer of, Castor, Tobacco, Isabgul (Psyllium), second largest Producer of Sesame seeds, Cotton and Groundnut in the country.
- Gujarat has highest productivity in, Mustard, Castor and cotton, second highest productivity in Groundnut and Bajra, third highest productivity in Gram and Guar in the country.
- Major Crops in horticulture : Mango, Banana, Sapota, Lime, Guava, Tomato, Potato, Onion, Cumin, Garlic, Isabgul, Fennel
- Gujarat has highest productivity in, Guava, Potato, Onion, Cumin and Fennel, third highest productivity in Banana and Isabgul in the country.
- There is a wide annual variation in rainfall.
- Erratic rainfall affecting the productivity of the crops.
- Out of 225 talukas of the state, as many as 56 talukas are drought-prone which suffer from drought or scarcity condition at regular interval.
- Draught, Flood and Cyclone raise after some interval badly affect agriculture of the state and also economy of the farmers.
- Our natural resources base of land, water and bio diversity is under severe stress and threat of erosion and depletion. Thus, some of which are formidable .
- Two third of population in Gujarat is engaged in agriculture and earn livelihood directly from this occupation



DISTRICT & MAJOR CROPS



Advantages of Gujarat in Agricultural Production

- Strong Agri Marketing system, Agro based Industries & Co-operatives
- Good transport facilities
- Presence of dedicated Agriculture Universities, Research Institute and Krishi Vignana Kendra (KVK)s for agriculture extensions and agriculture inputs with updated technique
- Enterprising Farmers having business instincts

Constrains of agriculture production

- Stress, Shortfall of rainfall during initial crop growing stage affected the crop growth.
- Heavy rain after long dry spell also affects the standing crops and also soil erosion.
- Even though, after sufficient rainfall, only 62 % of the live stock irrigation water in major and medium irrigation project is available till today.
- North Gujarat will be affected in coverage of irrigation due to less availability of irrigation water.
- Sea Water Ingress
- Deterioration of Soil and Water conditions due to salinity ingress
- Irregular rain pattern affecting productivity in agriculture
- Agriculture affected due to recurrent droughts
- Low Productivity Of Local Livestock Breeds
- Inadequate Fodder Resources
- Poor R & D Facilities For Marine resources
- Inadequate trained human resource for modern agricultural research, education and extension services

Strategies:

Gujarat State Watershed Management Agency plans the following strategies to increase the agriculture productivities in the watershed areas to utilize the IWMP funds;

1. Proper selection of crop as per the agro-climatic zone
2. Increasing the coverage under quality seeds/planting material
3. Increasing crop planting density with the help of latest technologies
4. Bridging the gap between demonstrated yield and average yield.
5. Encouraging the shift from high volume low value crop to low volume high value crop.
6. Judicious use of irrigation potential.
7. Create awareness and knowledge amongst people
8. Focused for small and marginal farmers to raise their income level
9. Disseminate information of modern technology and related infrastructure through transmission of creative real time agricultural practices though para worker.
10. Easy, assured and timely availability of quality agricultural inputs especially in remote areas.

This chapter gives brief details of the production system and how is get maximum benefit through increasing agriculture productivity and decreasing the cost of production.

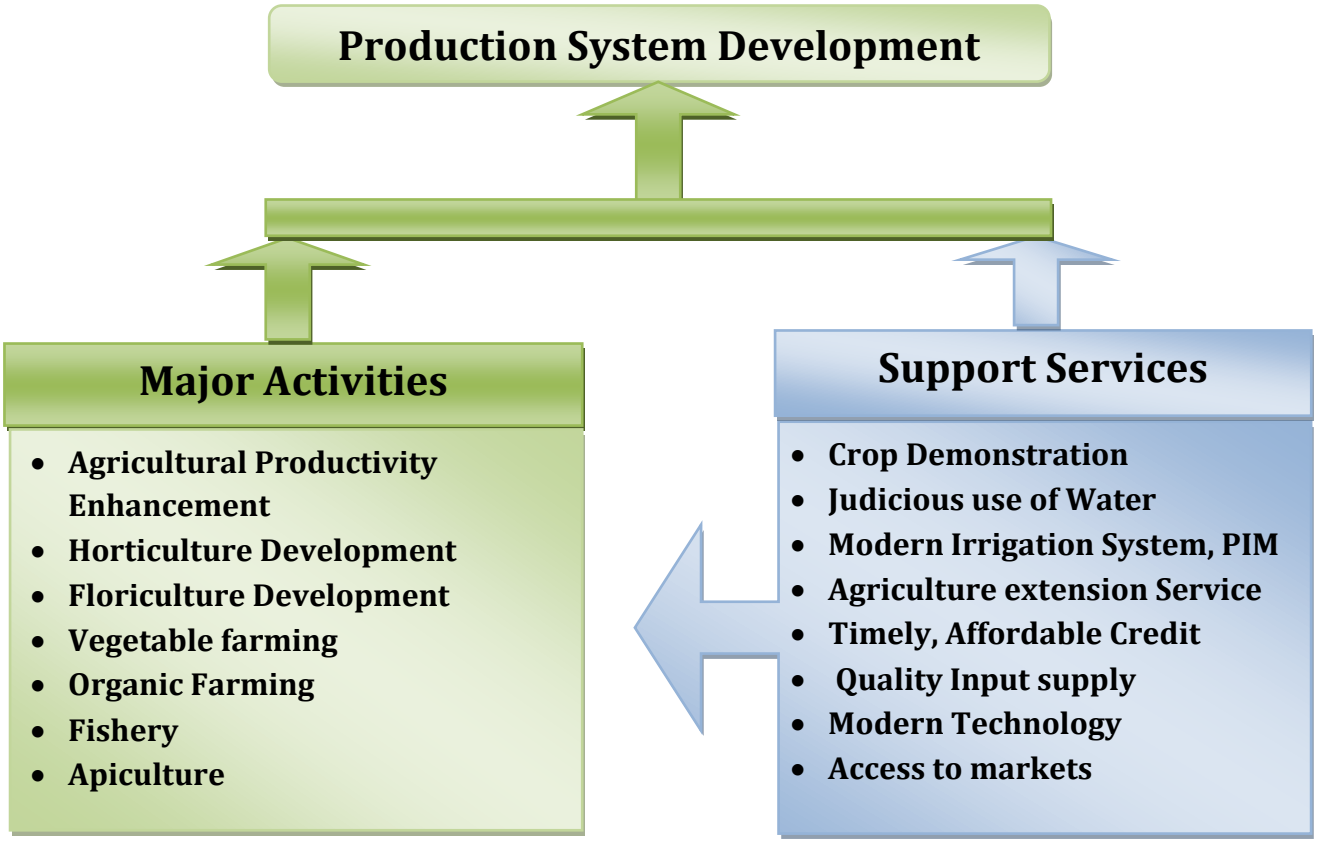


Fig: Flow chart of Production system development through various support services

3.2. Agriculture Productivity

Agricultural productivity is measured as the ratio of agricultural outputs to agricultural inputs. While individual products are usually measured by weight, their varying densities make measuring overall agricultural output difficult. Therefore, output is usually measured as the market value of final output, which excludes intermediate products such as corn feed used in the meat industry. These output values are compared to many different types of inputs such as labour and land (yield). Agricultural productivity may also be measured by what is termed total factor productivity (TFP). This method of calculating agricultural productivity compares an index of agricultural inputs to an index of outputs.

Always agricultural productivity has a relation with inputs and output of the produce. Increase in agricultural productivity is often linked with questions about sustainability and sustainable development. Changes in agricultural practices necessarily bring changes in demands on resources. This means that as regions implement measures to increase the productivity of their farm land, they must also find ways to ensure that future generations will also have the resources they will need to live and thrive.

To improve agricultural productivity, a number of things must be accomplished which are described bellow briefly:

a. ***Reduction of the present rate of degradation and loss of productive farmland due to erosion, salinization, water-logging, and nutrient depletion:*** Technologies for these purposes are available, but are little used because of the expense. However, many non-technological methods have been used for years by farmers (contour plowing, abandonment of marginal agricultural lands, planting of wind barriers, fallowing). Erosion can be prevented by the careful selection of appropriate crops, keeping ground cover on the soil, and contour ploughing. Irrigation increases crop yields by about 200%, so more land must be irrigated to increase production efficiency, but this uses great quantities of water. More efficient methods must be utilized to prevent water shortages, as only 45% of irrigation water is actually absorbed by plants. Drip irrigation and other efficient delivery systems, better water distribution systems, improved control systems, and raising crops suited to the climate and soil will aid in this endeavor. Excessive or continual irrigation leads to salinization and waterlogging of the soil, which will diminish or destroy its agricultural capacity.

b. ***Raising the crop yield on current agricultural land*****,** as most land is not producing yields even close to the maximum possible (in part because modern technologies are not used). If the gap between current and potential yield could be bridged, the production of major crops could be increased by 50 %. Increasing yields can raise income for marginal agriculturalists and reduce dependence upon destructive slash-and-burn agricultural methods. This may be done by improving tillage methods to preserve soils and nutrients, which will be more beneficial than removing rain forest to open more agricultural land. Other techniques might include soil testing to determine soil chemistry profiles, crop rotation, nutrient and water management, terracing,

instituting appropriate tillage methods for the soil/terrain, crop diversification, and interspersing crops with trees. These methods could reverse the nutrient depletion characteristic of so many cultivated soils in tropical areas. To increase productivity, one must also reduce losses from disease and pests, both during growth periods and after harvest Pest and disease-resistant varieties, better storage facilities and improved transportation could help in this, as well as the development of new high-yield crop varieties, suitable to local weather and soil conditions. Except for the "green revolution" with rice, less effort has been put into the development and study of tropical crops than temperate ones.

c. ***Reforming agricultural practices to be less harmful to forests and forest regeneration*****:** Among these reforms could be reductions in the use of burning, minimizing the use of toxic chemicals, and using swidden land less intensively by increasing fallow times. Zero tillage agriculture should also be utilized. When the soil is left untilled, organic matter is retained, preserving soil fertility and preventing erosion and runoff. Where the soils contain organic matter, forests can often regenerate.

d***. Improving the distribution of agricultural products*****:** Distribution systems are extremely unequal in most tropical countries, and often unreliable. Access to food and other agricultural goods must be increased in terms both of availability (delivery) and affordability.

e***. Reduction of the environmental impacts of new technologies*****.** To diminish environmental impacts, agricultural management systems must be devised which are suitable for specific areas and crops. This would allow reduction in artificial inputs, so that fertilizer and pesticide use could be considerably reduced.

f. Access to good quality inputs: Inputs play a major role in agricultural productions. Inputs include seed, fertilizer, and pesticides etc which are used to produce. Lack of knowledge of quality inputs & hesitation to adopt modern input are the main constrains in agricultural production. So the following points can be taken in consider for the better accessibility of inputs:

- Formation of certified seed bank at the local village level with proper guidance of the nearer Agricultural Universities and KVKs.
- Packaging of local vermin-compost or fertiliser in affordable price
- To improve affordability of agricultural inputs, it is important that suppliers of agricultural inputs be encouraged to package their products in smaller sizes that are affordable to the rural poor.

g. ***Development of agro-forestry projects*****:** Cash crops might be raised in small-scale agro-forestry plots. Marginal farmers will get benefited with this integrated approach.

h. ***Participatory Extention Management in IWMP Projects Area (Para Worker):*** Participatory extension system may be established for dissemination of relevant information to the stakeholders at our cluster villages. It will involve:

- Formation of a para-workers team from the community members who are willing to learn and undertake the assigned task for their villages.

- Following a hub and spoke model where Village watershed committee, user groups and self help groups can be utilized as the extension delivery spokes. These spokes will be facilitated by the Cluster office team.

- Use of ICT facilities at cluster office and Data cell at district unit for access to required information.

i. *Provision of governmental guidance and regulation*: The "green revolution" was successful and widespread only partly because of the dispersal of information to virtually all farmers.

Some of these scenarios require that new technologies be developed, others do not. All of these changes require that economic benefits accrue to farmers to provide them with incentives for using different technologies and methods, and for using them effectively. Economic and scientific aid will be required from international agencies as well as national governmental agencies in order to assure that any changes made are sound, adapted to local conditions, and environmentally safe.

Gujarat State Watershed Management Agency (GSWMA) tries to increase the income of the marginal farmer and the exploited section through increase the agricultural productivity through answering the following questions:

(i) What can be done to increase the produce
(ii) What can be done to reduce the inputs costs
(iii) What can be done to reduce the risk
(iv) What can be done to increase the price realisation of the produce among the stake holders

This whole chapter tries to analysis the above mention four crucial points which will helps to increase agricultural productivity.

(i) **To increase the agriculture produce,** following things should be practised during farming:
   i. Agriculture Mechanisation: Mechanized agriculture is the process of using agricultural machinery to mechanize the work of agriculture, massively increasing farm output and farm worker productivity. Besides improving production efficiency, mechanization encourages large scale production and improves the quality of farm produce.
   ii. Practicing of High yield variety of seed.
   iii. Modern irrigation practice
   iv. Proper knowledge of practicing or farming

(ii) **Reduction of the inputs costs** also helps to increase the benefit of the stakeholders.
   i. Provide the subsidies to the stakeholders
   ii. Convergence with other schemes
   iii. Adopting low cost techniques/ practice framed by the KVKs and Agricultural Universities.

(iii) **Risk** can be minimized through
   i. Insurance
   ii. Integrating low risk, low returning crops
   iii. Crop-diversification and practicing integrated crop practicing

(iv) **To increase the price realisation**, the following points will help the stakeholders to realise the actual price of the produce.
   i. Exposure visit to a successful firm who already benefited in that specific produce
   ii. Proper marketing linkage (Forward and Backward)
   iii. Value addition of the produce

Considering the above points, the chapter-3 tries to brief the following points which will help the field level staffs to understand the techniques and the process to implement the livelihood activities in the watershed areas.

a. **Judicious use of Water to increase Agricultural Produce or Access to Support Irrigation**
b. **Agriculture extension, New technology,**
c. **Timely, Affordable Credit**
d. **Forward and Backward linkages**
e. **Insurances to reduce risk**
f. **Farmers organisation**
g. **Methods and Practices of major crops**

3.3 Judicious use of Water to Increase Agricultural Produce

Judicious use of water means use of exact amount of water at correct timing. Water is essential for survival of all living organisms. It is the most important component of all life forms and necessary for sustaining life. It regulates climate, generates electricity and principal use in agriculture. About 97% of the water on earth is saline in nature, which is found in seas and oceans. The remaining 3% is fresh water, and most of which is stored in ice caps and glaciers, and just about 0.36% is distributed in lakes, rivers, ponds, etc. Apart from agricultural, and for industrial purposes, fresh water is needed by humans for their personal use (drinking, cleaning, and sewage disposal) and it is also used by other animals. Fresh water is a renewable resource as it is continuously being produced through hydrological cycle (evaporation, condensation and precipitation). The growing water scarcity and misuse of available water resources are now a day's major threads to sustainable development for arid and semi arid region of the country. This chapter describes the concept and objective of judicious use of water, various sources of water resources, present scenario of water resources in Gujarat, present gap in judicious use of water with probable remarks, then strategy for judicious use of water.

Gujarat being a water scarce State has been facing three consecutive years of drought in every decade. Absence of perennial rivers has remained a matter of continuing worry for the State. The underground sources are not adequate to cater the drinking water demand to overcome the drinking water supply problem. Over

exploitation of groundwater has resulted in failure of sources either in quality or quantity aspect. Living on hope of rains and the grace of God, Gujarat has adopted a path of strategic planning for resolution of water problem, considering water as divine gift of God.

Due to skewed water availability across various regions of the State, water scarcity was felt in most of Saurashtra, North Gujarat and Kutch regions. As per 2003 survey carried out as per Government of India's guidelines, more than 50% of the habitations in the State were facing water availability or water quality problems. Recurrent slipping back of habitations to not covered (NC), Partially Covered (PC) or quality-affected habitations needed a very ambitious planning for sustainability of water supply across the water scarcity and quality affected regions of the State. Safe and assured availability of drinking water throughout the year is the basic need of the human being. In these areas, the rural economy is heavily dependent on livestock and therefore paucity of water has got direct relation with their livelihood. The rural economy is dependent on availability of adequate and safe water not only to human being but also to large number of the livestock. *(Source: State Wide Water Supply Grid in Gujarat, Gujarat water supply and sewerage Board)*

3.3.1 Water Resources in Gujarat

Water resources consists of both surface water and ground water resources. The main source of all the water resources is the precipitation in the form of snow and rainfall. The surface and ground water resources play a major role in agriculture, livestock production, forestry development, fisheries development, etc.

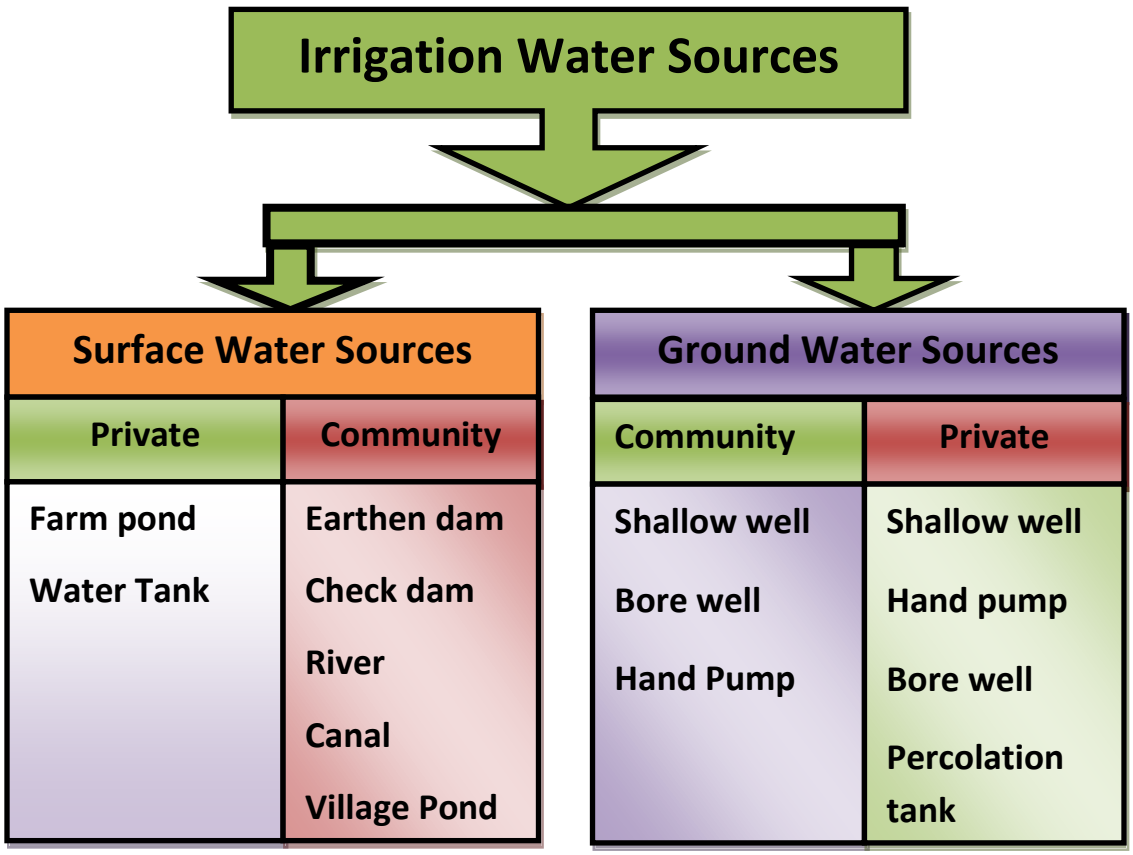


Fig: Various sources of Irrigation Water

Typical geological formations across the State make water storage in aquifers and percolation for ground water recharge difficult. Gujarat has long coastline and two huge gulfs – the Gulf of Cambay and the Gulf of Kutch - the entire Little Rann of Kutch and Greater Rann of Kutch are inundated with saline sea water for most of the year, deteriorating the ground water quality in adjoining areas Domestic and industrial water demand for the year 2025 are assessed to be 2,000 million cubic meters (MCM) per year. (*Source: Gujarat Water Conservation and Efficient Use, Vivrant Gujarat*).

Present Irrigation Potential in Gujarat		
1	Total Geographical Area	1,96 lakh ha
2	Cultivable Area	86 lakh ha
3	Rain-fed area in Gujarat	65.80 lakh ha
4	Irrigation Potential through canal irrigation	21.48 lakh ha.
5	Irrigation Potential through well irrigation	29.10 lakh ha.
6	Total Irrigation Potential	50.58 lakh ha.
7	Sardar Sarovar will add	17.92 lakh ha.
8	No. of Check dams constructed	3,455
9	No. of Farm Ponds created	31,091
10	No. of Village Ponds deepened	2,871
11	Creation of total storage capacity	1,664 lakh cu. Mt.
12	Drip Irrigation covered	1.51 lakh ha (93,000 farmers)

(Source: Narmada, Water Resources, Water Supply and Kalpsar Department, GoG)

Total fresh water availability is only 1,137 m3 per capita per annum. The distribution pattern of rainfall in the state ranges from over 2,000 mm in the Dangs in South Gujarat to about 200 mm in Kutch. 71% area of Gujarat is water scarce area. Coastal length is over 1600 kms whic is one third of the coastal length of India. As per international standard, if per capita availability of water is less than 1700 m3/year, the region is called "Water Stressed" and if less than 1000 m3/year, then the region is called "Water Scarce" *(Source: Narmada, Water Resources, Water Supply and Kalpsar Department, GoG).* In Saurashtra region per capita water availability is only 540 M^3/annum against 1700 m^3/annum minimum requirement. The excessive pumping of groundwater resulted in intrusion of saline water up to 10 km of entire coastal belt of Saurashtra.

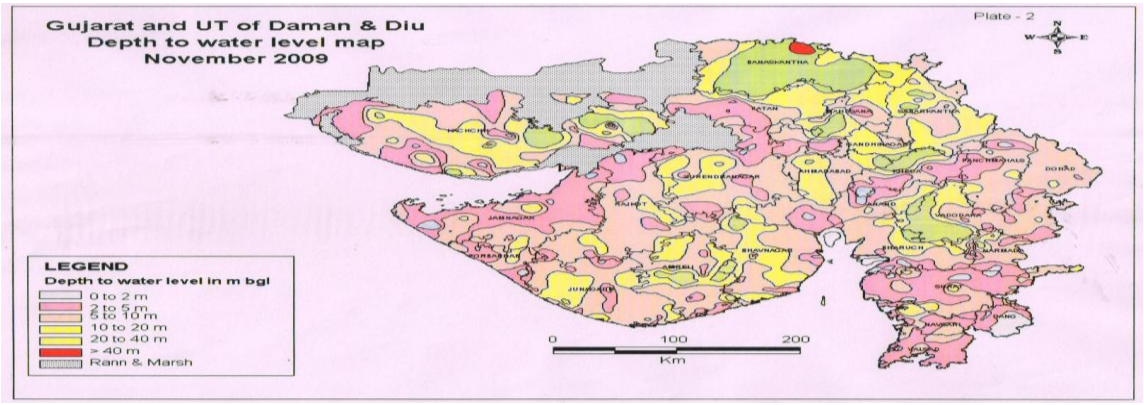


Fig: Groundwater depth map of Gujarat and UT of Daman & Diu (CGWB, Ahmedabad)

3.3.2 Objective of Judicious Use of Water

The different objectives of judicious use of water are:

1. Maximizing agricultural productivity by adopting micro-irrigation system
2. Maximizing the number of crops to be grown
3. For longer duration water access for drinking, cooking, bathing etc.
4. For longer duration access of water for livestock's
5. Strengthening policy for sharing of community water resources
6. Ecological balance and maximizing forestry development
7. Creating of ownershipness among the water user groups for community water resources
8. To enhance recharging of groundwater aquifer, wherever applicable
9. Improving the fertility and water holding capacity of soil
10. Improving On Farm Water Management and proper irrigation scheduling

3.3.3 Existing and Forecast Problems of Water Use in Gujarat

Forecast Gaps in Water use in Gujarat are as under:

Sr. No.	Forecast Gap	Forecast Causes
1	Drought prone & arid areas (50 % area of the state)	Due to tropical region
2	Faulty cropping practices	Lack of awareness in modern cropping practices
3	Improper Irrigation scheduling	Lack of awareness and extension services
4	Old method of irrigation practices in many areas	Lack of awareness on new irrigation tecnics
5	Non-participatory surface water use at village level	Lack of ownershipness and policy on Community water use at village level
6	Over Exploitation of Ground Water	Dewatering rate in many areas is much faster than its natural replenishment rate.
7	Sea-water Ingress	Due to coastal region and groundwater dewatering
8	Low Water Conveyance Efficiency	More seepage & evaporation loss due to longer & unlined drainage lines
9	Waterlogging	Due to inadequate drainage infustrature
10	Un-efficient On-Farm Water Management	Llack of awareness and extension services
11	Desertification in North & Saurastra region	Due to tropical and erratic rainfall
12	Undulated and slopy land	Lack of land leveling
13	Lack of Organic Farming	Lack of awareness and extension services
14	Lack of Mulching Activity	Lack of awareness and extension services

3.3.4 Strategy to access to Irrigation Support through IWMP

Sr. No	Irrigation Support	Irrigation Support through IWMP	Support by GGRC	Farmers Contribution
1	Marginal farmer (< 1 ha)	40 %	50 %	10 %
2	Small farmers (1 – 2 ha)	40 %	50 %	10 %
3	Semi-medium farmers (2-4 ha)	30 %	50 %	20 %
4	Medium (4– 8 ha)	20 %	50 %	30 %
4	Large farmers (> 8 ha)	10 %	50 %	40 %
6	Scheduled Tribe in tribal area	40 %	75 %	0 %
7	Scheduled Caste	40 %	50 %	10 %

3.3.5 General Roles to access Irrigation Support through IWMP

(i) Farmers living in the villages of IWMP project areas may accesss irrigation support through IWMP rules during the project period.

(ii) Irrigation support through integrated watershed management programme shall be given to only those farmers having surface water structure on their farm or near to the farm land withen 30m distance.

(iii) The surface water structure may be private or community watter resources.

(iv) For using community water resources, the user group must make a water use policy.

(v) Preference will be given to marginal and small farmers, schedule caste and scheduled caste farmers then other farmers.

(vi) The irrigation support shall be given to the farmers having their own farm lands and not to the leased in or leased out farm land.

(vii) Maximum limit for irrigation support to any individual through Integratted Watershed Management Programme is 1.00 lakhs as load to be refunded to the WDF within two years of giving the loan in maximum of four instalments.

NB: (i) Goverment of Gujarat (GoG) has appointed Gujarat Green Revolution Company as nodal agency for implementation of Micri-Irrigation Scheme in Gujarat. The general features of the scheme are given Annexure-II

(ii) List of field representatives with contact details of "Gujarat Green Revolution Company Limited" is given in Annexure-V

(iii) List of MIS suppliers with contact details identified by Gujarat Green Revolution Company are given in Annexure-V

3.3.6 Techniques of Judicious Use of Water Resources:

Improving water management in agriculture requires an improvement in soil moisture conservation measures and a reduction in wastage of irrigation water. Reduction in water wastage also brings about additional benefits in terms of reducing losses of applied nutrients, water erosion and pollution of surface and ground water.

The various techniques of judicious use of water resources are as under:

A. On Farm Water Management:

Management of Small catchment is the most efficient for water management in rain-fed agriculture shall be focused on improved management of the rain that falls on the farmer's field. Soil and water conservation or in-situ water-harvesting systems form the logical entry point is very important for improved water management in rainfed agriculture. Since in-situ rainwater management strate-gies are often relatively cheap and can be applied literally on any piece of land, they should be optimized on the field before supply of water from external sources is considered. Investing first in management of the local field water balance increases the likelihood of success in complementing the farming systems with supplemental irrigation systems based on rainwater harvesting, river-flow diversion or groundwater sources. In policy and investment terms, the focus should be on first tapping the in-situ potential prior to investing in external options. Conservation agriculture is of key importance in efforts to upgrade rain-fed agriculture among the resource-poor farmers. Water savings through improved management of irrigation supplies are considered essential to meeting future water needs. On farm water-use efficiency depends on adequate and timely supplies of water. This requires a surface-water system with sufficient off-farm storage and conveyance capacity, and effective control facilities and operating policies.

B. Surface Water Resources Management

The canal irrigation system was scientifically planned keeping in view the then cropping pattern, cropping intensity and water scarcity. The canal water operational schedule must be revised keeping in view the prevailing irrigation needs, availability of water resources etc. for making an optimal utilization of water resources.

C. Precision Land Leveling:

Unevenness in the soil surface adversely affects the uniform distribution of water in the fields. Now a day it is possible to do Precision land leveling on the fields, which seems to be leveled with naked eyes, with the help of Laser leveler which gives much better results than the earlier devices. Benefits of Laser leveling are:

i) More level and smooth surface.
ii) Reduction in time and water required to irrigate the field.
iii) More uniform distribution of water in the field.
iv) More uniform moisture environment of the crops.
v) More uniform germination and growth of crops.
vi) Improved field traffic ability.

D. Irrigation scheduling

Irrigation scheduling is commonly defined as the determination of the period when to irrigate and how much water to irrigate for optimum crop production. To achieve better productivity, it is important to work out an efficient and economic irrigation schedulenfor water use under any given set of agro-clamatic conditions. The

main objectives of efficient irrigation scheduling include (i) high yield of good quality; (ii) high water use efficiency; (iii) least demage to soil productivity, and (iv) Low irrigation cost. Scheduling of irrigations is based on type of crops, type of soil, atmosphere and plant water relations.

Physiological Stages: Irrigations are based on distintnstages of crop growth. The growth stages of some important field crops at which irrigations are given after considering for the rainfall, especially for Kharif crops.

Sr. No.	Crop	Physiological stage	Critical stage
1	Wheat	Crown root initiation (CRI), late tellering, late jointing, flowering, milk and dough	CRI and flowering
2	Potato	Sprouting, stolonization, stolon development, 20, 40, 60 and 80% of tuber weight	Sprouting and tuberization
3	Gram	Pre-flowering and pod formation	Pre-flowering
4	Soyabean	Early seedling, pre-flowering and pod development	Pre-flowering and pod development
5	Paddy	Early tillering, panicle inititation, flowering, milk and dough	Early tillering and flowering
6	Maize	Early vegetative growth, tasselling, silking and dough	Tasselling and silking
7	Cotton	Branching, pre-flowering and boll formation	Pre-flowering and boll formation
8	Sugarcane	Sprouting, tiller initation, tillering and grand growth	Sprouting
9	Groundnut	Emergence, flowering, pod formation and pod development	Flowering and pod development
10	Mustard	Vegetative growth, flowering	Flowering

Soil Moisture Deplition: Soil moisture levels are based either on available soil water depletion at certain depth (none of maximum root activity), or soil water potential of the same depths. The magnitude of available soil water depletions at which irrigation is to be scheduled may be 25, 50, 75% etc, while in soil water potential, the values may be 0.1, 0.2, 0.3, 0.4, 0.5, 0.6 bars etc., at some specific depths.

Farmers shall use satellite weather information and forecasting systems to schedule irrigation and employ evapotranspiration and soil moisture data for irrigation scheduling. Evapo-transpiration and soil moisture data may be available from the nearest weather stations, agricultural universities, KVKs etc or through radio, newspapers, mobile, web sites, etc Agriculture water use efficiency (WUE) depends on productivity gains, depicted by consistent increases in outputs per unit inputs. The

portion of water actually used by irrigated agriculture of the volume of water withdrawn.

E. Improving the Water Conveyance Efficiency

The water lost in the farms during conveyance from source to the crops can be reduced by adopting underground pipe line system. Water lost by seepage and evaporation can be reduced. By installing underground pipe line system, 3-4% of land can be saved which can be brought under cultivation.

F. Adoption of Improved Irrigation Methods:

The choice of irrigation technology is highly site-specific, reflecting locational, technical, and market factors. Field characteristics--such as field size and shape, field gradient, and soil type--are perhaps the most important physical considerations in selecting an irrigation system. Other important factors include technology cost (useful life, financing options); water supply characteristics (cost, quality, reliability, flow rate); crop characteristics (spacing, height); climate (precipitation, temperature, wind velocity); market factors (crop prices; energy cost, labor supply); producer characteristics (farming traditions; management expertise, risk aversion, tenant/owner status, commitment to farming); and regulatory provisions (groundwater pumping restrictions, drainage discharge limits, water transfer provisions).

i) *Furrow Irrigated Raised Beds:* In this system wheat is planted on the top of the raised beds that are superficially reshaped for sowing of next crop. Irrigation is applied through furrows between the beds. The main advantage of bed planting is saving in water. About 30-40% of water is saved in this method.

ii) *Furrow Irrigation method in wide row crops:* Crops like maize, cotton, Sun-flower, Sugar-cane and vegetables should be grown on ridges and water should be applied through furrows. In furrow irrigation water loss can be reduced because the wetted area is reduced. Water lost due to evaporation from soil surface and due to percolation is reduced too much extent.

iii) **Micro Irrigation:** The conventional methods of water conveyance and irrigation being highly inefficient have led not only to wastage of water but also to several ecological problems like waterlogging, salinization and soil degradation. It has been recognized that use of modern irrigation methods viz. drip and sprinkler irrigation is the only alternative for efficient use of surface as well as ground water resources. The water use efficiency in these systems is much higher than the flood method of irrigation. The Gujarat Green Revolution Company (GGRC) also supporting for Micro-Irrigation system in the state of Gujarat. The details micro- irrigation models and features of GGRC are given in Annexure-V, aa, bb, cc, DD and AB.

G. In Situ Retention of Rain Water:

In situ retention of rain water can help a lot in recharging the ground water. Studies have indicated that rising of peripheral bunds to a height of 18-20 cm around the fields could store nearly 90% of total rainwater in-situ for improved rice production and reduce the need of irrigation water.

H. Conjunctive use of water

There is excessive withdrawal of ground water to meet the irrigation demand of the crops. Increased use of canal water in conjunction with groundwater in this region will help in arresting the declining trend of water table. The status of groundwater depth map of Gujarat and UT of Daman & Diu collected in November 2009 by CGWB, Ahmedabad are given in para 3.2; Water Resources in Gujarat.

I. Crop Residue Management (CRM)

Crop residue management, which calls for fewer and/or less intensive tillage operations and preserves more crop residue from previous crops, is designed to protect soil and water resources and to provide additional environmental benefits. CRM is generally cost-effective in meeting conservation requirements and can lead to higher farm economic returns by reducing fuel, machinery, and labour costs while maintaining or increasing crop yields.

J. Mulching

Mulch is a protective covering, usually of organic matter such as leaves or straw, placed around plants. It prevents the evaporation of moisture, the growth of weeds and improves the water use efficiency. It reduces the evaporation losses from the soil surface. Mulching keeps the weed down and improves the soil structure and eventually increases the crop yield. Mulching films are most commonly used to save water, produce earlier, higher and healthier yields, and to produce plants with a better commercial appearance. Mulching has beneficial effects on soil, and on the environment. These include moisture retention, maintaining a proper structure, better use of fertilizers, protection of growing plants, less product damage and elimination of weeds when using opaque plastics.

K. Organizing Farmers Awarness Camp for Motivation and Demonstation

Improving agricultural water use efficiency depends on disseminating information on the use, costs, benefits, and impacts of technologies and on providing incentives for implementation. Need to strengthen capacity building institutions and farmers' organizations to support input and output marketing and agricultural production systems.

L. Participatory Irrigation Management (PIM)

Participatory Irrigation Management (PIM) is very important for efficient irrigation water sharing for agricultural development. The every community water resources mast form user groups to be involved in the operation, maintenance and management of water infrastructures/facilities. The legal framework provides for creation of farmers organisations i.e., Water Users' Association (WUA). The Associations at different levels are expected to be actively involved in monitoring flow of water in the irrigation system mainly.

Objectives of PIM:

i. To create a sense of ownership of water resources and the irrigation system among the users, so as to promote economy in water use and preservation of the irrigation system.
ii. To improve service deliveries through better operation and maintenance.
iii. To achieve optimum utilization of available resources through sophisticated deliveries, precisely as per crop needs.
iv. To achieve equity in water distribution.
v. To increase production per unit of water, where water is scarce and to increase production per unit of land where water is adequate.
vi. To make best use of natural precipitation and ground water in conjunction with flow irrigation for increasing irrigation and cropping intensity.
vii. To facilitate the users to have a choice of crops, cropping sequence, timing of water supply, period of supply and also frequency of supply, depending on soils, climate and other infrastructure facilities available in the commands such as roads, markets cold storages, etc., so as to maximize the incomes and returns.
viii. To encourage collective and community responsibility on the farmers to collect water charges and payment to Irrigation Agency.
ix. To create healthy atmosphere between the Irrigation Agency personnel and the users.

M. Organic Farming

Soil health is severely affected due to land degradation and is in need of urgent attention. Soil organic matter, an important driving force for supporting biological activity in soil, is very much in short supply, particularly in tropical regions. Management practices that augment soil organic matter and maintain it at a threshold level are needed. Farm bunds could be productively used for growing nitrogen-fixing shrubs and trees to generate nitrogen-rich loppings. The detail process of organic farming and model vermin-compost unit are given in this chapter.

N. Growing Suitable Crop Varieties:

Timely or late sown short duration varieties of crops should be encouraged over early and long duration varieties to reduce evapo-transpiration losses.

O. Renovation of village ponds for irrigation

Renovation of village ponds is very usefull for providing irrigation. The quality of pond water is not only suitable for irrigation in most of the cases but rich in nutrients, which is an added advantage. The renovation of these ponds for irrigation is of special importance in areas with declining water table. As a result of additional water available, the ground water draft in the declining water table area will be reduced and check the declining water table.

P. Crop diversification:

The success of crop diversification is possible only if the alternate crops provide returns to the farmers not less than being obtained by them from pre-planned crop.

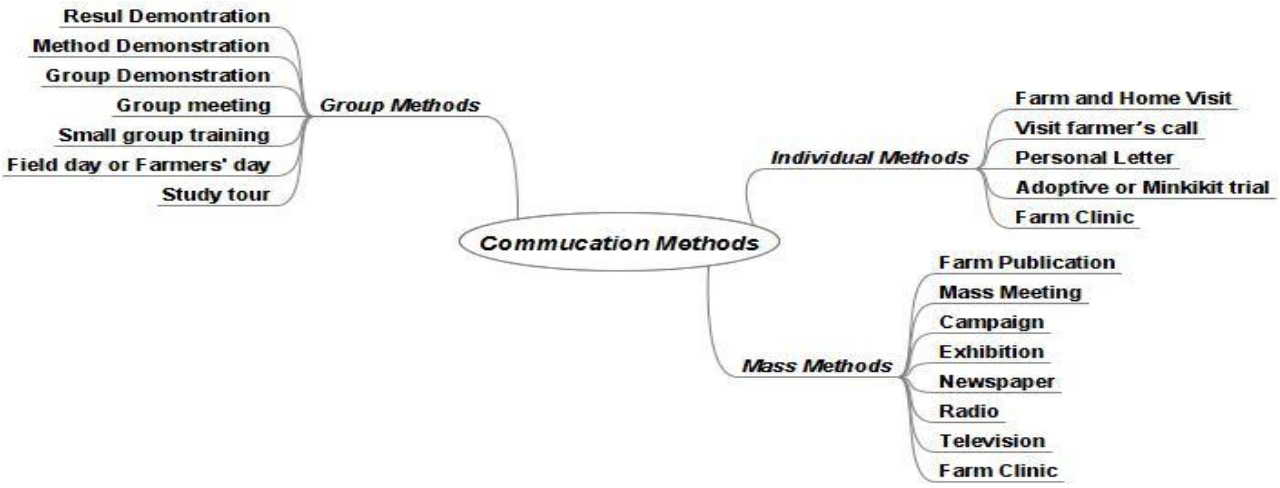
Q. Artificial recharge of Ground water:

It is a promising strategy to arrest the declining ground water table. Various techniques being adopted to recharge the ground water in Gujarat are (a) *Roof Top Water Harvesting:* The roof top rain water can be diverted to the existing open/bore well or the rain water from the roofs and the rain water available in the open spaces around the building may be recharged into the ground through the percolation pits, recharge trench or recharge wells depending on the conditions. (b) *Recharge from Village Ponds, (*c) *Recharge through Dugwells*

3.4 Agriculture extension, new technology

A method of procedure of process for attaining an objective is called communication method. The choice or the channel or method of communication, also known as extension teaching method, generally depends on the number and location of the target audience and the time available for the communication. They are categorized as –

- Individual Method
- Group Method and
- Mass method



3.4.1 Individual Method:-

In this method the extension agent communicates with the people individually, maintaining separate identity of each person. This method is followed when the numbers of people to be contacted are few, are conveniently located close to the communicator, and sufficient time is available for the communication examples are:

A. Farm and home visit,
B. Visit farmer's call
C. Personal Letter
D. Adoptive or Minikit trial
E. Farm Clinic

A. **Farm and home visit: -**

Farm and home visit is a direct, face-to –face contact by the extension agent with the farmer or home maker at their farm or home.

Technique

Planning and preparation

I. Decide on the audience and the objective- whom to meet and what for ?
II. Get adequate information about the topic. Contact research if needed.
III. Collect relevant publication and materials to be handed over.
IV. Make a schedule of visit to save time and energy.

Implementation

I. Visit on the scheduled date and time or according to convenience of the farmer and when the person is likely to listen.
II. Create interest of the farmers and allow the individual to talk first.
III. Present the message or points of view and explain up to the satisfaction of the farmer.
IV. Answers to questions raised and clarify doubt. And over publications.
V. Try to get some assurance for action.

B. Visit farmer's call: -

FARMER'S CALL is a call made by a farmer or homemakers at working place of the extension agent for obtaining information and assistance.

Technique

Planning and preparation

I. Keep the office neat, orderly and attractive
II. Remain present in the office on fixed days and hours, which have been communicated to the farmers and homemakers in advance.
III. Make alternative arrangements to provide information and assistance to the caller in case of absence.
IV. Organize and information center in the office or at least put up a few boards in the office room and display currents leaflets, folders , photos, charts etc. relating to important project and extension activities in the area.

Implementation

I. Allow the visitor to talk first and make the point.
II. Discuss about the problem and prescribe solutions. If necessary. Take the person to the subject matter specialist.
III. Let the visitor leave the office satisfied

C. Personal Letter: -

PERSONAL LETTER is written by the extension agent to particular farmer or home maker in connection with extension work. This should not be regarded as a substitute for personal contact.

Technique

I. Send the letter in time, or if a letter has already been received, send a prompt reply.
II. The content should be clear, complete, to the point and applicable to farmer's own situation.
III. Use simple and courteous language

D. Adoptive or Minikit trial :-

ADAPTIVE or MINIKIT TRIAL is a method of determining the suitability or otherwise of a new practice in farmer's situation. This may be regarded as an on farm participatory technology development process in which farmer's choice and opinion about the practice are most important. This is the first stage a new and improved practice passes through, before it is taken-up for result or method demonstration, or recommended for poor scale adoption . Minikits are, however, distributed in some States for assisting the poor farmer s or in times of distress, to maintain farm productivity.

Technique

Planning and preparation

I. Select new and promising practices suitable for the area in consultation with research and farmers.
II. Select a small number of innovative farmers for conducting the trails.

Implementation

I. Explain the objective of the farmers. Make it clear that it is a simple trial in a small portion of the plots and does not involve great risk.
II. Supply the critical inputs in the time and supervise all important steps personally.
III. Assist the farmers to maintain accurate records.

E. Farm Clinic: -

FARM CLINIC is a facility developed and extended to the farmers for diagnosis and treatment of farm problems and to provide some specialist advice to individual farmers. The extension agency may setup farm clinics in the village and/or in the organization's headquarters and sub centers, where the relevant subject matter specialists, in with extension agents, discuss, diagnose and prescribe treatment to farmers' problems, meeting those present individually, on fixed place, day and time. The specialists may visit the local area if needed, for an on-the spot diagnosis and guidance or follow-up. This method is suitable for treatment and prevention of health of problems relating to plants, animals and soils.

3.4.2 Group Methods:-

1. **Result Demonstration: -**

   RESULT DEMONSTRATION is a method of motivating the people for the adoption of new technology by showing its distinctly superior result. The demonstrations are conducted in the farm or home of selected individuals and are utilized to educate and motivate groups of people in their neighborhood. This is a very effective method for the transfer of technology in a community.
2. **Method Demonstration: -**

   A METHOD DEMONSTRATION is given before a group of people to show how to carry out an entirely new practice or an old practice in a better way. It is essentially skill training
3. **Group Meeting:-**

   GROUP Meeting is a method democratically arriving at certain decisions by a group of people, by taking into consideration the members' points of view . Group meeting and discussions aim at collective decision making and at improving individual decision making by using the knowledge and experience of colleagues. The group processes enhance the people's participation and facilitate

programme implementation. It also develops capability of the people for disaster management.

The convenient size of group for conducting a meeting or discussion may be around 15 to 20, which may be extended up-to about 50. Group discussions may be directive or non-directive according to needs of the situation.

Technique

Planning and preparation

I. Decide on the topic to be discussed and the persons to be involved.
II. Collect relevant information. Contact research if required.
III. May request resource person and subject matter specialist to participate.

Implementation

I. Start the meeting on the scheduled date and time.
II. Introduce the topic to the group and initiate discussion.
III. Allow the members to talk and interact.
IV. Facilitate discussion by further explanation the points already made and giving new points, if required.
V. Enforce the less vocal members to participate in the discussion.
VI. Assist the group to take decisions and make a record of important decisions.

4. Small Group Training: -

SMALL GROUP TRAINING is a technique of imparting specific skills to a group of people who need them by creating an appropriate learning situation. This is an effective method of transfer of technology.

Technique

Planning and preparation

I. Identify the technology for which there is a need in a community.
II. Decide on the time and duration of the training programme.
III. Select trainers having both theoretical knowledge and practical experience about the technology.
IV. Prepare a written programme allocating topics to different trainers.
V. Collect relevant materials publications and audio-visual aids.
VI. Inform all concerned in time.
VII. Make arrangement for food, accommodation etc.
VIII. Allocate responsibilities to suitable persons.
IX. Make arrangement for registration of the participants.

Implementation

I. Start the training programme on the appointed date and time.
II. Distribute publications and materials for taking notes.
III. Keep inaugural function and others formalities to a minimum.
IV. Invite the trainers as per programme and give enough time for the discussion and the trainees to react.

V. Explain the relevant technology and state clearly why and how it should be done.
VI. Use visual aids like chalk board, models, slide projector etc.
VII. Arrange practical demonstration and give enough to reach trainee for practicing the skills.
VIII. Clarify doubts and answer their queries.
IX. Arrange a film show on the topic and take the group to nearby place where they can see successful demonstration of the practice.

5. **Field Day or Farmers' Day: -**
   FIELD DAY or FARMERS' DAY is a method of motivating the people to adopt a new practice by showing what has actually been achieved by applying the practice under field conditions. A field day or farmer's day may be held in a research farm or in a farmer's field or home.
6. **Study Tour :-**
   In STUDY TOUR, a group of interested persons accompanied and guided by one or more extension agents moves out of their neighborhood to study and learn significant improvements in farm and home elsewhere. The main purpose is to motivate the visitors by showing what others have been able to achieve. The programme may include visit to farmers' place as well as research stations, and may held within the district, outside the district or even outside the State.

3.4.3 Mass Methods:-

1. **Farm Publication: -**
   FARM PUBLICATION is a class of publication prepared by the extension agency in printed form, containing information relating to the improvement of farm and home. Farm publications are of various types such as leaflet, bulletin, newsletter, journal and magazine. Farm publications may be used singly or in combination with other extension methods.

2. **Mass Meeting: -**
   MASS MEETING is held to communicate interesting and useful information to a large audience at a time. The size of the audience for mass meeting may be few hundreds, but at time of fairs or festivals it may be few thousands. The majority of audience has a purpose in attending the meeting, though some outsiders may attend it out of curiosity. Mass meeting may be held in a covered or in an opened place address system is essential for conducting mass meeting. Slide or film show may enhance effectiveness of the meeting.

3. **Campaign: -**
   A CAMPAIGN is an intense educational activity for motivating and mobilizing a community to action, to solve a problem or satisfy a need urgently. The duration of a campaign may be for a single day on a theme like "water for life", for a few weeks or few months as "Vanamahotsava (tree planting)" and for a few year as in Grow more food campaign. A campaign may be held involving a small number of

people in a few villages, or by involving an entire community or entire State/nation over the whole country. Campaign on certain themes (say environment, disease control etc) may be organized over the whole world. Campaign around a theme may be organized only ones, or may be repeated year after year, till the goal is satisfactorily reached.

4. **Exhibition: -**
   An EXHIBITION is a systematic display of models, specimens, charts, photographs, pictures, posters, information etc. in a sequence around a theme to create awareness and interest in the community. This method is suitable for reaching all types of people. Exhibition may be held at the village, block, sub-division, district, State, national and international levels. The main objectives of the exhibition are 1. To acquainting people with better standards. 2. To create interest in wide range of people. 3. To motivate people to adopt better practice.

5. **Radio rural forum: -**
   A combination of mass media and inter personal communication is more is more effective in reaching people with new ideas and persuade them to adopt innovation than mass media alone. Such combinations are known as media forums, where small organized groups of individuals meet regularly to receive a mass media programme and discuss its contents.

*(**Reference Book**: - Extension communication and Management forth Edition by GL Ray, Chapter - 4 page no. 85-120)*

3.5 Timely, Affordable Credit

To get the best from their land, farmers need access to affordable credit. Banks have been consistently meeting the targets set for agriculture credit flow in the past few years. For the year 2011-12the Finance Minister is arising the target of credit flow to the farmers from `3, 75, 000 crore this year to `4, 75,000 crore in 2011-12. Banks have been asked to step up direct lending for agriculture and credit to small and marginal farmers.

The existing interest subvention scheme of providing short term crop loans to farmers at 7 per cent interest will be continued during 2011-12. In the last budget, Finance Minister had provided an additional 2 per cent interest subvention to those farmers who repay their crop loans on time. The response to this scheme has been good. In order to provide further incentive to these farmers, Finance Minister has proposed to enhance the additional subvention to 3 per cent in 2011-12. Thus, the effective rate of interest for such farmers will be 4 per cent per annum.

In view of the enhanced target for flow of agriculture credit, Finance Minister has proposed to strengthen NABARD's capital base by infusing `3000 crore, in a phased manner, as Government equity. This would raise its paid-up capital to `5,000 crore. To enable NABARD refinance the short-term crop loans of the cooperative credit institutions and RRBs at concessional rates, I propose a contribution of `10,000 crore to

NABARD's Short-term Rural Credit Fund for 2011-12 from the shortfall in priority sector lending by Scheduled Commercial Banks.

3.5.1 Agricultural Credit

The Government has taken many policy initiatives for strengthening farm credit delivery system for providing credit at affordable rates of interest to support the resource requirements of the agricultural sector. The emphasis of these initiatives has been on providing timely and adequate credit support to farmers with particular focus on small and marginal farmers and weaker sections of society to enable them to adopt modern technology and improved agricultural practices for increasing agricultural production and productivity.

The policy essentially lays emphasis on augmenting credit flow at the ground level through credit planning, adoption of region specific strategies and rationalization of lending policies and procedures and bringing down the rate of interest on farm loan.

3.5.2 Institutional Arrangements:

Agricultural credit is disbursed through a Multi- Agency network comprising of Commercial Banks (CBs), Regional Rural Banks (RRBs) and Cooperatives. With their vast network (covering almost all the villages in the country), wider coverage and outreach extending to the remotest part of country, the Cooperative Credit Institutions, both in short and long-term structure are the main institutional mechanism for dispensation of agricultural credit.

3.5.3 Policy Initiatives for Increasing the Flow of Credit:

The Government has initiated several measures to galvanize the institutional credit system to make them more responsive to the needs of farmers. Some of the important measures initiated in this regard are as under:-

In order to improve the flow of credit problem of indebtedness, Government of India on 18.6.2004 announced a special farm credit package. The package interalia envisaged that credit to agriculture sector will double in the next three years. Banks have been advised to simplify the procedure for documentation for agricultural loans. To improve the outreach among the poor and the informal sector, the SHG-Bank linkage programme was intensified. Banks have also been advised to finance Joint Liability Groups and Tenant Farmers' Groups. As part of the measures announced by the Reserve Bank of India (RBI) for financial inclusion, banks have been advised to open "No Frills" accounts and issue simple overdraft facility against such accounts. Banks have also been advised to issue General Credit Cards upto Rs. 25,000/- without insisting on security and end use of funds. Banks have been advised to undertake, on a pilot basis, 100% financial inclusion in at least one district in each State. Based on the success of the pilot, the State Level Bankers Committee in the States will draw a time bound plan for achieving 100% financial inclusion in other districts of the State.

3.5.4 Revival Package for Short Term Cooperative Credit Structure:

In pursuance of the recommendations made by the Vaidyanathan Committee Task Force, Government of India had approved a Revival Package for Short Term Cooperative Credit Structure (STCCS) aimed at making it a well managed and vibrant

structure to best serve the credit needs of Rural India. Revival Package envisages an outlay of Rs.13, 597 crores for recapitalization of STCCS, capacity building & training and computerization subject to legal reforms by the State Governments. The Revival Package seeks to (a) provide financial assistance to bring the system to an acceptable level of health; (b) introduce legal and institutional reforms necessary for their democratic, self-reliant and efficient functioning; and (c) take measures to improve the quality of management as an integrated package. So far, 25 States, namely, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Haryana, Jammu & Kashmir, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Rajasthan, Orissa, Punjab, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal have signed the Memorandum of Understanding (MoU) with Government of India (GOI) and NABARD. These states cumulatively cover 96% of the STCCS units in the country. An amount of Rs. 8009.75 crores has been released by NABARD as GOI's share for recapitalization of 49,976 PACS as on 30th November, 2010.

3.5.5 Kisan Credit Card:

Banks are issuing Kisan Credit Cards to farmers for providing adequate and timely support from the banking system for their cultivation needs including purchase of all inputs in a flexible and cost effective manner. About 948 lakh KCC have been issued up to June,2010. Further, under Kisan Credit Card, a farmer is sanctioned loans for short term /medium term & long term and a reasonable component of consumption credit within the overall limit sanctioned to the borrowers. Banks have been advised to provide active KCCs to all the eligible and willing farmers in a time bound manner.

3.5.6 Rate of Interest on Agricultural Loan:

From Kharif 2006-07, farmers are receiving crop loans upto a principal amoun 1% interest subvention to those farmers who repaid their short term crop loans as per schedule. Government has raised this subvention for timely repayment of crop loans from 1% to 2% from the year 2010-11. Thus the effective rate of interest for such farmers will be 5 % p.a.

3.5.7 Rehabilitation Package for Distressed Farmers:

A Rehabilitation Package of Rs. 16978.69 crores for 31 suicides prone Districts in the four States, namely, Andhra Pradesh, Maharashtra, Karnataka and Kerala is under implementation. The rehabilitation package aims at establishing a sustainable and viable farming and livelihood support system through debt relief to farmers, improved supply of institutional credit, crop centric approach to agriculture, assured irrigation facilities, watershed management, better extension and farming support services and subsidiary income opportunities through horticulture, livestock, dairying, fisheries etc. So far an amount of Rs.19163.91 crores (as on Sept, 2010) has been released to these States. Government has further carried out mid-term modifications and has extended the period for implementation of the non credit components by 2 more years i.e. up to 30th September, 2011.

3.5.8 Flow of Agriculture Credit:

The target of agriculture credit flow for the year 2010-11 was fixed at Rs. 375000 crores and the achievement as on 31st October, 2010 was Rs. 228884.39 crores which is 60.50 % of the target. During this period, around 31.51 lakh new farmers have been financed by the Public Sector Commercial Banks and 2.75 lakh new farmers by Private Sector Commercial Banks. Further, RRBs have financed 11.84 lakh new farmers during this period. Thus the total number of new farmers financed by CBs and RRBs together is 46.10 lakh, against the target of 50.00 lakh for the year. In addition to this, the Cooperative Banks have financed 10.22 lakh new farmers during this period taking the total of new farmers financed by the Banking System to 56.32 lakh.

3.5.9 Banks in agricultural sector for Affordable credit

Nationalization of banks was a major step for channelizing credit to various sectors of economy of which agriculture is a major sector. A dynamic and growing agricultural sector needs adequate finance through banks to accelerate the overall growth. The government has directed the banks to double their flow of credit to agriculture sector in three years commencing from the year 2004-05. With the government's keen interest and special budget allocation for agricultural in the 11th five-year plan, it is now in the hands of the farmer to reap the benefit of the schemes offered by the banks. Following is a list of offers of credit from some of the nationalized banks.

Name of banks	Schemes or facility in Agriculture Credit
Allahabad Bank (www.allahabadbank.com)	• Kisan Shakti Yojana Scheme • Farmers are free to utilise the loan at their own choice • No margin is required • 50% of the loan amount may be utilized for personal/domestic purposes including repayment of debt to money lenders
Andhra Bank (www.andhrabank.in)	• Andhra Bank Kisan Green card • Coverage under Personal Accident Insurance Scheme (PAIS)
Bank Of Baroda (www.bankofbaroda.com)	• Purchase of second hand tractors scheme for dry-land farming • Working capital needs to dealers/distributors/traders of agrl. Inputs/livestock inputs • Hiring agrl. machinery • Development of horticulture • Working capital for units engaged in dairy, piggery, poultry, sericulture etc. • Financing Scheduled Caste/Scheduled Tribes for purchase of farm implements, tools, pair of bullocks, creation of irrigation facilities.
Bank of India (www.bankofindia.com)	• *Star Bumiheen Kisan Card* – for share croppers, tenant farmers and oral lessees

	• *Kisan Samadhan card* – Kisan credit card for crop production and other related investments • *BOI Shtabti Krishi Vikas Card* – electronic card for anywhere anytime banking for farmers • Funding for contract farming in hybrid seed production, cotton industry, sugarcane industry etc. • Special schemes for SHGs and to empower women folk • *Star Swarojkar Prashikshan Sansthan (SSPS***)**, a new initiative to provide entrepreneurial training tofarmers • Crop loans : Upto Rs. 3 lakhs at the rate of 7% per annum • Collateral security: loans up to Rs. 50, 000, no collateral required, but for above Rs. 50, 000, RBI directives are followed.
Dena Bank (www.denabank.com)	• Dena bank is most active in **Gujarat**, Maharashtra, Chhattisgarh and UT of Dadra and Nagar haveli. • **Dena Kisan Gold Credit Card Scheme** • Maximum credit limit up to Rs. 10 lakh • Provision of 10% towards domestic expenses including education of children • Longer repayment period up to 9 years • Loan is available for any type of investment in farm such as farm implements, tractors, sprinklers/drip irrigation systems, oil engine, electric pump sets, etc. • Short term crop loan up to Rs. 3 lakhs @ 7% • Disposal of loans within 15 days of application • No collateral up to Rs. 50, 000 for farm loans and up to Rs. 5 lakhs for setting up agri-clinic and agri-business units.
Indian Bank (www.indianbank.in)	• **Production Credit :** Crop loans, Tie-up with sugar mills & Kisan Credit Card Scheme, Crop loans to tenant farmers, share croppers and oral lessees • **Agricultural Investment Credit :** Land development, minor irrigation, micro irrigation, farm mechanization, plantation and horticulture • **Agricultural Structured Loans :** Kisan Bike, Agri- Vendors Bike, Agri. Clinics and Agri Business Centres • **Group Lending for Agricultural Development:** Loan to joint liability groups / Self Help Groups **New Agricultural Avenues:** Contract farming, Organic farming, rural godowns, cold storage,

	medicinal and aromatic plants, bio-fuel crops etc..
Oriental Bank of Commerce (www.obcindia.co.in)	• Oriental green Card (OGC) Scheme • Composite Credit Scheme for Agricultural lending • Setting up of cold storages/godowns • Financing commission agents
Punjab National Bank (www.pnbindia.in)	• **PNB Kisan Sampuranrin Yojana** • **PNB Kisan Icha Purti Yojana** • Growing potatoes/fruits against pledge of cold storage receipts • Self propelled Combine Harvestors • Development of Forestry nursery • Wasteland development • Mushroom/Prawn culture and mushroom spawn production • Purchase nad maintenance of milch animals • **Dairy Vikas Card Scheme** • Schemes for pisciculture, piggery, bee-keeping etc.

Ref: Website: India Development Gateway

References: *Indiabudget.nic.in/ub2011-12/bs/bs.doc, Ministry of Finance-GoI Budget)-India Budget 2011-12 point no. 62, 63, 64).*

3.6 Access to Good Quality Inputs and Markets

3.6.1 Access to Good Quality Inputs

Inputs and Services

(i) **Seeds:** Good quality seeds and disease-free planting material, including in-vitro cultured propagates, are essential for crop productivity and security. Hybrids are now becoming available for many crops. In the case of new varieties, foundation seeds would be provided to grass root level seed growers and their groups such as cooperative societies and SHGs. Mutually beneficial farmer-seed company partnerships will be encouraged. Agricultural universities would be encouraged to organize courses on seed technology and business, and mainstream business principles in all applied courses. A national seed grid will be established to ensure supply of seeds across the Country, as per the area specific requirement.

Table: Details crop-wise schemes and the scale of assistance

Scheme/ Component	Crop	Scale of Assistance
Macro Management Mode of Agriculture-State Work Plan	Rice and Wheat Bajra, Jowar, Ragi and Barley	(i) Rs.500/- per quintal or 50% of the cost, whichever is less for certified seed distribution for rice and wheat. (ii) Rs.800/- per quintal or 50% of the cost, whichever is less for certified seed distribution of varieties for Bajra, Jowar and Barley (iii) Rs.1000/- per quintal for certified seed

		distribution of hybrid of Bajra and Jowar. (iv) Rs.1000/- quintal or 50% of the cost, whichever is less for assistance for production hybrid rice seed. (v) Rs.2000/- per quintal or 50% of the cost, whichever is less assistance for production hybrid rice seed distribution.
Integrated Scheme on Oilseeds, Pulses, Oil Palm and Maize	All Oilseeds, Pulses and Maize Oil Palm Sprouts	(i) Full cost for purchase of Breeder seed. (ii) Rs.1000/- quintal for foundation and certified seed production. (iii) Rs.1200/- per quintal or 25% of Seeds cost whichever is less for certified seed distribution. (iv) Full cost of Seed Minikits of high yielding varieties (implementing agency NSC/SFCI). (v) 75% of the cost with a ceiling of Rs.7500/ha.for entire land holding of farmers.
Technology Mission on Cotton	Cotton Seed	(i) 50% of the cost or Rs.50/- per kg. whichever is less for foundation seed production. (ii) 25% of the cost or Rs..15/- per kg. whichever is less for Certified seed production. (iii) Rs.20/- per kg. for certified seed distribution. (iv) 50% of the cost limited to Rs.40/- per kg. seed treatment
Technology Mission on Jute and Mesta	Jute and Mesta	(i) 50% of the cost limited to Rs.3000/- per quintal for foundation seed production. (ii) 25% of the cost limited to Rs.700/- per quintal for Certified seed production (iii) 50% of the cost limited to Rs.2000/- per quintal for certified seed distribution.
National Food Security Mission	Rice	(i) Rs.1000/- per quintal or 50% of the cost whichever is less for certified hybrid rice seed production. (ii) Rs.2000/- per quintal or 50% of Seeds cost whichever is less for certified hybrid rice seed distribution. (iii) Rs.5/- per kg.. or 50% of the cost, whichever is less for certified high yielding varieties seed distribution. (iv) Full cost of Seed Minikits of high yielding varieties.
	Wheat	(i) Rs.5/- per kg. or 50% of the cost whichever is less for certified high yielding varieties seed distribution (ii) Full cost of Seed Minikits of high yielding varieties.
	Pulses	(i) Rs.1000/- per quintal for foundation and certified seeds production. (ii) Rs.1200/- per quintal or 50% of the cost whichever is less for certified seed distribution. (iii) Full cost of Seed Minikits of high yielding

		varieties
Seed Village Programme	All Agricultural Crops	(i) To upgrade the quality of farmer saved seed financial assistance for distribution of foundation/certified seeds at 50% cost of the seed for production of quality seeds. (ii) Assistance to train the farmers on seed production and seed technology @ Rs.15000/- for a group of 50-150 farmers. (iii) To encourage farmers to develop storage capacity of appropriate quality assistance @ 33% subject to a maximum of Rs. 3000/- for SC/ST farmers and @ 25% subject to maximum of Rs. 2000/- for other farmers for procuring seeds storage bin of 20 qtl. capacity .Assistance @ 33% subject to maximum of Rs. 1500/- to SC/ST farmers and @ 25% subject to maximum of Rs. 1000/- for other farmers for making seeds storage bin of 10 qtl. capacity in the seed villages where seed village scheme is being implemented.
Transport subsidy on Movement of Seeds to North Eastern States including Sikkim, Himachal Pradesh, Jammu & Kashmir, Uttarakhand & Hill areas of West Bengal	All certified seeds excluding potato	(i) 100% difference between road and rail transportation charge is being reimbursed to implementing States/Agencies for movement of seeds produced from outside the State to the identified State Capital/District Headquarter. (ii) Actual cost restricted to maximum limit of Rs.60/- per quintal whichever is less for movement of seeds transported within the State from State Capital/District Headquarter to sale outlets/sale counters is being reimbursed.
Hybrid Rice Seed Production	Only Rice	Hybrid Rice Seed Production assistance Rs.2000/qtls. Hybrid Rice Seed Distribution assistance Rs2500/qtls.
Creation and Strengthening of Infrastructure Facilities	All Crops	To create/strengthen infrastructure facilities for production and distribution of quality seeds for the States/State Seeds Corporation financial assistance for creating facilities for seed cleaning, grading, processing, packing and seed storage is being provided in public sector
Rashtriya Krishi Vikas Yojana	All Crops	All Activities including Seed Infrastructure Facilities

National Horticultural Research and Development Foundation (NHRDF):

The National Horticultural Research and Development Foundation (NHRDF) was established by National Agricultural Co-operative Marketing Federation of India Ltd. (NAFED) and its Associate Shippers of onion on 3 November, 1977 under Societies

Registration Act, 1860 at New Delhi. The aim of establishment of NHRDF was to guide the farmers, exporters and others concerned for improving the productivity and quality of horticultural crops in order to make available sufficient quantity for domestic requirement and also to boost up export of onion and other such export oriented horticultural crops in the country.

Table: List of (National Horticultural Research and Development Foundation (NHRDF) Centres and their addresses in Gujarat

Sr.No.	Addresses of Centres	Phone No. & E-mail	Activity
1	National Horticultural Research and Development Foundation, Plot No.7, Behind Hotel Murlidhar, Village- Naranka, Post- Khandheri Taluka- Paddhari, **Distt- RAJKOT– 60 110 (GUJARAT).**	Telefax: 02820-291505 E-mail: rajkot@nhrdf.com Mob: 9586560841	**Extension, Seed Production and Distribution, Seed processing plant**
2	Regional Research Station **National Horticultural Research And Development Foundation, Onion and Garlic Research and Development Centre, Old railway station Road,** TALAJA, DIST-BHAVNAGAR-364 140 (GUJARAT)	**02842-222830 E-mail: talaja@nhrdf.com Mob. - 9426788419**	**Research and Development, Extension, Seed Production and Distribution**

Gujarat State Seeds Corporation Ltd. "GURABINI":- Gujarat Sate Seeds Corporation Ltd., established in April 1975 popularly known by its brand name "GURABINI" is serving in the larger interest of farmers from more than three decades with farmer's faith brand loyalty, quality assurance, dedicated service and sustainable contribution for up-liftment of farmers with Glorious achievements. GURABINI is primarily engaged in production, processing and marketing of seeds of more than 30 crops and 100 varieties and hybrids in almost all categories i.e. Cereals, Pulses, Oilseeds, Fibre Crops, Fodder, and Green Manuring Crops. GURABINI is having its Head office at Gandhinagar, and 13 Branches across the Gujarat and one Sales Depot. The Chairman of Gurabini is Principal Secretary (Agriculture) to Government of Gujarat and Managing Director is also a senior technical officer from Government of Gujarat.

List of branch detail of GURABINI from the seed can be purchased: -

Branch Name	Address	Email	Area of Operation
AMRELI	Nagnath Complex; Near Nagnath Mandir, Amreli	bm_amreli@gurabini.com	Amreli, Bhavnagar
BARODA	Model Farm, Sarabhai Char Rasta, Alembic Road., Vadodara.	bm_vadodara@gurabini.com	Vadodara, Narmada, Bharuch

BHUJ	Near. Arya Samaj Vadi, Lal Tekari, Bhuj	bm_bhuj@gurabini.com	Kutchh
GANDHINAGAR	Beej Bhavan, Sector 10A, Gandhinagar	mm@gurabini.com	Ahmedabad, Gandhinagar
GODHRA	Near Maize research centre, Dholakua, Dahod Road, Godhra	bm_godhra@gurabini.com	Panchmahal, Dahod
HIMATNAGAR	Mahalaxmi Market, Nr. New Market Yard, Khedtasiya Road., Himmatnagar	bm_himatnagar@gurabini.com	Sabarkantha
JAMNAGAR	Sagar Market, Potari Gali,Outside Tran Darvaja,near Grein market		
JUNAGADH	Nilam Bag, Nr. Sardar bag, Junagadh	bm_junagadh@gurabini.com	Junagadh, Porbandar
MEHSANA	Umiya Shopping Center, Near Maniyar Chamber, State High-way, Mahesana	bm_mahesana@gurabini.com	Mehsana, Patan
NADIAD	4, Ashok Nagar Society, Opp : Jilla Panchayat, Out of Khodiyar Nala, Nadiyad	bm_nadiyad@gurabini.com	Kheda, Anand
PALANPUR	Rachana Building, Opp : Jilla Pancyayat, Palace Road., Palanpur	bm_palanpur@gurabini.com	Banaskantha
RAJKOT	Lati Plot, Street No. 1/6, Sadgurunagar, Near Parevada Chowk, Kuvadava Road., Rajkot	bm_rajkot@gurabini.com	Rajkot, Jamnagar
SHIHOR	Nagar Panchayat, Nr. Town Hall, Shihor	bm_shihor@gurabini.com	Bhavnagar
SURENDRANGAR	Bus Stand Road., Near Bus Stand, Opp : I.T.I. Street, Surendranagar	bm_surendranagar@gurabini.com	Surendranagar
VYARA	Sahakar Bhavan, 1st Floor, Apana Bazar, Near Bus Stand, Vyara	bm_vyara@gurabini.com	Surat, Valsad, Navsari, Dang,Tapi

(ii) **Soil Health**

Soil health enhancement holds the key to raising farm productivity. Steps would be taken to ensure that each farmer is issued with a soil health passbook containing integrated information on the physics, chemistry and microbiology of farm soils with corresponding advisories. More laboratories to detect specific micronutrient deficiencies in soils will be established for this purpose. Soil organic matter would be increased by incorporating crop residues in the soil. Proper technical advice on the reclamation of wastelands and on improving their biological potential will be made available. Fertilizer pricing policies will be reviewed to promote balanced use of fertilizers. Agro-forestry will be encouraged for efficient nutrient cycling, nitrogen fixation, organic matter addition and for improving drainage. Appropriate production

and marketing mechanisms for bio-fertilizers, organic manures etc. will be put in place to promote their use for improving/ maintaining soil health.

(iii) **Pesticides:**

The triple alliance of pests, pathogens and weeds is the cause of substantial crop losses every year. The development, introduction and diffusion of environmentally safe and effective pesticides will be given priority. There is a need for incorporating the use of chemical pesticides in an Integrated Pest Management (IPM) system. Suitable quality control, safety evaluation and other regulatory systems would be strengthened. The sale of spurious and substandard pesticides would be prevented and bio-pesticides would be promoted.

(iv) **Implements:**

Farmers need region and crop specific machines and implements for timely sowing, management of weeds and improving their post-harvest operations. Women especially need woman-friendly implements / tools which can reduce drudgery, save time, enhance output and can be handled comfortably. Agri-entrepreneurs including farm graduates and progressive farmers would be encouraged to provide implements and tools, machinery, tractors and other farm implements on a custom-hire basis.

3.6.2 Access to markets

MARKETING OF AGRICULTURAL PRODUCTS:

There are two important aspects to the marketing of agricultural products. The first has to do with the physical process that brings products from producers to consumers; the fundamental stages of this process are the collection, packaging, transport, processing, storage and lastly the retail sale of agricultural products. This first aspect shall be dealt with in detail in the fact sheet on post-harvest management. The second aspect, which is addressed here, involves the market pricing mechanism. Emphasis will therefore be placed on the market mechanisms that contribute to the pricing of agricultural products and on the way that producers can obtain acceptable prices for their crops.

Grading:

Grading means the sorting of the homogenous lots of the produce according to the fixed grade standards. Produce is graded in accordance with the various quality factors. Grading of the produce before sale enables farmers to get better price for their produce, whereas grading helps the consumers to get standard quality produce at fair price. After grading, it is easier for the consumer to compare the prices of different qualities of a produce in the market. Grading also reduces the cost of marketing.

In the market, the sale is generally done on the basis of visual inspection of sample and with local commercial name. Buyers offer price on the visual examination of whole lot considering the quality factors like size, colour of the grains, moisture content, refraction and admixture with other varieties in order to ensure remunerative price to the farmers as well as to gain the confidence of consumer.

Packaging:

Packaging is very important as good packaging protect the produce from any damage during storage, transportation and other marketing operations. It provides convenience in handling during transportation and storage. In recent years, packaging plays an important role in marketing of produce.

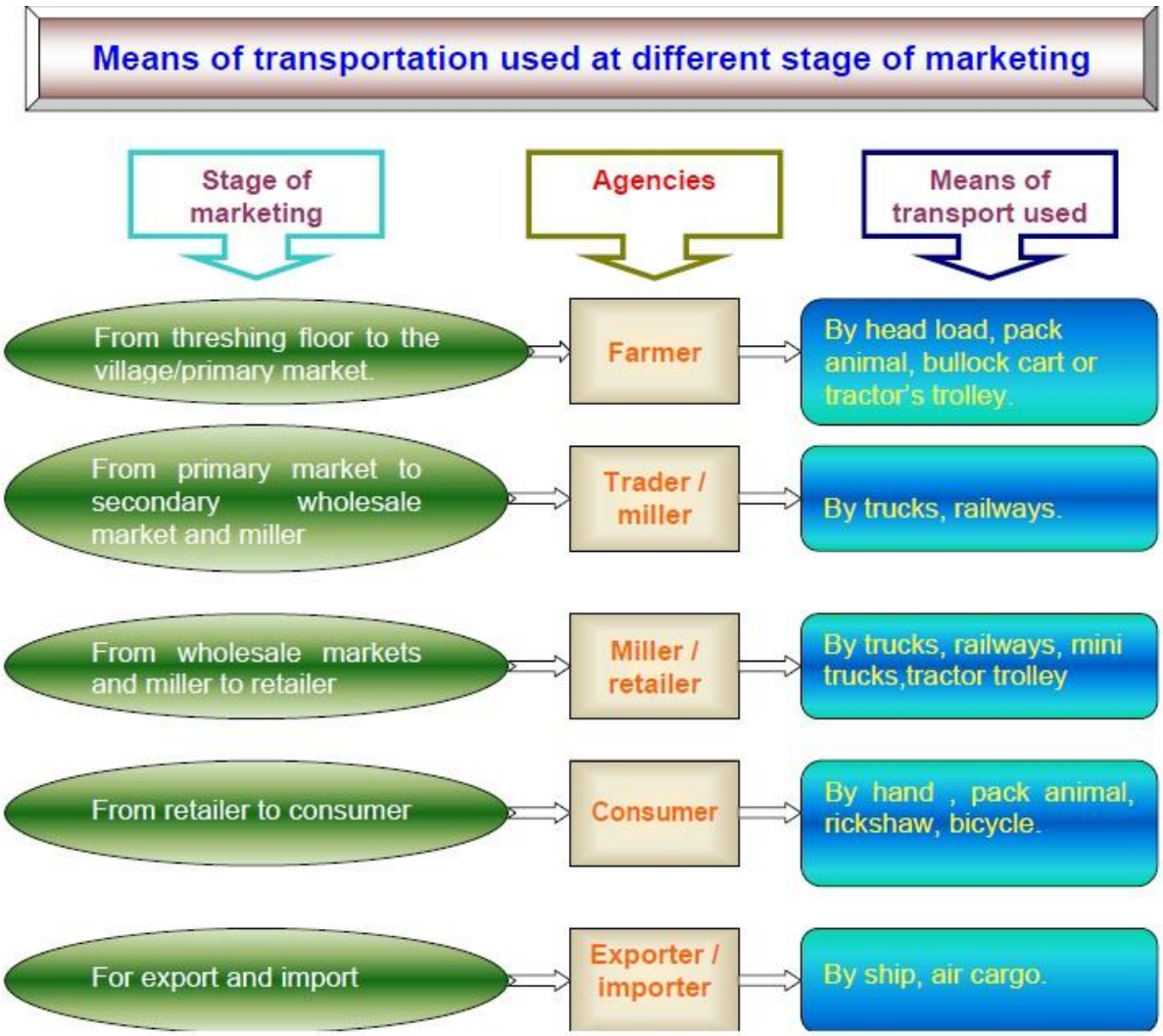
Criteria for selection of packaging material:

Packaging material should;

- Protect the quality and quantity of the produce.
- Prevent spoilage during transportation and storage.
- Suitable according to climatic and environmental conditions.
- Convenient and suit the need of the consumer.
- Attractive for display
- Tell information about quality, variety, date of packing, weight and price etc.
- Be convenient in handling operations.
- Be convenient to stack.
- Be cheap, clean and readily available.
- Be environment friendly and biodegradable.
- Be free from adverse chemicals.
- Conform to the requirements as laid down under PFA standards as amended from time to time.

Transportation:-

The following means of transportation are used at different stages of marketing.



Availability of cheaper and convenient modes of transport:

There are different modes of transport used in transportation. Road and Rail transport are normally used for internal markets. However, for export and import, mainly Sea transport is used. The most common modes of transportation are;

1) Road transportation: Road transport is the most popular mode to the assembling markets as well as to the distribution centers. The following means of road transport are used in different parts of the country to transport Agri-products.

a) Bullock carts/camel carts:

Benefits:

1. Suitable for small quantity of produce.
2. Cheap and easily available.
3. Easy transport for short distance.
4. Easily manufactured by village artisan.
5. **Easily operated on *kaccha* road, muddy or sandy path.**

b) Tractor trolley:

Benefits:

1. Carry larger quantity of produce than bullock carts in less time.

2. Suitable to transport produce in primary assembling markets in the absence of proper *pucca* road connecting the villages and market.
3. Multipurpose use of tractor for farmers.

c) Trucks:
The truck is the most convenient means of transport throughout the country for longer distances for bulk quantity.
Benefits:
1. Suitable for long distance.
2. Comparatively easily available.
3. Quick movement.
4. Convenient during loading and unloading.
5. Provide door to door delivery.
6. Safe transport.
2) Railways: Railway is one of the most important means of transportation.
Benefits:
1. Suitable for carrying larger quantity of produce.
2. Suitable for long distances throughout India.
3. Comparatively cheaper and safer mode of transport.
3) Water transport: This is the oldest and cheapest mode of transport. It includes river transport, canal transport and sea transport.
Benefits:
i) Suitable for carrying large quantity for export and import to other countries.
ii) Comparatively cheaper mode of transport.

Storage:
The storage is an important aspect of post harvest operations. Storage provides protection to produce against moisture, weather, insects, micro-organisms, rodents, birds and any other type of infestation and contamination. Storage losses are high .Moisture content is the key factor that determines the storage.

Basic requirements for safe and scientific storage:
The following requirements should be fulfilled for safe storage.
Selection of site: The storage structure should be located on a raised well drained place. It should be easily accessible. The land of the site should be protected from humidity, excessive heat, direct sun rays, insects and rodents. Storage godown should be constructed on a well-built pucca platform at a height of not less than 1 foot above ground level to prevent dampness.
Cleaning of storage structures: The storage structures should be properly cleaned before storing. There should be no left over grains, cracks, holes and crevices in the structure, which may harbor insects. The structure should be fumigated before storage.
Cleaning of bags: Use new and dry gunny bags. Before using, disinfect the old gunny bags by boiling in 1 percent Malathion solution for 3-4 minutes and dry it.

Separate storage of new and old stock: To check infestation and to maintain hygienic condition of godown, the new and old stocks should be stored separately.
Cleaning of vehicles: The vehicles used for transporting should be properly cleaned with phenyl to avoid infestation.
Proper aeration: There should be proper aeration during clear weather condition but care should be taken to avoid aeration during rainy season.
Regular inspection: Regular inspection of stored grain should be carried out to check infestation. It is necessary to maintain proper health and hygiene of the stock.

Storage structures:

1. Improved bins: Circular steel bin, Plastic bin, Pre-fabricated steel bin with hopper bottom, Aluminium bin, RCC bin, Cement masonary bin and improved pusa bin.
2. Pucca godown: These are made by brick-walls with cemented flooring for storing sunflower in bulk and bags.
Storage facilities:
i) Rural godowns:
Considering the importance of rural storage in marketing of agricultural produce, the Directorate of Marketing and Inspection initiated a Rural Godown Scheme, in collaboration with NABARD and NCDC, to construct scientific storage godown with allied facilities in rural areas and to establish a network of rural godowns in the States and Union Territories. The main objectives of Rural Godowns Scheme are as under:
1. Creation of scientific storage capacity with allied facilities in rural areas to meet the requirements of farmers for storing farm produce, processed farm produce, consumer articles and agricultural inputs;
2. Promotion of grading, standardization and quality control of agricultural produce to improve their marketability;
3. Strengthen agricultural marketing infrastructure in the country by paving the way for the introduction of a national system of warehouse receipts in the respect of agricultural commodities stored in such godowns;
4. Prevention of distress sale immediately after harvest by providing the facility of pledge financing and marketing credit; and
5. Reverse the declining trend of investment in the agriculture sector by encouraging the private and co-operative sectors to invest in the creation of storage infrastructure in the country.

ii) Mandi godowns:
Most of the States and Union Territories have enacted Agricultural Produce Market (Regulation) Act. The APMCs have constructed godowns in the market yard. At the time of keeping the produce in the godown a receipt is issued indicating the quality and weight of produce to be stored. The receipt is treated as negotiable instrument and eligible for pledge finance from the Scheduled Banks. The CWC and SWCs were also allowed to construct godowns in the market yards. Traders also have their permanent storage godowns or warehouses.

iii) Storage and Warehousing

Central Warehousing Corporation (CWC) was established during 1957. It is the largest public warehouse operators in the country. On 31st March 2005, CWC was operating 484 warehouses in the country with the total storage capacity of 10186395 tonnes. In Gujarat storage capacity with CWC as on 31-03-2005 is given below:

FCI*	CWC**	SWC**	OTHERS***	GRAND TOTAL
5.7	6.23	2.27	2.25	16.45

*Storage capacity of FCI as on 01-04-2005

** Storage capacity of CWC and SWCs as on 01-04-2005

AGRICULTURAL PRODUCE MARKETS:

Actual buying and selling of agricultural commodities takes place in market yards, sub-yards and rural markets/ haats spread throughout the length and breadth of the country. Agricultural produce regulated markets have been playing a major role in the smooth distribution of food-grains, oilseeds, fiber crops and fruits and vegetables to meet the supply and demand needs of the farmers, traders, processors and consumers of the State.

There are 7157 agricultural produce regulated markets in the country by the end of March 2010. There is uneven spread of these regulated markets in the districts (Table-1) of the state.

Table-1: Agricultural Produce Markets in Gujarat (2009-10)

Name of the State/UT	**Area in Sq. Kms.**	**Total Population**	**Total Regulated Markets**	**Area covered / Market (Sq. Km)**	**Requirement of Markets**	**Population Served/ Market**
Gujarat	196024	5.06	414	473.49	2495	122215
TOTALS	3287240	102.70	7157	28982.67	41836	5850385

A rural periodic market/ haats is the first contact point for producer – sellers for en-cashing his agricultural produce and income.

MARKET INFORMATION SYSTEM (MIS):

AGMARKNET is a NICNET based Agricultural Marketing Information System Network sponsored by Directorate of Marketing and Inspection (DMI) [of the Department of Agriculture & cooperation, Ministry of Agriculture, GoI] and is implemented by NIC. The project is aimed at networking all the APMC's /Mandi's, State Agricultural marketing Boards / Directorates and DMI regional offices located throughout the country, for effective information dissemination. NIC is the implementing agency for this project. It facilitates in the effective dissemination, over web, of the daily arrivals and prices of commodities in the agricultural produce markets spread across the country. AGAMARKNET aims at improving decision making capability of the farmers and strengthening of their bargaining power.

"The arrival and prices of different agricultural commodities as received from the Agricultural Produce Market Committee (APMCs) of different States are uploaded at AGMARKNET portal for information only and shall not be considered as guidance, invitation or persuasion. Users/visitors have to make their own decisions based on their own independent enquiries, appraisals, judgments, wisdom and risks. The Govt. of India shall not be liable or responsible for any loss or cost or any action whatsoever arising out of use or relying on the arrivals and prices and other related information disseminated at the portal."

(i) CLEANING, GRADING AND PACKAGING INFRASTRUCTURE:

(ii) MARKETING INSTITUTIONAL INFRASTRUCTURE: Following marketing institutions have been created in the country during the last 60 years:

(I) Public Sector Marketing Organizations:

(a) Food Corporation of India (FCI)
(b) Cotton Corporation of India (CCI)
(c) Jute Corporation of India (JCI)
(d) State Trading Corporation (STC)
(e) Commodity Boards – Tea, Coffee, Cardamom, Rubber, Tobacco, Spices, Areca nut, Horticultural Crops, Dairy Products (NDDB)
(f) Directorate of Marketing and Inspection (DMI)
(g) Agricultural Produce Market Committees (APMCs)
(h) State Agricultural Marketing Boards (SAMBs)
(i) Council of State Agricultural Marketing Boards (COSAMB)
(j) Commission for Agricultural Costs and Prices (CACP)
(k) Commodities Export Councils
(l) Agricultural and Processed Products Export Development Authority (APEDA)

(II) Cooperative Marketing Institutions

(a) Primary, Central and State level Marketing Societies, Unions, and Federations.
(b) Special Commodities Marketing Societies (Sugarcane, Cotton, Oilseeds, Milk etc.)
(c) Processing Societies
- Cotton Processing and Ginning Societies
- Oilseeds Processing Societies
- Fruits and Vegetables Preservation Societies
- Sugarcane Crushing Societies
- Milk Processing and Chilling Societies; etc.

(d) National Agricultural Cooperative Marketing Federation (NAFED)
(e) National Cooperative Development Corporation (NCDC)
(f) Tribal Cooperative Marketing Federation (TRIFED)

List of No of APMC available in Gujarat:-

Sr.No.	District.	Name of APMC	Phone Nos.	Mobile No.
1.	Ahmedabad	Ahmedabad	079 25323634	94267 08325
2.		Bavla	02714 232235	9825025189
3.		Dholka	02714 221739	9825066532
4.		Dhandhuka	02713 222357	98795 40534
5.		Sanand	02717 222022	94260 58930
6.		Viramgam	02715 233260	
7.		Mandal	02715 253826	94270 52149
8.		Ranpur	02711 238239	94270 70874
9.		Barvala		98258 65303
10.		Rampura	02715 232924	
11.	Gandhinagar	Randheja	079 23245469	9426727226
12.		Mansa	02763 272751	98253 93684 c
13.		Kalol	02764 220422	98980 28384
14.		Dehgam	02716 232612	98255 22664
15.	Mehsana	Mehsana	02762 253406	98253 78180
16.		Kadi	02764 242021	94260 29444
17.		Vadnagar	02761 222046	94273 70228
18.		Vijapur	02763 220190	94263 51718
19.		Unjha	02767 253608	98250 69751
20.		Unava	02767 254250	98250 46869
21.		Visnagar	02765 231145	98259 44698
22.		Becharaji	02734 286716	98791 98216
23.	Patan	Patan	02766 222296	
24.		Chanasma	02734 222016	98253 40916 c
25.		Harij	02733 223045	98795 20138
26.		Radhanpur	02746 277202	98253 04601 c
27.		Siddhpur	02767 220082	98259 88441
28.		Sami	02733 244328	98255 62174 c
29.		Varahi	02738 224136	
30.	Banaskantha	Palanpur	02742 255071	9825393271
31.		Deesa	02744 220762	98250 51247
32.		Dhanera	02748 222038	94265 93939 c
33.		Panthwada	02748 226202	98253 66945 c
34.		Bhabhar	02735 222048	98245 12148
35.		Thara	02747 222019	94264 11454
36.		Tharad	02737 222147	
37.		Danta	02749 278068	94260 49649
38.		Amirgadh	02742 235848	9426049649
39.		Vav	02740 227593	
40.		Vadgam	02739 261131	9426342480
41.	Sabarkantha	Himatnagar	02772 228678	98256 29902
42.		Bayad	02779 220023	9825067921 c
43.		Idar	02778 250043	9825538225 c
44.		Khedbrahma	02775 220054	9426575685 c

45.		Meghraj	02773 244429	
46.		Bhiloda	02771 232099	9427038604
47.		Prantij	02770 233562	98257 18534
48.		Modasa	02774 246601	98259 94818
49.		Dhansura	02774 220006	94260 60802
50.		Talod	02770 220404	9426013006 c
51.		Malpur	02773 223044	94270 59941
52.		Vadali	02778 222020	94270 80097

Type-wise number of Co-operative Societies in Gujarat State (as on 31st March-2011)

Sr.No.	Type of co-op. Societies	No. of Societies
1	**Primary Agri. Credit Societies**	8517
2	**Primary Non-agri. Credit Societies**	5198
3	**Marketing Societies**	1812
4	**Processing Societies**	620
5	**Milk & livestock**	13433
6	**Farming**	834
7	**Fisheries**	571
8	**Irrigation**	3671
9	**Transport**	129

3.7 Forward and Backward Linkages

Proper linkages among the agricultural producer, groups and processing units to the end user, market, support institutions are very essential for sustainable productivity and optimum market value. The SHG - Bank Linkage Programme is a major plank of the strategy for delivering financial services to the poor in a sustainable manner. The search for such alternatives started with internal introspection regarding the innovations which the poor had been traditionally making, to meet their financial services needs. It was observed that the poor tended to come together in a variety of informal ways for pooling their savings and dispensing small and unsecured loans at varying costs to group members on the basis of need. The forward-backward linkages of various agricultural activities to the end users and various support institutions are given below:

Table: Forward-Backward Linkages of Various Agricultural Activities

Sr. No	Producing Activity	Stake Holder	Forward Linkages	Backward Linkages
1	Nursery Raising	SHG, User groups, Forest Dept.	Farmers, schools	KVK, Horti. Dept, Banks
2	Crop production through Drip Irrigation	Farmers, User groups, SHGs	Farmers, User groups,	KVK, Agril. Univ. Banks, GGRC
3	Horticultural Development	Farmers, User Groups, SHGs,	Local Market, retailer, vendor	Horti. Dept, Banks. KVK

		Forest Dept.		
4	Floriculture Development	Farmers, User groups, SHGs	Local market, retailer, vendor	KVK, Agril. Univ. Banks
5	Agro Processing	Farmer, SHGs, Landless BPLs	Local Market, APMC, Wholesalers, vendors, Retailers	Banks, KVK. Agril. Univ.
6	Micro-enterprises	SHGs, Landless BPLs,	Local market, retailer, vendor	Banks, KVKs, Agril. Univ., NGO
7	Organic Farming	Farmers, SHGs,	Other Farmer, User groups, other SHGs, Forest Dept.	KVK, Agril. Univ. Banks
8	Vermi-compost	Farmers, SHGs,	Other Farmer, User groups, other SHGs, Forest Dept.	KVK, Agril. Univ. Banks
9	Vegetable farming	Farmers, User groups, SHGs	Direct selling, Local market seller , Vegetable stalls, Shopping malls etc.	KVK, Agril. Univ., NGO. , Banks
10	Fisheries Development	Farmers, User groups, SHGs	Local market, retailer, vendor	KVK, Agril. Univ., NGO, Banks
11	Apiculture Development	Farmers, SHGs, Forest dept.	Local market, retailer, vendor	KVK, Agril. Univ., NGO, Banks
12	Poultry Development	Farmers, SHGs, Landless BPLs,	Local market, retailer, vendor	KVK, Agril. Univ., NGO, Banks

3.8 Managing the Risk

Agriculture is widely considered more risky than industry or trade. Thus, it is not surprising that agricultural have had poor repayment performance. Weather, pests, diseases and other calamities affect the yield of crops, substantially in extreme cases. Such risks are higher for farmers engaged in monoculture of crops that are particularly sensitive to the correct use of high-quality inputs or the timing of harvesting. Following table explains the strategies to manage weather risks:

Table: Strategies to manage Weather risk facing small-scale Farmers

		Potential Risk Management Mechanisms		
		Household/ Community	Markets	Governments
Severity of Risks	Non Specific	Sharecropping Farmer self-help-groups Water resource mgnt	New Technology Improved seed	Provision of Extension Service, Weather Data Systems
	Low	Crop Diversification Saving in Livestock's Integrated method of practice	Formal Savings	

	Moderate	Labour Diversification, Risk Pooling (Peers, family members, Money lenders)	Formal Lending Risk sharing (Input Suppliers, Wholesalers)	Sate-Sponsored lending
	High	Sale of assets Migrations	Insurance	Disaster relief State-sponsored Insurance

3.8.1 Agricultural Insurance

a. National Agricultural Insurance Scheme (NAIS):

National Agricultural Insurance Scheme (NAIS) with increased coverage of farmers, crops and risk commitment was introduced in the country from Rabi 1999-2000 replacing the erstwhile Comprehensive Crop Insurance Scheme (CCIS). The main objective of the scheme is to protect the farmers against crop losses suffered on account of natural calamities, such as, drought, flood, hailstorm, cyclone, pests and diseases. The scheme is being implemented by the Agriculture Insurance Company of India Ltd. (AIC).

b. The scheme is available to all the It envisages coverage of all the food crops (cereals, millets and pulses), oilseeds and annual commercial/horticultural crops, in respect of which past yield data is available for adequate number of years. Among the annual commercial/horticultural crops, sugarcane, cotton, ginger, jute, onion, potato, tomato, brinjal, turmeric, chillies, garlic, pineapple, annual banana, tapioca, Isabgol, methi, coriander, cumin and fennel have already been covered under the scheme. All other annual commercial/horticultural crops are stipulated to be placed under insurance cover in due course of time subject to availability of past yield data. The scheme is operating on the basis of 'Area Approach' i.e. defined areas for each notified crop.

C. The premium rates are 3.5% of sum insured for bajra and oilseeds, 2.5% for other Kharif crops, 1.5 per cent for wheat, and 2 per cent for other Rabi crops. In the case of commercial/horticultural crops, actuarial rates are being charged. Under the scheme, small and marginal farmers were originally provided a subsidy of 50% of the premium charged from them. The premium subsidy has now been phased out over a period of 5 years and at present, 10% subsidy in premium is available to small and marginal farmers which is shared equally by the Central and State Governments.

D. The scheme is optional for States/ UTs. At present, the scheme is being implemented by the following 25 States and 2 Union Territories:

3.9 Farmer organizations

The detail on "Farmers Organizations" is discussed in Chapter-8, Institution framework and detailed in the annexure.

3.10 Method and Practices of major Agriculture Produces

3.10.1 Method and Practices of Major Crops

3.10.1.1 Pigeon Pea (*Tur*)

A. INTRODUCTION

Use of pulses is very common in Indian diet. Apart from the most popular use of making "Dal", they are used in making many food as well as snack preparations. They provide proteins. Many types of pulses are used in the country and pigeon pea is one of them. Pulses are used only after de-husking and splitting. This activity is going on since decades and even today some farmers employ these traditional techniques. But with growing demand, manual operations are taken over by the machines which have increased production as well as recovery. Per capita consumption of pulses in India is still very low and thus there is a need to increase it to ensure adequate intake of nutrients.

B. PRODUCT

Pulses are used only after de-husking and splitting. Conventional methods have been replaced by machines and today it has become a regular commercial activity and is the third largest processing industry after wheat and paddy. This note deals with de-husking, cleaning and splitting of pigeon peas. This project can be started in several states as pulses are cultivated in most parts of the country. This note considers Gujarat as a prospective location in view of ever increasing demand.

C. MARKET POTENTIAL

i. Demand and Supply

Various types of pulses are cultivated throughout the country and they are consumed only after cooking them. The most common use is preparation of curry, popularly known as "dal". It is prepared in most of the households as well as restaurants, dhabas, canteens, hostels and even during social ceremonies. Certain other food and snack preparations are also made from pulses. Different pulses are popular in different regions of the country.

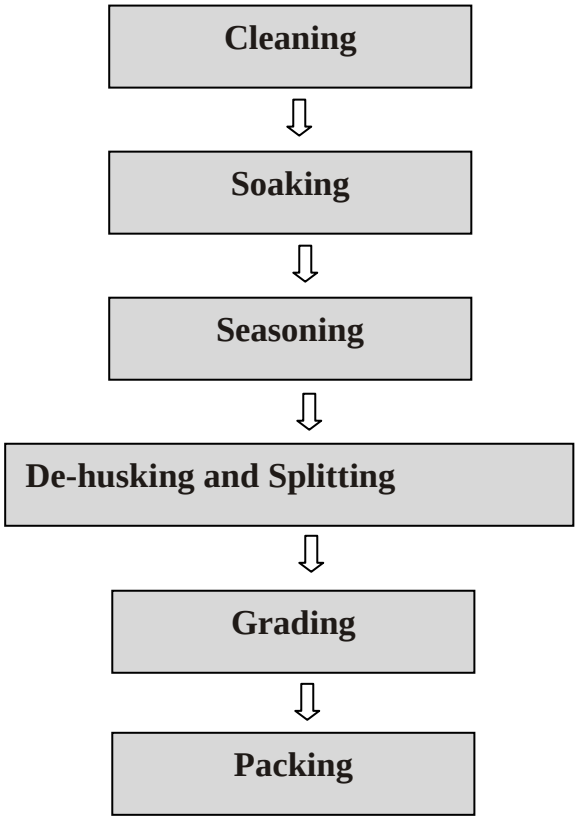
ii. Marketing Strategy

Pigeon peas are very popular in Gujarat. More than 30,000 tonnes of pigeon peas are produced every year in the district of Bharuch and more than 20,000 tonnes in nearby Narmada district but reportedly there are no processing facilities in these districts. Hence, pigeon-pea processing has good prospects in these districts. There are some existing brands in the state. But in view of growing

market and the fact that there are no adequate processing facilities in these 2 districts, augurs well for any new unit. It is assumed that the processed pigeon peas shall be sold in bulk to traders as retailing would call for huge production capacity, elaborate marketing network and substantial advertisement budget.

D. MANUFACTURING PROCESS

It is very well standardized. Pigeon pea being an agricultural produce, it is cleaned to remove dust, stones, chaff etc. Then it is soaked in water. Then pigeon peas are kept in a shed for around 8-10 hours for seasoning. Subsequently, this lot is fed to the mill wherein de-husking and splitting operations are carried mechanically and then grading is done before packing. The weight loss during the process is 15% to 20%. At times, edible oil is mixed as pigeon peas with oil applied on them are more popular in Gujarat. The process flow chart is as under:



E. CAPITAL INPUTS

i. Land and Building

A plot of land of around 300 sq.mtrs. Would cost about Rs.1.00 lac. Built-up area of 75 sq.mtrs. could accommodate production and packing area. This would cost around Rs. 1.90 lacs. Drying yard of 100 sq.mtrs. is estimated to cost Rs.1.00 lac.

ii. Machinery

This is a seasonal activity and the mill would be operated only for 6 months during the season. A dal or pulse mill with processing capacity of 75 kgs/hour would mean daily capacity with 2 shift working of 1200 kgs. Considering functioning of the mill for about 150 days during the season, the rated production capacity would be 180 tonnes. A composite pigeon pea processing mill of this capacity would cost about Rs. 5.00 lacs including erection and installation charges. Some other equipments like weighing scales, jute bags sealing machines etc. would cost Rs. 30,000/-.

iii. Miscellaneous Assets

Some other assets like furniture and fixtures, packing tables etc. shall be required for which a provision of Rs. 30,000/- is made.

iv. Utilities

The total power requirement shall be 20 HP whereas water requirement will be about 1,500 ltrs. every day.

v. Raw and Packing Materials

The all-important material would be pigeon peas which are grown in large quantity in Bharuch and adjacent Narmada districts. Reportedly, there are no processing facilities in either of these districts. Edible oil will be required if that quality is to be processed. Jute bags of 10, 25 and 50 kgs. shall be required for packing.

F. Price Realization

Input	Old Practice	Intervention Proposed	Price difference
seed	Local (40*25)=1000	Vaishali 20*80= 1600	-600
Bio-fertilizer & seed treatment FYM-OM	No fertilizer application No application	100 3000 (Own)	-100 -3000
Weeding/ interculturing	Nil	2000 (family labour)	-2000
Pest management	Nil	1000	-1000
Production	(310*25) = 7750	High yield (1500*25)=37500	29800
		Green pod/seed— 4500=150*30	4500
		Dal mill – 1000 *70 =70000	49000 (30% processing)
		Seed 350* 60	21000
			74500-7700=66800 + income from inter crop

3.101. 2 Wheat

3.10.2 1. Wheat scenario in Gujarat

Wheat is largely grown in Gujarat. Wheat products are having very important place in Gujarati cuisine. It is a major rabi crop & accounts 4 % of total wheat production of India. Wheat is grown in around 10-11 lac hectare area of Gujarat. However Average yield of wheat is 26.8 Qtl/ Ha, which is slightly lower than india's average yield (27.1 Qtl per Ha). Junagadh, Rajkot, Ahmedabad and Sabarkantha are the major wheat producing districts in Gujarat.

As watershed projects are running in all the districts of Gujarat this crop should be focused as the most important cereal crop of Gujarat which can be grown at lower risk and give optimum results.

Wheat Crop	**Wheat**
Sowing Time	15 – 25th November
Late sowing	26 November – 10 December
Rain-fed wheat sowing peroid	15-30 October
Variety in Gujarat	Lok1, GW 496, GW 503, GW 190, GW 273 For late sowing:-GW 173, GW 11 Rain fed
Crop Duration	85-100 Days
Productivity	4000-5000 per Ha Irrigated 1400- 1800 per Ha Rain-fed
Spacing	22.5 cm

1.3 Agro climatic conditions required for Wheat

A. CLIMATE:- the cool winters & long nights are very conducive to a good crop of wheat. In Gujarat Wheat is cultivated in Saurashtra & North & middle Gujarat area.

B. SOILS:- Well drained loams and clayey loams are considered to be good for wheat. However, good crops of wheat are raised in sandy loams and the black soils also.

3.10.2 2. Wheat Cultivation

i. CULTIVATION:- The wheat crop requires a well-pulverized but compact seedbed for good and uniform germination. Three or four ploughings in summer repeated harrowing in the rainy season, followed by three or four cultivations and planking immediately before sowing produce a good, firm seedbed for the dry crops on alluvial soils. Timely cultivation and conservation of moisture are essential. In the black cotton soil blade harrow is used instead of the plough.

ii. SOWING TIME:- Under irrigated conditions, the first fortnight of November is considered to be the optimum time for sowing the medium long-duration wheat, The sowings in some cases may go up to even the second week of December. However,

wheat sowings beyond the rain-fed condition the second half of October is the optimum time. The sowing of wheat, when the temperatures are high results in a poor stand, poor tilling, attack by root-infecting fungi and pests and the early onset of flowering. All these factors depress yield. The success of rained wheat depends on the amount of conserved moisture in the soil.

iii. SOWING:- Seed is sown by drilling or broadcasting. Sowing with seed drills, whether tractor drawn or bullock-drawn, will deposit the seed at uniform depth, give a uniform stand and lead to the early emergence of vigorous seedlings. For irrigated timely sown wheat a row spacing of 15 to 22.5 cm is followed, but 22.5 cm between the rows is considered optimum spacing. Under irrigated late sown conditions, a row spacing of 15 to 18 cm is the optimum. For dwarf wheat the planting depth should be between 5 and 6cm. the Planting beyond this depth results in poor stand. In the case of conventional tall varieties, the depth of sowing may be 8 or 9 cm. Under rainfed conditions after sowing, the furrows are left open, whereas in the case of irrigated wheat, the furrows are covered with a wooden plank. Generally, deeper sowing is practiced in rough, dry and light soils, whereas comparatively shallow sowing is done in moist soils. The transplanting of wheat seedlings can be done when sowings are delayed.

Tractor Mounted Seed cum fertilizer drill costs Rs 15000-20,000. As it do not required much traction it can be also operated with 30 HP tractor

iv. IRRIGATION:- For wheat sown under irrigated conditions, 8-12 irrigations are required. The 1st irrigation should be given at the crown-root initiation stage about 20-25 days after sowing. Other irrigation should be given at late tilling, late jointing, flowering, milk and dough stages. Two or three extra irrigations are given where the soils are very light or sandy.

Under limited water supply, (a) if water is available for only one irrigation, it should be applied at the crown root initiation to tillering stage, (b) if water is available for two irrigations, the first irrigation should be applied between the crown root initiation and late tillering and the 2nd irrigation 7 or 8 weeks after the 1st irrigation (flowering stage), (c) if water is available for three irrigations, the 1st irrigation should be given at the crown root initiation stage and the 2nd and 3rd irrigations at intervals of 6 to 10 weeks. Thus the 3 irrigations should be given at crown root initiation, flowering and milk stages. Hoeing or interculturing a few days after the 1st and 2nd irrigations will break the crust and will also remove the weeds.

v. Fertilizers

Nitrogen (N) @ 80-120 kg/ha, Phosphorus (P_2O_5) @40-60 kg/ha & Potash (K_2O) @ 40 kg/ha. This quantity may be adjusted according to soil Health card. The rain fed wheat in the majority of cases is not fertilized by the farmers owing to economic reasons. So It recommends seed treatment needs to be done with 250gm Azotobactor & 30-40 Kg Seeds. It is desirable that 2 or 3 tonnes of farmyard manure per hectare or some other organic matter is applied 5 or 6 weeks before sowing. 40 kg of N and 20 kg of P_2O_5 per hectare gives a considerable boost to the wheat yield, if applied 10 cm deep (3-4 cm below the seed) at or before sowing.

3.10.2 3. Post Harvest Management

The farmer's risk does not end when the crop matures, grain may be lost during harvest because of shattering and spillage or birds, rodents and insects may consume/damage it in the field or in storage. Whereas, early harvesting results in the grains with higher moisture content, which may attracts mould infestation. The post-harvest losses can be reduced to half with the use of available technology viz., timely harvest, use of proper harvesting and threshing equipments, safe storage, prophylactic and curative measures to check infestation. However, farmers are not fully aware of the post-harvest losses during harvesting and storing etc.

i. Drying

Drying is a very important process in wheat crop. Drying stops growth of bacteria & fungus and reduces attack of insects. If harvesting is done so late when moisture content is very low it reduces Production and increases breakage. Wheat should be stored below 13%. Methods of drying are as below

a. Direct Sun drying

This is a traditional method widely used in Gujarat. Wheat is spread over the ground under direct sunlight. However there is no direct control over drying in this method so breakage increases, also losses done due to animals & birds. It is recommended to use plastic sheet for proper handling of wheat.

b. Hot air drying

Wheat is kept in close room & hot air is blown in to crop layers. This is very efficient method & using this method, losses can be reduced to 0.5 %. However this method is quite costly.

ii. Cleaning & Grading & Packaging

There is no need to emphasize that bold size grains free from chaff, broken, immature & shrivelled damaged free from admixture of other varieties, foreign matter, fetch higher prices.

In the modern urban market, ready to cook items are in demand with increased purchasing capacity. Since the wheat is produced in varying agro-climatic conditions, heterogeneous quality is unavoidable. Hence, it is necessary to have one national language for defining the quality characteristics to facilitate marketing without physical inspection. Grading provides following marketing benefits –

- Low expenditure in transport and storage.
- Knowledge of prevailing price, and right markets.
- Easy financial assistance and future trading.
- Widens the market for farm products.
- Consumers get wide choice of quality at a reasonable price.
- Promotes competitive marketing.

iii. Agmark Grade Designation and Definition of Quality of Wheat

A. General Characteristics:

- wheat shall be the dried grains of Triticum vulgare and Triticum durum Desf;
- Have uniform size, shape and colour;
- Be sweet, hard, clean, whole-some and free from moulds, weevils obnoxious smell, discolouration, admixture of deleterious substances and all other impurities except to the extent indicated in the Schedule;
- Be in sound merchantable condition; and
- Not have moisture exceeding 12 per cent.

B. Special Characteristics

Grade desig-nation	Special characteristics						
	Maximum limits of tolerance 1% by weight						
	Foreign Matter	Other Food Grains	Other Wheats	Damaged Grains	Slightly Damaged Grains	Immature shriveled and broken grains	Weevilled grains
I	1.5	1.6	5.0	1.0	2.0	2.0	1.0
II	2.5	3.0	15.0	2.0	4.0	4.0	3.0
III	3.5	6.0	20.0	4.0	6.0	10.0	6.0
IV	4.0	8.0	20.0	5.0	10.0	10.0	10.0

iv. Grading Equipments:

(1) Sampler – Tube or Scoop, Sample Divider Wheat Sample-50 gm.
(2) Cleaning and Grading System Machine
(3) Dust Collection Plant
(4) Screen Air Separation
(5) Clean-o-Graders
(6) Destoners
(7) Gravity Separators
(8) Air Classifiers
(9) Pre-cleaning and Silo Storage System

v. Economics of Cleaning, grading & packaging unit is as below

Sr. No.	Cost Head	Unit	Unit cost	Total
I	Fixed Cost			
a	Land/Building			
b	Equipments	1 each	2.50	2.50
c	Electric connection	1	0.20	0.20
	Total: Fixed Cost		**2.70**	**2.70**
II	Variable Cost (One production cycle) One month			
a	Labour	5	200	25000
b	Raw material	25000 Kg	12.00	300000
c	Rent		5000	5000
d	Packaging Cost (500 Bags)		12	12000
e	Miscellaneous		10000	10000
	Total Variable Cost			**327000**

Sr. No.	Heads	Unit	Amount / Quantity
1	Total Variable Cost (TVC)	Rs	327000
2	Total Production (Q)	Kg	25000
3	Average Variable Cost : AVC= (TVC/Q)	Rs/Kg	13.08
4	Average Revenue (AR=Price)		18.00
5	Total Revenue: Total Market Value of the produce (P*Q)		450000
6	Unit Margin (P-AVC)		4.92
7	Net profit per cycle (TR-TVC)		123000

- Break Even Point= Total Fixed Cost (or, Investment) / Unit Margin
  = 320000/4.92
  =54878 Kg
- Benefit Cost Ratio (BCR)= Net Benefit / Net Cost
  =18/13.08
  =1.37
  - This activity can be done after 3rd or 4th year of watershed preoject.
  - Strong institutional framework is essential for this type of activity.
  - 2 to 3 SHGs together can run the plant.
  - Market survey/ market linkages are needed to identified before setting up the plant

Based on physical characteristics different types of wheat are suitable for different type of products

Soft (sonalika) :- Bakery Products, Biscuits

Medium soft (GW 496, GW 173, GW 273, Lok1):- Roti, Suji & Menda making

Hard (GW 190, Bhal wheat): Pasta, bread making

In case of above such type of product making hand holding required to be done for longer period of time. In case of better quality products some process & quality standards needs to maintained.

Sales & Marketing

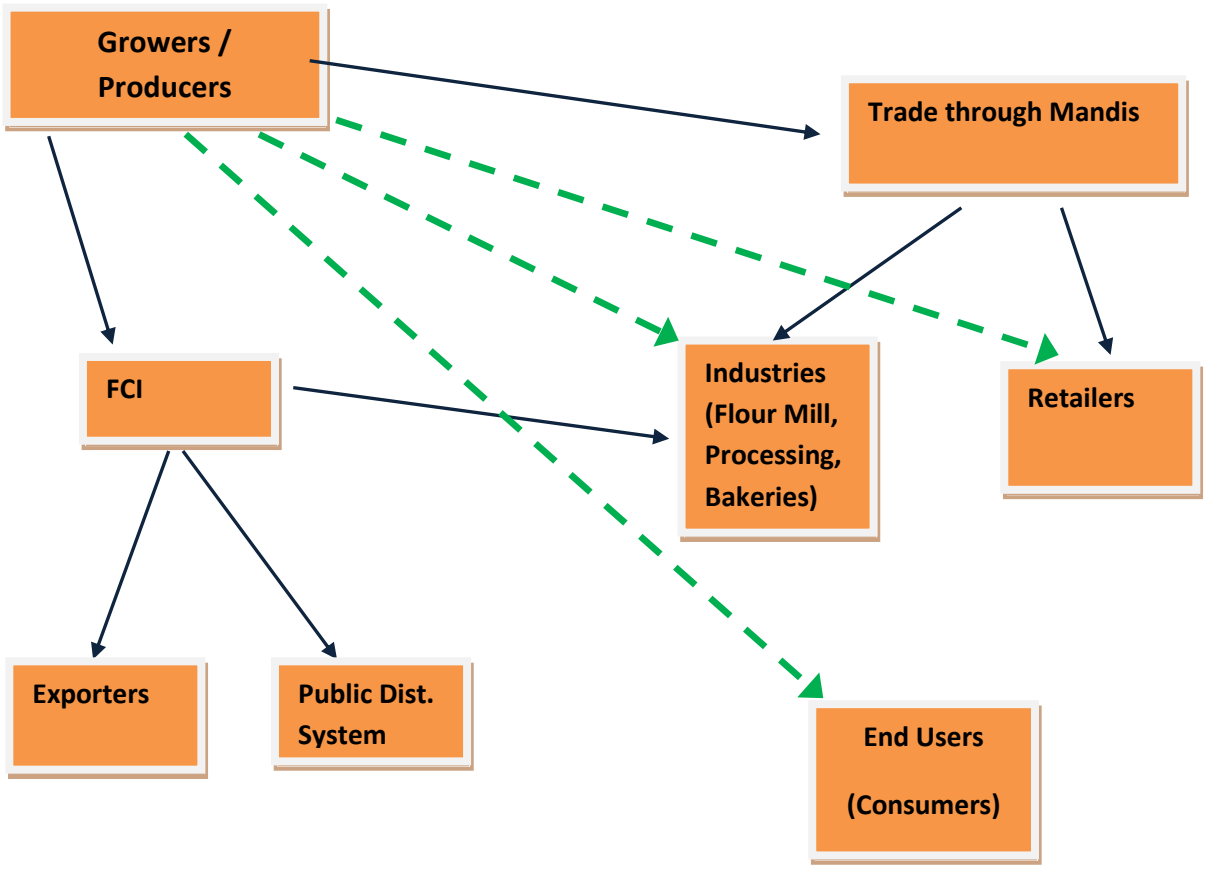


Fig: Marketing Channel of Wheat

At present, there are various channels of Wheat active in the market at different levels. The Government procures Wheat from Growers through agencies such as (FCI) Food Corporation of India. This wheat thus procured is distributed through State PDS (Public Distribution System). The PDS system at grass root level is well defined and organized sector set up at state level. FCI being the major player in wheat procurement and distribution; procures nearly 18% of wheat from growers and maintains buffer stocks in the Central Pool with a key role in maintaining price stability.

The balance 82% of the Wheat produced is marketed through various channels such as commission agents at mandi level, stockiest, semi-wholesalers, retailers, manufactures, small flourmills, and large-scale manufacturers such as bread makers and flour mills (maida-suji). Though the Government procures 18% of the wheat but in

comparison to the remaining sector, it is the largest organized buyer in the Wheat market.

In the diagram (⟶) shows existing Market channel & (⟶) shows proposed new channels. Grower can get better price realization by reducing long supply chain & proper processing & value addition. Grower can directly sell wheat to organized retail players viz. Big Bazar, ITC, Reliance Fresh who directly sell it customers or processors like atta makers, menda – soji makers, Bread producers.

Following are some important issues should be addressed during watershed projects.

Improving Cultivation and Post-Harvest Handling Practices

In terms of post-harvest handling, there is an opportunity to reduce storage losses through education on on-farm storage techniques that utilize current appropriate technology solutions and correct chemical usage for controlling storage pests. Local remedies such as the use of neem ash and turmeric powder incorporated with the improved in-house pit method of storage should be extended. The adoption of these measures could greatly reduce storage loss and enable farmers to market surpluses to take advantage of price fluctuations without quality loss.

3.10.1.3 Paddy Cultivation

Rice is life for millions of people in the world, particularly in developing countries. It is the main cereal for majority population in India. The demand for rice is growing with ever-increasing population. Rice is water intensive crop. More than 70 percent of the country's ground and surface water is being used for agriculture, and out of this, 70 percent is allocated to rice cultivation. Each kg of rice produced with irrigation requires 3000-5000 litres of water.

India is the world's second largest producer of white rice, accounting for 20% of all world rice production. Rice is India's preeminent crop, and is the staple food of the people of the eastern and southern parts of the country. India could achieve a record rice production of 100 million tonnes in 2010-11 on the back of better monsoon this year. Andhra Pradesh, West Bengal, Bihar, Utter Pradesh, Madhya Pradesh, Assam & Punjab are major paddy cultivators of India. Paddy is mainly cultivated in Ahmedabad, Anand, Kheda & south Gujarat district of Gujarat

SRI techniques

System of Rice Intensification (SRI) emerged in the 1980's as a synthesis of locally advantageous rice production practices encountered in Madagascar by Fr Henri de Laulanie, a Jesuit Priest who had been working there since 1961. But, it is Dr. Norman Uphoff from Cornell International Institute for Food and Agriculture, Ithaca, USA, who had brought this method to the notice of outside world in the late 1990s. Today SRI is being adopted in many states in India and the response from farmers has been overwhelming seeing the benefits of the method, notwithstanding the constraints.

SRI is a combination of several practices those include changes in nursery management, time of transplanting, water and weed management. Its different way of cultivating rice crop though the fundamental practices remain more or less same like in the conventional method; it just emphasizes altering of certain agronomic practices of the conventional way of rice cultivation. All these new practices are together known as System of Rice Intensification (SRI). SRI is not a fixed package of technical specifications, but a system of production with four main components, *viz*., soil fertility management, planting method, weed control and water (irrigation) management. Several field practices have been developed around these components. Of them, the key cultural practices followed in most cases are

Preparing high-quality land

SRI requires careful levelling and raking, with drainage facilitated by 30 cm wide channels at two-meter intervals across the field.

Preferring compost or farmyard manure to synthetic fertilizers

It is better to use organic nutrients, as they are better at promoting the abundance and diversity of microorganisms, starting with beneficial bacteria and fungi in the soil. This will promote proper microbial activity, thereby improving production.

Developing nutrient-rich and un-flooded nurseries

The seedbeds have to be nutrient-rich and established as close to the main field as possible. This will enable quicker and easier transportation between the nurseries and the fields, minimizing both transport time and costs so that the seedlings are efficiently transplanted.

Using young seedlings for early transplantation

This has to take place when the seedlings are just 8 to 12 days old, soon after they have two leaves, and at least before the 15th day after sowing.

Ensuring wider spacing between seedlings

The seedlings should be planted at precise spacing, usually 25 X 25 cm2, about 16 plants per square meter. Rice plant roots and canopies grow better if spaced widely, rather than densely.

Transplanting the seedlings singly

The seedlings must be transplanted singly with their roots intact, while the seed sac is

still attached. They must not be plunged too deep into the soil, but placed at 1-2 cm on the ground at the appropriate point on the planting grid.

Frequent intercultivation with weeder

A manual weeder is to be operated perpendicularly in both directions in between the hills within 10 to 12 days of transplantation, and at intervals of 10-12 days afterwards. This operation not only controls the weeds but churns the soil which causes a lot of changes in the soil which favours better growth of the crop.

Managing water carefully so that the plants' root zones moisten, but are not continuously submerged

SRI requires the root zone to be kept moist, not submerged. Water applications can be intermittent, leaving plant roots with sufficiency, rather than surfeit of water. Rice grown under SRI has larger root system, profuse and strong tillers with big panicles and well-filled spikelets with higher grain weight. The rice plants develop about 30 – 80 tillers and the yields are reported to be higher. The secret behind this is that rice plants do best when young seedlings are transplanted carefully at wider spacing; their roots grow larger on soil that is kept well aerated with abundant and diverse soil microorganisms.

Harvesting, drying and milling

Unmilled rice, known as paddy is usually harvested when the grains have a moisture content of around 20-25 percent. In most Asian countries, where rice is almost entirely the product of smallholder agriculture, harvesting is carried out manually, although there is a growing interest in mechanical harvesting. Harvesting can be carried out by the farmers themselves, but is also frequently done by seasonal labour groups. Harvesting is followed by threshing, either immediately or within a day or two. Again, much threshing is still carried out by hand but there is an increasing use of mechanical threshers. Subsequently, paddy needs to be dried to bring down the moisture content to no more than 20 percent for milling. A familiar sight in several Asian countries is paddy laid out to dry along roads. However, in most countries the bulk of drying of marketed paddy takes place in mills, with village-level drying being used for paddy to be consumed by farm families. Mills either sun dry or use mechanical driers or both. Drying has to be carried out quickly to avoid the formation of moulds. Mills range from simple hullers, with a throughput of a couple of tons a day, that simply remove the outer husk, to enormous operations that can process 4,000 tons a day and produce highly polished rice. A good mill can achieve a paddy-to-rice conversion rate of up to 72 percent but smaller, inefficient mills often struggle to achieve 60 percent.

These smaller mills often do not buy paddy and sell rice but only service farmers who want to mill their paddy for their own consumption. These type of activity can performed at project level

Rice Mill

Sr.No	Details	No	Prices Rs.
1	Rubber Soller Machine	1	48000/-
2	Polisher	1	18000/-
3	Electric Motor 5HP	1	8000/-

4	500Kg Capacity Weighing Machine	1	5000/-
5	Equipments		1000/-
6	Furniture		5000/-
7	Paddy		5000/-
	Total		**90000/-**

3.10.1. 4 Cotton

Cotton (*Gossypium hirsutum* L.) is a plant that is cultivated by many since it is used in the making of fabrics and clothing. There are different types of cotton that are produced worldwide. This is majorly due to the change in the methodology of production of the cotton. In some parts, **growing cotton** most suitable at wild parts. There are many locations where it is grown in big scale and this is the reason for the increased use of this textile.

Table:1 Showing area, production and productivity of cotton in Gujarat state

	AREA (000'ha)			**PRODUCTION (000' tons)**			**PRODUCTIVITY (tons/ha)**		
Gujarat	2005-06	2006-2007	2007-2008	2005-06	2006-2007	2007-2008	2005-06	2006-2007	2007-2008
	1906	2390	2516	1513	1717	1870	0.79	0.71	0.74

Source: Cotton Advisory Board, http://www.cotcorp.gov.in/statistics.asp

Table:2 Showing concentrated pockets of cotton in the state

Gujarat	Surendranagar, Kheda, Rajkot ,Kutchh, Banskantha, Patan, Sabarkantha, Mehsana, Ganganagar, Ahemdabad, Jamnagar, Porbandar, Junagarh, Amreli, Bhavnagar, Godhra, Dahod, vadodara, Bharuch, Narmada, Surat

Climate: Cotton is a crop of subtropical climate. Cotton needs on an average a minimum temperature of 60 degrees fahrenheit for germination, 70-80 degrees fahrenheit for vegetative growth, 80-90 degrees fahrenheit with cool nights during fruiting period.

An annual rainfall of at least 50 cm is minimum requirement for cotton cultivation unless it is grown on irrigated soils. Ultimately rains and the heavy humid weather during later stages of cotton cultivation may spoil the produce, lower its ginning properties or promote attack of insect, pest, diseases. Weather should be clear at harvesting because rain will discolor the lint and reduce its quality.

Soil: Cotton needs a soil with a excellent water holding capacity and aeration and good drainage as it cannot withstand excessive moisture and water logging. The major group of soil for cotton cultivation are the alluvial soils, black soils, and red sand loam.

Major varieties: SHANKAR 6, CNI-36, Guj.67, Supriya, HD-107,HD-123,H-1098,HS-6,B. Nerma, RG-8, RST-9, F-846, HS-6, H-777,RG-18,H-1117 F-505, Anjali, Abhiditya, DS-28, SB-425(YF), LH-974, M-12, T-7, AC-738, P-4, HLS-329, MCV-5VT, NHH-44, F-1054, HB-4, Savita. In Gujarat, following varieties have been recommended to grow in different cotton zones.

Table: Variety in Gujarat

Zone	Recommended varieties/ hybrids
South Gujarat Cotton Zone	Digvijay
Central Gujarat Cotton Zone	Digvijay , G.Cot-16, G.Cot-17 and G.Cot 23
Saurashtra Zone	V-797, G.Cot-13, G.Cot-21,G.Cot-12 (Surendranagar dist.), G.Cot-18 (Junagadh)

All hybrids like Hybrid-4, G.Cot.Hy-6, G.Cot.Hy-8, G.Cot.Hy-10, G.Cot.Hy-12, G.Cot.DH-7, G.Cot.DH-9 and G.Cot.MDH-11 and hirsutum 2 varieties like Deviraj and G.Cot.10 are recommended for whole state. In addition to this the following varieties are gaining popularity all over the state.

SHANKAR 6: The crop is generally sown in the month of June-July, the first flowers appear in 60-75 days after sowing and the balls appear within 190-210 days after sowing. The crop is ready for harvest by November and may extend upto February. The plant grows to a height of 120-150 cm. It is susceptible to bollworms and mildly susceptible to prodenia and mites. This variety is spreading fast on account of its high demand in the market. Now it is the major variety of cotton in the whole of Gujarat and also in an appreciable area adjoining to Gujarat this cotton is grown. This hybrid cotton has fiber characters similar to that of Hybrid 4 and is early by about 2 weeks. It is in great demand by the textile industry in India, Europe and Japan.

HYBRID -4: It is a cross between Guj.67 (G.hir.) x American nectariless(G.hirs.). Its duration is June/July to November/February. It is grown in the state of Gujarat under irrigated and assured rainfall conditions. It is generally cultivated in well drained black, sandy, loam soil. This variety matures about 5-6 weeks early as compared to other standard of cottons. It has continuous production of flushes of flowers and bolls. Thus it easily meets the internal demand and export needs as well.

Package of Practices in Gujarat

Cultivation Practices: Before sowing, the soil is ploughed, loosened and harrowed to make soil suitable for cultivation.

Seed Rate and Spacing: Depending upon the variety, soil type, the cultivation on practices and method of sowing, seed rates and spacing have been recommended. A seed rate of 15-25 kg/hectare and spacing of 75-90 cm between the rows are generally recommended for irrigated conditions. For dryland cotton, seedrate of 12-16 kg/hectare and spacing 45-60 cm between rows are adopted. For Dryland American Cotton, seedrate is 12-16 kg and spacing is 60-75 cm between the rows.

Time of sowing:

Normally, the crop is sown with the onset of monsoon in the last week of June to first week of July. Where irrigation facility is available, the crop may be sown little earlier i.e. in the first week of June. Advance sowing of the crop will give higher yield than normally sown crop.

Interculture: Weed control begins 30-40 days after sowing. thinning of cotton is a special feature of the irrigated crop.

Diseases and Pests: Cotton aphids, Cotton jassids are controlled by spraying Malathion 0.08%. Cotton leaf roller, Spotted boll worm, pink boll worm are controlled by dusting crop with 10% carbonyl whereas red cotton bug.

Fertilizers: Fertilizer application differs from district to district depending upon available nutrients in the soil. For dryland cotton crop, 20 kg of nitrogen, 18 kg of phosphorus and 78 kg potash is economical. Nitrogen is applied in split doses, half dose at the time of sowing and other half as top dressing during thinning or just before flowering. For irrigated cotton this dose can be doubled.

Water Requirement: The irrigated cotton crop is mostly sown after a preliminary heavy irrigation and second light irrigation is given three to four weeks after germination. Subsequent watering depends upon the nature of the soil and the weather conditions.

Flowering and boll formation are the critical stages with regard to irrigation. Inadequate irrigation schedule during these stages leads to a heavy shedding of flower buds and bolls. Generally cotton crop needs 6-8 irrigations and 600-800 mm of water during its lifetime. **Optimum Harvesting Time:** Cotton is harvested in three or more pickings with suitable intervals. The season of harvesting varies with of sowing and duration of variety. Well dried bolls are picked either manually or through harvesters.

Yield

*Unirrigated Conditions:700 to 1200 kg per hectare.

*Irrigated Conditions : 1500 to 2000 kg per hectare.

Improvement in traditional practices

Manuring

In order to maintain a fertile soil, organic matter should be added to it regularly. If organic farming is being performed on own land since many years, the soil will have a good nutrient content. Compost / Farmyard manures can also be added to further enrich the soil. Application of organic manure is very important for tomato cultivation. Farm yard manure of 10 t or 1-1.5 t of vermicompost per acre is generally applied. To prevent contamination, FYM can be treated with trichoderma at the rate of 500 g per a tractor load of manure. After mixing the required amount of trichoderma the manure should be allowed to remain in a heap covered with wet gunny bag for proper culturing.

Low cost drip – Cost effective and precision irrigation

Since cotton is one of the identified crops for adoption of drip irrigation commonly known for its response, accommodating of higher plant population (associated with annual crops) warrant longer laterals and drippers for water distribution and delivery. Laterals and drippers cost (constituting more than 60-80% of the total cost) plays an important role in deciding the cost of the system for annual and closely spaced crops like cotton. Adoption of drip system one hectare of cotton is estimated to meet initial investment of Rs 65,000 to Rs 75, 000. Keeping this in view, low cost drip systems were developed through rigorous testing procedures for optimum efficacy under farm situation. Drip irrigation increases the yield of cotton on an average of 27 per cent. The influence of irrigation water on fibre quality is less pronounced compared to its effect on seed cotton yield. The extreme regime of either excess water or prolonged dryness could reduce the fibre length . But, limited irrigation has no influence on ginning percentage, fibre length and bundle strength although limited moisture increased the fibre staple length.

Integrated pest and disease management

Non-pesticidal management technologies include deep ploughing in summer, use of bonfires/light traps, nipping of the terminal buds to destroy eggs and larvae of spotted bollworm, selecting tolerant varieties for sucking pest complex, spraying of

tobacco decoction, spraying of 5% *neem* seed kernel suspension, chilli garlic spray and spraying of cattle dung and urine, bird perches, collection sand destruction of affected bolls. When red spots appear on cotton leaves (in July or August), farmers dilute buttermilk with water and sprinkle it on the crop. When the application is made during the early stages of the disease, control comes within a week. This practice can also be used as a preventive measure (Bhavnagar, Gujarat). Some farmers add tobacco powder/just @ 30 g per 15 litres with insecticide solution mainly with the idea of controlling the attack of whitefly in Gujarat.

Good Agricultural Practices (GAP)

• Adoption of improved varieties.

• Integrated water and nutrient management.

.Expected Outcome/Deliverables

Area	Activity	Expected Out Come
Cotton Production	Incorporation of best crop Management Practices	• 15% more yield with desired quality attributes (high strength,appropriate micronaire,low trash,high ginning outturn) • 5% premium price for quality produce.
Post harvest Management	Better on-farm and off-farm practices & Quality Characterization of each bale	• Reduction in trash content in cotton (from the present 4-5%, to around 1-2%) • Reduction in mixing cost (5% saving in spinning cost) • Yarn with better quality (higher strength, more uniformity)
Cotton Stalks utilization	Chipping, board Manufacture, Mushroom Growing, briquetting	• Additional income to farmers (Rs.500/- per tonne of stalks) • Energy efficient process for growing mushrooms (Saving of 50 units of electricity for a batch of 50 Kg raw material) • An alternate raw material for board industry

Value chain

- Development of short duration, high yielding, disease and pest resistant varieties/hybrids with appropriate fibre parameters to meet the need of the textile industry.
- Development of integrated water and nutrient management practices for cotton and cotton based cropping system.
- Development and validation of Integrated Pest Management Technology for different cotton growing areas of Gujarat to improve yield and reduce the cost of cultivation to ensure better net return to the cotton growers.
- Technology Transfer through demonstration and training.
- Supply of delinted certified seed by setting up of delinting units.
- Accelerating Integrated Pest Management activities.
- Providing adequate and timely information input to the farmers periodically.

3.10.1. 5 Maize

ORIGIN AND HISTORY

Primary centre of origin: Central America and Mexico. It was grew and selectively improved from 3400 B.C to 1500 A.D. In Europe, maize was first introduced in Spain and later spread to Southern France and Italy. Its introduction to India occurred probably before seventeenth century.

Areas of Maize Production in Gujarat-

- Mainly- Panchmahal, Dahod, Vadodara, sabrkatha
- Other District- Kheda, Amreli, Bhawnagar, Rajkot, Bharuch, Narmada, Dang and Banaskatha

CLASSIFICATION

Maize belongs to the family *Gramineae* and Genus *Zea mays L*. The classification is mainly based on the character of the Kernels.

1. Flint corn (Zea mays indurata)
2. Dent corn (Zea mays indentata)
3. Pop corn (Zea mays everta)
4. Sweet corn (Zea mays saccharata)
5. Soft corn (Zea mays amylacae)
6. Pod corn (Zea mays tunicata)
7. Waxy corn (Zea mays Cerabina Kulesh)

CLIMATIC REQUIREMENT

- It is a warm weather plant. Mainly grown in the Kharif (Monsoon season).
- It can grow from sea level to 3000 m altitude.
- It requires considerable moisture and warmth from germination to flowering.
- Suitable temperature for germination is 21°C and for growth 32°C.
- 50-75 cm well distributed rainfall is conducive to proper growth.
- It is very sensitive to stagnant water especially in its early growing age.

SOIL & FIELD PREPARATION

- ❖ Suitable in well drained Sandy loam to silty loam.
- ❖ Can grow in a pH range of 5.5 to 7.5.
- ❖ Field should be friable, well aerated and moist and weed free.
- ❖ First ploughing should be deep so that 20-25 cm deep soil can be loose.
- ❖ Further it should be followed by 2-3 harrowing or 3-4 intercrossing ploughing with local plough.
- ❖ Planking should be done after each ploughing.
- ❖ Crop leveling must not be overlooked.

Use Of maize

Maize is mainly used for Food, Animal Fodder, Industrial Use and for Medicine

Different Upland Maize Production system

Verity	Name	Seed rate (Kg/ Hac)	Production (Kg/ Hac)	Seed Treatment	sowing Distance	% of Farmer Use this Practice
Local	Desi	30-40	1500-2000	No	30cm	60-75

Improved	GM-2, GM-4, GM-6, Narmada Moti, Madhuri, Amber, GM-3(Ravi)	20	2800-3000	No	60cm X 20cm	20-25
Hybrid	Ganga White-2, Saktiman-2, Ganga-11	15-20	4000-42000	No	75cm X 20 Cm	40673

Products of Maize

Different products are prepared by maize. They are Maize Starch, Liquid Glucose, Maize o Sweet, Loaf (Bread), Green Crop Shell, Pop Corn, Maize Pauwa, Organic Farming, Dextrose Monohydrate, Waist Cake fodder, Animal Food, Industrial Chemical, Edible Oil and Agriculture waist fuel cake.

SN	Name	Rate (Rs./Kg)
1	Green Cob	5-10
2	Seed Maize	10-12
3	Pop Corn (Seed)	35-40
4	Pop Corn	80-100
5	Baby Corn	50-60
6	Maize Pauwa	25-30

The above calculation shows that, if Value added maize will be sold in the market then farmer can get at least more than double price in comparison to Maize seed.

Cropping sequence

Adopted By Farmer	Recommended
Kharif- Ravi - Summer	
Maize & Wheat	Maize- Gram- Vegetable
Maize- Gram	Maize- Wheat- Vegetable
Maize- Pigeon Pea	-
Maize- Maize	-

Intercropping

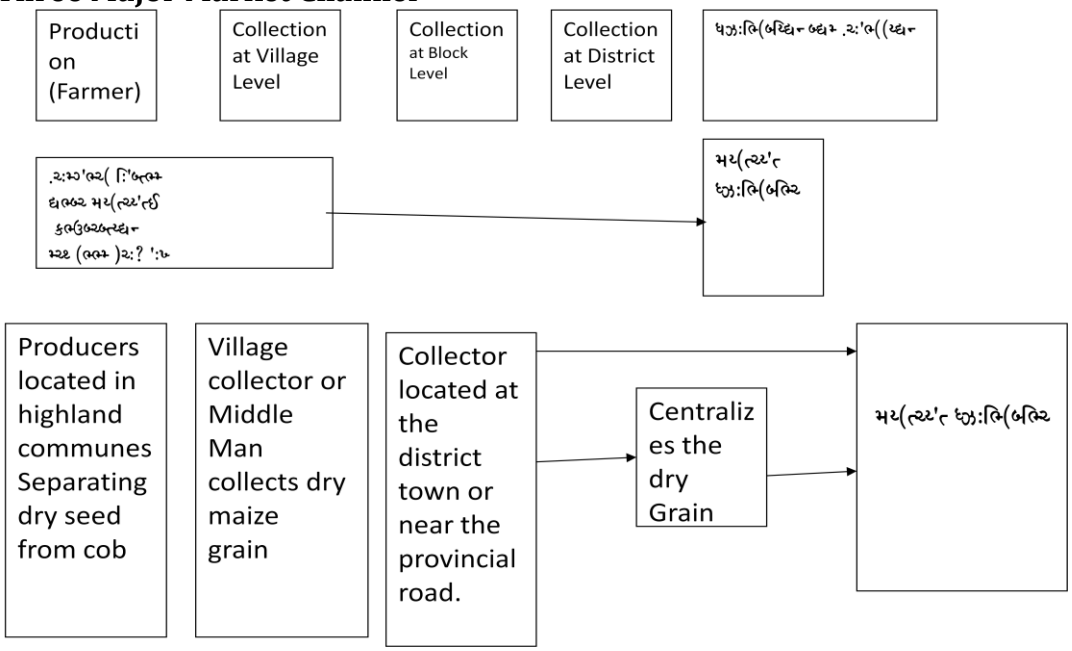
- Maize + Pigeon Pea
- Maize + Soyabean
- Maize + Black Gram
- Maize + Green Gram

Short value chain

- Some Farmers, which are near the provincial road and 10km away from Market Place used to sell directly to collectors.
- Besides that, there is some middle Man, Who Buy it from Farmers and sell to Dahod market at Fluctuated Price.

Major Market Channel

Three Major Market Channel



SWOT Analysis of Maize

Strengths	Weakness
1 Can adapt well to different soils and climatic conditions. 2 In the uplands maize is the main staple food and is also sold to buy basic goods. 3 Relatively cheap animal feed in view of the nutrients it brings. 4 Easy to market. 5 No competition with other nearby Maize Production Areas. 6 Subsidy on Fertilizer and seeds. 7 Requires Less Rain fall. 8 Grow in Upland	1. Low yields (low use of fertilizers, pesticides…). 2. Market information is lacking. 3. Poor Economic Condition. 4. Use of Local verity in Majority. 5. Erratic rain fall. 6. Unavailability of HYV in the market at the time of sowing. 7. Lack of seed Treatment. 8. Small Size of Land Holding. 9. Low Literacy Rate. 10. Mono Crop. 11. No risk Bearing Ability.

Opportunities:	Threats:
1. Use of improved & HYV seed. 2. Marketing Facility at Village Level. 3. Awareness about recommended practices of Maize. (Trading, Demonstration & mass Media). 4. Develop Credit facility. 5. Formation of Co-operative Structure. (SHG, FIG, WFIG). 6. Increase area under organic farming. 7. Lump sum Income. 8. Involvement of family Labour.	1. Occurrence of Drought. 2. Incidence of Disease. 3. Market Fluctuations.

POSSIBLE AREAS OF INTERVENTION

Maize is a commodity which involves most farmer families in Dahod. This commodity represents an important cash income for families. Moreover, there are a number of small businesses who thrive on the collection and transport of this commodity during the season (end of October to December).

As it is produced today, there is a serious question on the long term sustainability of maize production. The fact it is produced on Undulating land, as a monoculture year after year, poses a risk of erosion, and possible development of diseases, both factors jeopardizing the possible increase in yields due to the introduction of new varieties and increase availability of fertilizers.

On the short term, until an alternative crop is found, which could be cultivated with less threats of soil erosion but with a potential to yield similar incomes, maize will continue to be grown.

Farmers should be encouraged to use more fertilizers. This can be done by making subsidized fertilizers available at the community level along with explanations on how to use them. A network of State owned shops selling fertilizers at a subsidized rate should be developed at the community level. Company guarantees it will purchase the soybean. Such agreements for maize could be initiated.

3.10.2 Horticulture Production

Gujarat is one of the major mango growing states occupying an area of 1, 09,600ha under mango cultivation with production of 9, 30,100 T and productivity 8.5 T/Ha in2007-08. The share of mango in total fruit production of Gujarat is 15.9%. Gujarat is contributing 6.7% share in the total production of Indian mango. The South Gujarat is known for commercial cultivation of prime Indian export mango varieties 'Kesar'. In this region, about 75000 ha area is under fruit crops yielding more than 2.87 lakh MT of mango which is contributing 30.85% of state production. The average price of unripe mango fruit during the year 2007-08 in the Surat market is 1280.50 Rs/Qtl. The total postharvest loss in this fruit is amounting to about 13.6 crores annually from the South Gujarat only (Indian Horticulture Database-2008).

As the largest producer of banana in the world, India contributes nearly 23 per cent to the total global production. Gujarat is one of the largest producers of banana in the country with districts like Anand, Surat, Vadodara, Narmada, Bharuch and Kheda contributing about 93.36 per cent to the total banana production in the state

The productivity of banana in Gujarat which is 42.7 MT per hectare, is much higher than the global average of 24.7 MT per ha.

Due to high demand of fruits from this region in countries like; UAE, Africa, Japan,USA and Europe the government has declared this region as Agri Export Zone. To take the advantage of government support many farmer's co-operatives, export and processing unit are already involved in export of fresh as well as processed products like; mango, guava, banana, pomegranate as well as mango pulp, mango based pickles, mango chutney, mixed fruits jam including mango etc.

Although several advanced technologies have been developed in mango and Banana, the extent of their adoption and correct method of implementation is very poor. Technologies such as canopy modification in old and senile mango and Banana orchards, judicious water and nutrient management to increase the productivity and scientific methods for harvesting and post harvest management like pre-cooling, sorting, grading, packaging and marketing have not yet been adopted by a large majority of mango and Banana growers. Similarly farm mechanization in production and harvesting of mango and Banana orchard is present need. In case of processing except mango pulp canning and pickling, no other products are being processed. The process industry waste is also not utilized adequately and so it is generating unhygienic condition in the plant.

The intervention is needed in each steps of entire value chain of mango and Banana from management as well research point of view. This Livelihood manual, therefore, aims at developing appropriate environment friendly production systems for quality

3.10.2.1 A Value Chain on Mango and Banana

Production of mango and Banana, using scientifically developed protocols for judging proper maturity of fruits, harvesting methods, post harvest management practices such as pre-cooling, sorting, grading, packaging, transport and marketing. Efforts will also be made to ensure tying up of producers with processors and entrepreneurship development for promotion of processing which is quite meager, in respect of mango and Banana at present. This will result in enhanced gains to the producer in terms of enhanced yield, quality fruits, higher income, employment generation, development of value added products, etc.

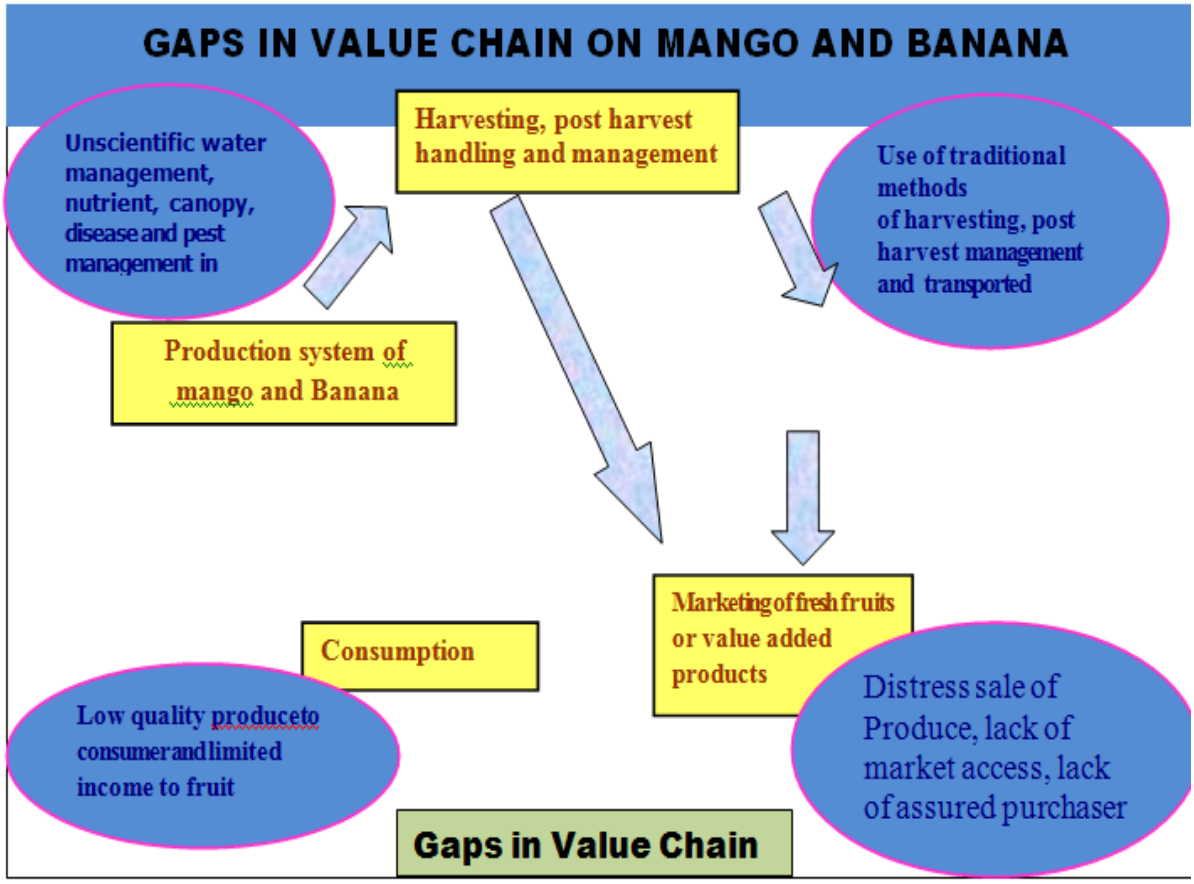
In what will be music to the ears of banana cultivators, a Gujarat-based agriculture university has successfully converted those parts of the fruit's plant which are usually thrown away as waste into highly useful products, including an edible candy with nutritional values.
Under a project 'A value chain on utilization of banana pseudostem for fibre and other value added products', Navsari Agriculture University (NAU) professors have developed edible candy high in fibre and nutrition made out of central core of plant pseudostem

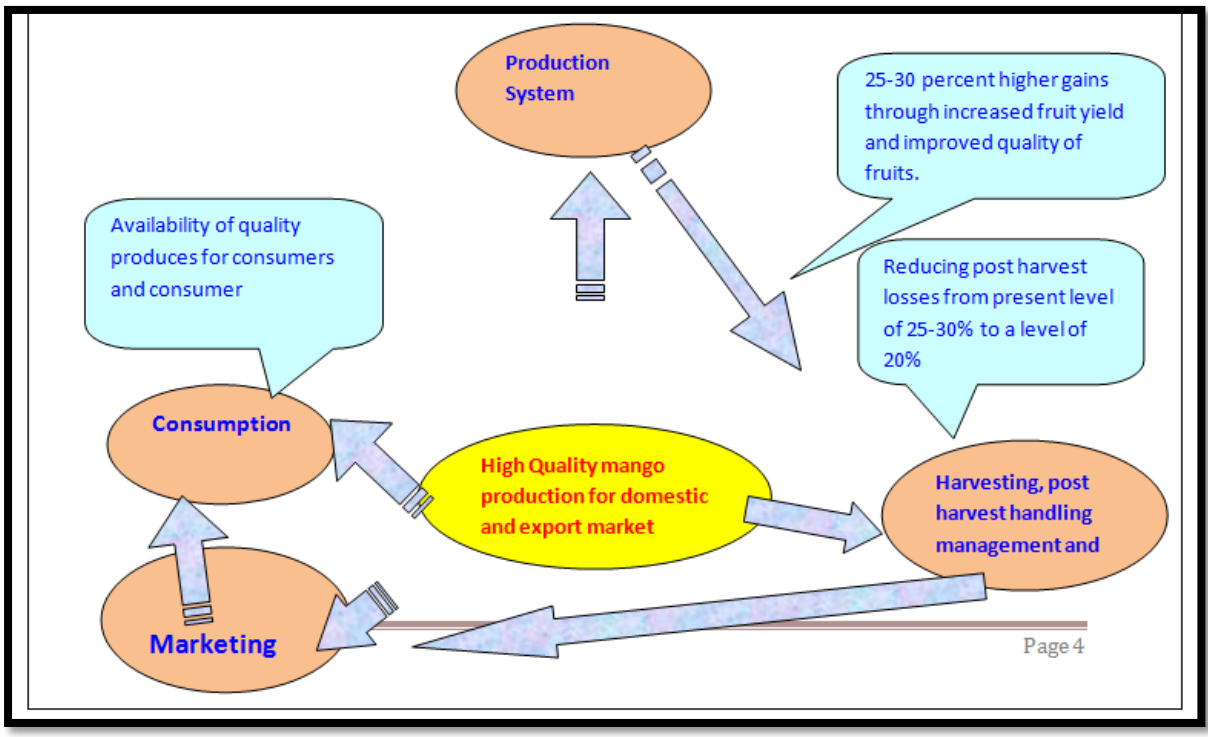
OBJECTIVES:

- Enhancing productivity and quality of mango and Banana through good agricultural practices.
- Reducing post-harvest losses, enhancing shelf life through scientific pre and postharvest management practices.
- Strengthening of processing of mango and Banana through entrepreneurship development and tying up with processors.
- Facilitating the producers in getting domestic and international market access for
  their produce by creating market linkages

Available Technologies for fruit production

- ✓ Adopted Latest Technologies
- ✓ Propagation-(Grafting/Tissue Culture)
- ✓ Irrigation (Micro Irrigation)
- ✓ Fertigation (Organic/Inorganic)
- ✓ Integrated Pest Management
- ✓ Post Harvest Management





Fruits	Foods	Beverages	Fibre based products	Medicinal & cosmetic applications	By products & animal feeds
Mango	Puree, pickles, Chatni, amchoor, squash, jam, mango shake, custard, baby food, toffee, sliced & canned Mango, Mango honey.	Juice, wine, gums		Burnt leaves for Hiccups & threat affection, amattar (from flower) dried flower (for cronic dysentery) and face-pack, tannin from bark.	Wood for making furniture,worship, match boxes,splint, brush back, boats, oarblader etc.
Banana	Banana chips, dried banana, flour jam, puree, banana figs	Juice, wine and butter, banana vinegar	table mats, bags etc	Fibre based products: table mats, bags etc	Fruit & pseudostem, shampoo, health promoting supplements

VALUE-ADDED PRODUCTS:

Problems Faced by Farmers in Production &Post Harvest Management

- Small holding of Farmers (0.2-0.80 ha), weak economic condition with fragmented land.
- Low productivity of fruits.
- Non-availability of quality planting material and farmers are producing own planting material in non scientific manner resulting in poor quality.
- Constraints on investment in latest technology.
- Inadequate fertilizer application.
- Damage due to climate (Frost), Diseases (Virus)
- Harvesting and poor collection environment.
- Lack of sense of proper grading & storage.
- Inadequate infrastructure facility i.e. pre cooling & cold storage at the farmers field, Rural Market yard, transportation and Whole sale and Retail Market.
- Weak Supply-Chain forcing farmers to overstock raw produce & its products.

PRODUCT – STRENGTH &CONSTRAINTS

- Raw materials are available but not adequate for processing industries.
- Farmers are doing primary processing of fruits making pickles, jam, jelly, squash etc (Roughly 20% is utilized).
- Difficulty faced by small farmers in the Marketing of primary processed products due to lack of brand name. .
- Percentage of processed produce is very small.
- Processed products are costlier vis-a vis fresh products.

3.11 Methods and Practices of Floriculture Development

Floriculture offers a wide range of opportunities to women in terms of employment, income generation, empowerment and above all self-fulfilment. Floriculture has emerged as an important agribusiness, providing employment opportunities and entrepreneurship in periurban and rural areas. Since a large number of women in rural areas where floriculture is practiced are already engaged in growing flowers, they have an opportunity to increase their incomes by taking to modernization in floriculture. During the last decade there has been a thrust on export of cut flowers, especially roses. The export surplus has found its way into the local market influencing people in cities to purchase and use flowers in their daily lives.

Gujarat farmers are smelling profit in floriculture. The horticulture scenario in the state has met a morphosed from traditional open cultivation to commercial and hi-tech cultivation of flowers. The proficient knack of educated farmers in the region and the influx of new technology are contributing to the increasing floriculture market not only in the metros but also in the Middle East and European countries. Hence, the state offers tremendous scope for commercial floriculture.

- Suitable agroclimatic condition for floriculture
- Easily availability of market like Surat, Vadodara, Ahmedabad and Mumbai
- More income in less investment and less land required
- Planting Materials are easily available in nearby areas
- Generation of more employment
- Easily availability of labour (Landless)

- Short duration Crop
- Floriculture are doing already in South Gujarat like Kamraj, Surat and Navsari

AFRICAN MARIGOLD (*Tagetes erecta* **L.)**

Marigold are growing throughout the Gujarat in open condition. It is sale as a loose flower and it can be grow throughout the year so it is suitable for watershed project areas.

Varieties

Local types (orange & yellow), Pusa Narangi Gainda, Pusa Basanthi Gainda (IARI varieties) and MDU 1 can be cultivated.

Orange type Yellow type

Soil

Well drained loamy soil is found suitable. The soil pH should be 6.0 -7.5. Saline and acidic soils are not suitable for cultivation.

Seeds and sowing

The seeds are sown throughout the year. Nursery is raised with 1.5 kg seeds/ha and the seedlings are transplanted after four weeks on one side of the ridge at 45 x 35 cm spacing. Treat the seeds with *Azospirillum* (200 g in 50 ml of rice gruel) before sowing.

Irrigation

Irrigation is done once in a week or as and when necessary. Water stagnation should be avoided.

Manuring

During last ploughing, incorporate 25t/ha of FYM. Apply 45:90:75 kg NPK/ha as basal and 45 kg N/ha as top dressing 45 days after planting.

After cultivation

Weeding should be done as and when necessary. Irrigation should be given immediately after planting and life irrigation on third day after planting. Water stagnation should be avoided. Based on the soil moisture condition, irrigation should be done.

Nipping/tipping: Thirty days after planting terminal portion should be tipped / removed to encourage the branching.

Plant protection: Spider

It can be controlled by spraying Kelthane 1 ml/lit of water

Leaf spot: Leaf spot can be controlled by spraying Bavistin 1 g / lit of water

Root rot: Drench 1 g/lit of Bavisitin to control root rot.

Crop duration:the crop duration is about 130 - 150 days.

Harvest: Flowers are picked once in 3 days beginning from 60 days after planting.

Yield: The average yield is about 18 t/ha.

Cost of Cultivation

Cost of Cultivation per Ha. Marigold				
Sr. No.	Particulars	Quantity	Unit Cost	Total Cost (Rs.)
1	Land Preparation			3000
2	Seed Cost	1.5 Kg	1000 Rs /Kg	1500
3	Nursery Raising			2000
4	Transplanting (Labours)	12	124 Rs.	1488
5	Gap Filling (No. of Labour)	3	124	372
6	Manuring	25 ton	300 Rs/ton	7500
7	Fertilizer			3900
8	Irrigation (No. of Labour) + Other Charges	10	124	5240
9	Vermicompost	2.5 t	3000 Rs/Ton	7500
10	Interculturing and Weeding (No. of Labour)	40	124	4960
11	Plant Protection Chemicals			3000
12	Harvesting (No. of Labour)	40	124	4960
13	Transporting and Marketing			7000
14	Middlemen Commission			0
15	Land Lease (@25000 Rs. Per Ha)			25000
16	Miscellaneous			2000
17	Total Expenditure			79420
18	Bank Interest	12 % PA		9530.4
19	Total Cost of Cultivation			88950.4
20	Flower Yield	18 tn		18 Tn
21	Gross Return	18 ton	20 Rs / Kg	360000
22	Net Return			271049.6
23	Benefit to Cost Ratio (B:C)			3.0

Note:- All the data of costing were taken by discussing with farmers and KVK Persons

3.12 Method and Practices of Vegetable Farming Development

India is next only to China in area and production of vegetables and occupies prime position in the production of cauliflower, second in onion and third in cabbage in the world. The area and production of major vegetables during 2004-05 is estimated at 6.30 million ha with a production of 93.0 million tonnes and average productivity of 14.8 tonnes per ha. The production has increased by 5.7 per cent.

Gujarat has about 49% of the total area of the state are under cultivation. The area under irrigation is about 33% of the net area sown, while rest of area is cultivated under rainfed conditions.The major fruits grown in Gujarat are Mango (31%), Banana

(17%), chikoo (9%), Citrus (10%), Aonla (2%), Papaya (2.25%). The state occupies number one position in the country in respect to per unit area production of potato and onion. The major vegetables grown in Gujarat are Onion (16%), potato (12. %), Brinjal (17%), Tomato (8 %). Gujarat has highest productivity in, Guava, Potato, Onion, Cumin and Fennel, third highest productivity in Banana and Isabgul in the country

Operational Strategy

Fruits and vegetables are produced seasonally, but the market requires products throughout the year. For many decades, this problem of matching product availability with consumer demand was solved in two ways: (1) selling fresh products during harvest and shortly thereafter, and (2) processing the rest to meet demand during the rest of the year

Types of vegetable farming

1. Commercial vegetable production:
2. Green house vegetable farming:

1. Commercial vegetable farming

Vegetables that are farmed include carrots, lettuce, peas, beans, potatoes, tomatoes, cabbage, broccoli, onions, squash, and pumpkin. Choose your crop depending on:

- Climate. Some vegetables are cold resistant, some are not. They should be planted just in time for them to be harvested before weather conditions prove fatal to them.
- Available time and labor. Some crops have high labor requirements to grow. Before choosing a vegetable to raise, know first the extent at which some plants need tending. Determine whether you have the time to invest to grow and market it. For example, if you expect to be unable to get your produce sold immediately, avoid easily perishable crops like asparagus, sweet corn, peas and grow potatoes and onions instead.
- Technical knowledge and equipment. Some crops are difficult to grow and need special attention from the farmer for optimum results. Your choice of crop should consider whether you have the knowledge and experience in growing such crop and whether you are willing to learn from available resources. Also, some crops would need special equipment. Choose those you won't need to buy the equipment to grow.
- Market Preference. If you plan to open a pick-your-own farm, be sure that your area accessible to people. As a small gardener, you can also sell produce in retail from a roadside market, farmer's market, or local grocery store.

2. Green house vegetable farming:

About 95% of plants, either food crops or cash crops are grown in open field. In some of the temperate regions where the climatic conditions are extremely adverse and no crops can be grown, man has developed methods of growing some high value crop continuously by providing protection from the excessive cold, which is called as Greenhouse Technology. So, Greenhouse Technology is the technique of providing favourable environment condition to the plants. It is rather used to protect the plants from the adverse climatic conditions such as wind, cold, precipitation, excessive radiation, extreme temperature, insects and diseases. It is also of vital importance to create an ideal micro climate around the plants. This is possible by erecting a Greenhouse / glass house, where the environmental conditions are so modified that

one can grow any plant in any place at any time by providing suitable environmental conditions with minimum labour.

Marketing

About 42 fruit & vegetable co-operative marketing societies and 197 Agriculture Produce Market Committees dealing with selling & buying of horticulture produce in the State. These have been mandate to maintain utmost transparency for dealing to ensure farmers against exploitation by middlemen. Agriculture Export Zone for dehydrated onion & zone for fruits - vegetables has been established, which will be the back bone to boost horticultural development in the state. The vegetables viz. okra, beans, bitter gourd, onion fresh as well as flacks and powder, garlic powder and gourds.. The spices viz. cumin, fennel and garlic are also potential for export.

State has 202 mandis located in 224 talukas and 25 districts. Large mandis include Ahmedabad, Unjha and Rajkot. These mandis are price leaders and determine price even in small mandis

Activities carried out in implementation of Vegetable Farming program:

1. Institutional Trainings
2. Project Trainings
3. Exposure Visits
4. Workshops
5. Mass Awareness Events
6. Communication

3.13 Methods and Practices of Organic Farming Development

Leading as Second in 'Green Revolution' – Gujarat has achieved Agricultural Growth table at 9.6% and have carved a niche in the field of Agricultural Development in India. As of 2009, Gujarat's agriculture growth rate has been three times more than the national growth rate.

Gujarat has taken the lead in this area covered 7760.82 ha under organic cultivation, with increased public-private relationship. It has good scope for expansion of fruits, vegetables, spices, forest products, cotton etc. The rain-fed agriculture area of Gujarat can be grown under the bio-farming and produce organic agriculture commodity, which has great value in the international market. Within minimal available water and low water resistant traditional varieties, which produce valuable agriculture commodities, this is a sustainable livelihood generation for rural people

Organic farming is the new catch word for a group of farmers from Gujarat who have set up an organization, to make hay in the competitive area of agriculture. As per FAO's definition "Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity, and this is accomplished by using on-farm agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs". The Codex Committee of World Health Organization on Food Labeling has been guiding the approval of such products. Organic farming has made creditable advancements during the past decade. National Project on Organic Farming (NPOF) and National Horticulture Mission (NHM) scheme of Department of Agriculture and Cooperation has significantly contributed to this growth.

Organic Inputs

There are various inputs for nutrient, pest and disease management commonly used in the organic farming of crops. The method of preparation and application is briefly described.

Organic Manures:

Farmyard manure (FYM)

Farmyard manure (FYM) refers to the decomposed mixture of c dung and urine of farm animals along with the Lit.ter (bedd material) and leftover material from roughage or fodder fed to cattle. The average composition of well-rotted FYM is 0.78% N, 0.7 P_2O_5 and 0.65% K_2O, depending on the Substrate.

Poultry manure

Poultry manure is collected from chicken, hen and other househ domesticated poultry. It is rich organic manure, since liquid and so excreta are excreted together resulting in no urine loss. The aver composition of poultry manure is 1.47% N, 1.15% P_2O_5 and 0.48% K_2

Biogas slurry

The residual end product of a biogas plant is known as bio slurry. The anaerobic decomposition of cattle dung to form meth yields slurry which can be used as organic manure. The man composition of biogas slurry is 1.4–1.8%N, 1.1–1.7% P_2O_5 and 0.8–1. K_2O.

Aerobic Composting:

A wet bed, consisting of shredded crop residue is spread at bottom of the pit. Cattle dung is then spread over this layer and sprinkled with water . The process is repeated until layers of th residues reach 30 cm above ground level. A shed is erected over the to prevent the contents from getting soaked by rain. The materia turned every fortnight and good quality compost is ready in 16 wee The width of the pit may be 2-2.5 m and its depth may be 0.9 m. T length may vary from 3-10 m.

Anaerobic Composting:

The Bangalore method attempts to conserve larger quantities nutrients. Heaps are prepared as in the Indore method after wh each heap is sealed with a plaster of mud, which increases temperature due to the anaerobic fermentation process. By t method, nitrogen rich compost is formed in 32 weeks. The fi product is dark in colour, finely divided, rich in humus and ha C:N ratio of 10 : 1 to 20 : 1

Mulching:

Mulch is simply a protective layer of a material that is spread on the of the soil. Any material such as straw, plant residues, leav stubble, loose soil may be used as mulch and placed on the s surface.

Mulching increases infiltration of water, improves soil and moist conservation, regulates soil temperature, improves root growth, a over time, enhances the water holding capacity of the soil a enriches it with organic matter.

Green Manure:

Green manure consists of fresh green plant matter which ploughed into or turned into the soil to serve as a source organic matter and plant nutrients. They are as follows:

Leguminous green manure	Non-leguminous green manure
Dhaincha (*Sesbania aculeata*)	Bhang (*Cannabis sativa*)
Sunhemp (*Crotalaria juncea*)	Sorghum (*Sorghum vulgare*)
Moong (*Vigna radiata*)	Maize (*Zea mays*)
Cowpea (*Vigna unguiculata*)	Kodogira (*Vernonia cineria*)
Senji (*Melilotus alba*)	Sunflower (*Helianthus annus*)

Green manure can provide 4–5 t/ha of dry biomass and 80–100 kg of N/ha within 50–60 days of plant growth. Green manuring hastens microbial activity in the soil, reduces weed growth and improves the plant's resistance to disease.

Phospho-compost: Phospho compost is phosphorus-enriched compost. It is prepared by composting decomposable wastes along with 15–25% suitable rock phosphate for 3–4 months. Preparation of one type of phospho compost includes crop waste 60%, animal dung 15%, FYM 2%, soil 2%, rock phosphate 15%, iron pyrites 5%.

Bio-fertilizers:

Nitrogen Bio-fertilizer:

Rhizobium:

It is an aerobic, soil bacterium which fixes atmospheric N_2 in symbiotic association with legumes whose root nodules act as the site of N-fixation. Its inoculation is recommended for legumes (pulses, oilseeds and forage legumes). Application of rhizobium @ 1.0–2.0 kg/ha as seed treatment for chickpea, pea, pigeon pea, groundnut, soybean and @ 0.4–0.6 kg/ha for lentil, lucerne, berseem, green gram, blackgram, cowpea, etc. is recommended. Seed treatment should be done immediately prior to sowing.

Azotobacter:

Azotobacter is a non-symbiotic, aerobic, free-living, nitrogen fixing, soil bacteria. It fixes 20–40 kg nitrogen/ha. It also produces growth promoting substances like Indole, acetic acid, gibberellins, etc.

Its use is recommended for cereals and horticultural crops including flowers and vegetables. Usage is by seed treatment, seedling treatment or soil application, depending on the crop. Normal dose recommended is @ 200 gm/10 kg of seed as seed treatment during sowing time; 1.5–3.0 kg/ha as seedling treatment during transplantation; and @ 4–5 kg/ha mixed with 30–40 kg well-decomposed cattle manure as soil application.

Azospirillum: It is recommended as a bio-fertilizer especially for maize, pearl millet, finger millet, etc.

Blue-green algae (BGA): 25 kg/ha for paddy. And **Azolla:** 3–4 tones/ha.

Phosphorous Bio-fertilizer:

Phosphorous solubilising bio-fertilizer (PSB):

PSB is a preparation of bacteria or fungi which can solubilise 20–30 % of insoluble phosphate. PSB includes Bacillus megatharium var. phosphaticum, B. polymyxa, Pseudomonas striata, etc. The PSB fungi include Aspergillus awamori, Penicillin digitatum, etc. Its use is recommended for all crops. Usage is by seed treatment, seedling

treatment or soil application.

Phosphorous mobilizing bio-fertilizer (PMB):

Vesicular-arbuscular mycorrhizal (VAM) fungi are known as PMB. It is required for the crops like wheat, maize, millets, soybeans, tomato, grapes, citrus, apple, banana, etc. Mycorrhizae can supply 15–30 kg phosphate/ha/season by mobilizing P from the soil.

Neem:

Neem has been used from time immemorial as a bio pesticide.

Insect and Pest control:

Neem seed kernel extract:

Good quality neem seeds should be collected and pounded to remove the outer seed coat. The stripped seed should then be immersed in water (50 gm of kernel in one Lit.re of water). After 12 hours, the solution should be filtered through a fine cloth and sufficient water added to make a solution of one Lit.re. The solution can be used for direct spraying. About 350–450 Lit. of the solutions are required for one Ha.

Neem leaf extract:

To prepare leaf extract, 1Kg of neem leaves is crushed and soaked overnight in five Liters of water. Before spraying, the solution is strained and 1 ml of soft soap solution is mixed per Lit. of extract. This solution is effective as a foliar spray against sucking and chewing insects. It can also be applied directly on the soil to control nematodes, especially in solanaceous crops, in which case the concentration of the solution needs to be doubled, i.e., 2–2.5 Lit. of crushed leaves to be soaked per Lit. of water.

Neem cake extract:

A 100 gm of de-oiled neem cake is used to make 1 Lit.re of aqueous solution. The cake should be kept in a cloth bag and hot water poured over it. The solution should be kept overnight in a covered container. The extract made in this way is very effective against all plant boring insects.

Neem oil:

About 25 to 30 ml of neem oil is mixed with soap water to make an emulsion that is sprayed for the control of fungal disease such as downy mildew. Neem oil solution is also effective against a wide range of insects such as beetles, plant hoppers, caterpillars, etc., but it can also harm some beneficial insects. Neem oil is mainly used to protect seeds during storage. Between 5–10 ml of oil is mixed well with 500 ml of seeds, before the latter are stored in an airtight container.

Vermicompost:

Vermicompost is nothing but the excreta of earthworms, which is rich in humus and nutrients. Earthworms can be nurtured artificially in a brick tank or near the stem / trunk of trees (especially horticultural trees). By feeding these earthworms with biomass and watching properly the food (bio-mass) of earthworms, produce the required quantities of vermicompost.

Nutrient content of vermicompost

Nitrogen- 1.5 – 2.5 % Calcium- 0.5 – 1.0 %

Phosphorus- 0.9 – 1.7 % Magnessium- 0.2 – 0.3 %
Potash- 1.5 – 2.4 % Sulphur- 0.4 - 0.5 %
And other micronutrients with vitamins, enzymes and hormones.

Materials for preparation of Vermicompost:
Any types of biodegradable wastes-Crop residues, Hotel refuse, Weed biomass, Waste from agro-industries, Vegetable waste, Biodegradable portion of urban and rural wastes, Leaf litter.

Efficient species:
Eisenia foetida, Amyanthes diffrigens, Eudrillus engineac.

Methods of preparation:
The Vermi-compost can be prepared in concrete tank. The size of the tank should be 10 ft. length or more depending upon the availability of land and raw materials, breadth 3- 5ft and height 3 ft. Suitable plastic tube / basin structure may also be needed. The floor of the tank should be connected with stones and pieces of bricks. The available bio-wastes are to be collected and are to be heaped under sun about 7-10 days and be chopped if necessary.
Sprinkling of cow dung slurry to the heap may be done. A thin layer of half decomposed cow dung (1-2 inches) is to be placed at the bottom. Place the chopped weed biomass and partially decomposed cow dung layer wise. Place wire net / bamboo net over the tank to protect earthworm from birds. Sprinkling of water should be done to maintain 70-80 % moisture content.
Provision of a shed over the compost is essential to prevent entry of rainwater and direct sunshine. Sprinkling of water should be stopped when 90 % bio-wastes are decomposed. Maturity could be judged visually by observe
ng the formation of granular structure of the compost at the surface of the tank. Harvest the Vermi-compost by scrapping layer wise from the top of the tank and heap under shed. This will help in separation of earthworms from the compost.

Operational Strategy

1. **Selection of Farmer:**
   a. Farmers get mind wash through training, exposure & meeting from organization at village level.
   b. Check through Mandal sahayak & other representative of village.
   c. Providing base line information in documents developed by corporate company along with proof like 7-12 & 8A.
   d. Agreement with company & farmer for follow up the principle of organic & marketing of product.

2. **Production, Organic Certification & Monitoring:**
   a. Cost of cultivation diary maintained by farmer.
   b. Each farm contains sign board supplied by Corporate Company.
   c. Inspection form maintained by committee of corporate & organization.
   d. Staff of corporate & Technical Expert/ WDT (Agri.) involved in monitoring.
   e. All information checked during inspection by Certification Agency, APEDA &

FAIR TRADE inspector.

f. After completion of three year inspection farmer get certificate of organic farm from different agency.
g. For commercial Kharif crop like Cotton, Bajra, Sesame etc. certified by Certification Agency & Spices crop like Cumin, Coriander inspected by APEDA.
h. Production estimation carried out during visit.
i. Storage other than conventional & contamination rectified by company's staff.
j. Required all proof of cultivation during inspection.
k. Minimum three time inspection required for certification by staff.
l. Every year inspection is must & renew every year from certification agency.
m. Required Sarpanch certificate (NOC from village institute body) & revenue map for group certification.

3. Marketing:

a. Organic agriculture produce is taken by Corporate company after completion of three year at 10 % premium price
b. First & second year farmer got premium of 13 % in group account if Fair Trade Certification obtained.
c. Individual marketing through MUNCH in surrounding area product like Ground nut, Bajra, Mung, Muth etc

4. Activities carried out in implementation of Organic Farming program:

Sr. No.	Activities
1.	Institutional Trainings
2.	Project Trainings
3.	Exposure Visits
4.	Workshops
5.	Mass Awareness Events
6.	Folk Theatre
7.	Collaboration with Certification Agency & Corporate company for Certi & Marketing
8.	Communication

5. Facilitators of Organic Farming program in Gujarat:

A) Corporate Companies working in the Organic Farming

1. Suminter India Pvt. Ltd.
2. Agrocel Pvt. Ltd.
3. Ameet Green Pvt. Ltd.

B) NGO working in the field of Organic Farming

1. AKRSP
2. CEE
3. JATAN Trust
4. Shristi
5. Yuva
6. Cohesion
7. Manav Kalyan Trust
8. Kutch Sajeevkheti Manch

C) Educational Universities working in the Organic Farming

1. Anand Agriculture University
2. Navsari Agriculture University
3. Junagarh Agriculture University
4. Dantiwada Agriculture University
5. Krishi Vidyan Kendras

List of Facilitators of Organic Farming program in Gujarat

Sr. no	Name of the organization	Working area	Address	Contact person/s
1.	Aga Khan Rural Support Programme (AKRSP)	Taluka- Syla, Chotila Distt. Surendranagar	Nr. Rajsobhag ashram, Syla, Surendranagar; Nr Shastrinagar maidan, Chotila, Surendranagar HO: A'bad	**Mahesh Patel Mob: 9427156716**
2.	Agrocel Industries Limited	Taluka- Mandvi, Bhachav, Rapar Distt. Kutch	Kodai, Mandvi, Bhuj-Kutch	**Dillip Chhatrola Mobile: 9979558176**
3.	Kutch Sajeevkheti Manch (KSM); Satvik	Taluka- Bhachav, Rapar Distt- Kutch	Bhuj Kutch	**Sailesh Vyas, MD Mobile no: 9426909872**
4.	Amit Green	Distt- Surendranagar	Surendranagar	**Mr. Amitabh K SinghTelephone: +(91)-(2752)-225414 Mobile - 9824233277**
5.	Centre for Environment Education (CEE)	Taluka- Jasdan Distt- Rajkot	HO: A'bad	**Suman Rathor (Jasdan)**
6.	Shristi	Gujarat Ahmedabad	Ahmedabad	**Ramesh Patel Prof Anil Gupta (IIMA)**
7.	Jatan	Varoda		**Kapil Shah, Chairman ; MD 9427054132**
8.	YUVA	Taluka- Bhachav, Rapar Distt- Kutch		
9.	Sumintar India Pvt. Limited	Gujarat and Maharashtra	308, Oberoi Chambers, A Wing, New Link Road, OPP Sab T. V.,	**Mr. Sameer Misra, 09821718317 91-022-26743685**

			Andheri (W),Mumbai	
10.	Junagarh Agriculture University, Gujarat	Gujarat	Junagarh	**Dr. B.K. Sagarka 09909312244**
11.	Navsari Agriculture University, Gujarat	Gujarat	Navsari	
12.	Anand Agriculture University, Gujarat	Gujarat	Anand	**Shri N.H.Gohil 02713-293013**
13.	**Dantiwada Agriculture University**	**Gujarat**	**Dantiwada**	**Prof.H.D.Patel 02748-278424 (O) Prof.P.P.Patel 02748-278424 (O)**

VERMICOMPOST UNIT MODEL

Organic waste, a challenge for disposal, a serious environmental pollutant, and a great social nuisance can be converted, using simple techniques, into useful and valuable product known as 'Vermicompost'. 'Vermicompost' is an organic form of fertilizer with all beneficial properties of inorganic fertilizer but is free from the harmful effects on soil and human health. In recent past with popularity of organic farming gaining, demand for organic fertilizers is increasing. The scope for betterment of soil health using vermicompost and globalization of our economy has opened up new vistas of business opportunity to commercially produce this commodity of multiple social and economic values.

Vermicompost

Utilizing earth worms and microorganisms to convert organic waste into nutrient-rich humus like material known as vermicompost.

What is vermicomposting ?

Vermin' stands for earthworm. The organic matter when subjected to decomposition with the help of earthworms the resultant product is 'vermi compost' and the process is known as vermicomposting. Thus it is a simple cost effective waste management technology, wherein the earthworms are used to consume and digest organic waste in their guts to obtain excreta in the form of granules called vermicompost.

Vermi composing is a technology of using earthworms as versatile natural bio-reactor for rapid conversion of any organic wastes under value added manure. The earthworms feed on the wastes of organics origin, which is rich in NPK, micro nutrients, enzymes and vitamins suitable for crop growth besides number of useful micro organisms.

Vermicompost vs. Chemical Fertilizers in Soil

Criteria for Comparison	Chemical Fertilizers	Vermicompost
Macro nutrient contents	Mostly contains only one (N in urea) or at the most two (N & P in DAP) nutrients in any one type of chemical fertilizer	Contains all i.e. nitrogen (N), phosphorus (P) & potassium (K) in sufficient quantities
Secondary nutrient contents	Not available	Calcium (Ca), magnesium (Mg) & sulphur (S) is available in required quantities
Micro nutrient contents	Not available	Zinc (Zn), boron (B), manganese (Mn), iron (Fe), copper (Cu), molybdenum (Mo) and chlorine (Cl) also present
pH balancing	Disturb soil pH to create salinity and alkalinity conditions	Helps in the control of soil pH and checks the salinity and alkalinity in soil
EC correction	Creates imbalance in soil EC affecting nutrients assimilation	Helps in balancing the EC to improve plant nutrient adsorption
Organic carbon	Not available	Very high organic carbon and humus contents improves soil characteristics
Moisture retention capacity	Reduces moisture retention capacity of the soil	Increases moistures retention capacity of the soil
Soil Texture	Damages soil texture to reduce aeration	Improves soil texture for better aeration
Beneficial bacteria & fungi	Reduces biological activities and thus the fertility is impaired	Very high biological life improves the soil fertility and productivity on sustainable basis
Plant growth hormones	Not available	Sufficient quantity helps in better growth and production

AVERAGE NUTRIENT CONTENTS OF VERMICOMPOST & FYM.

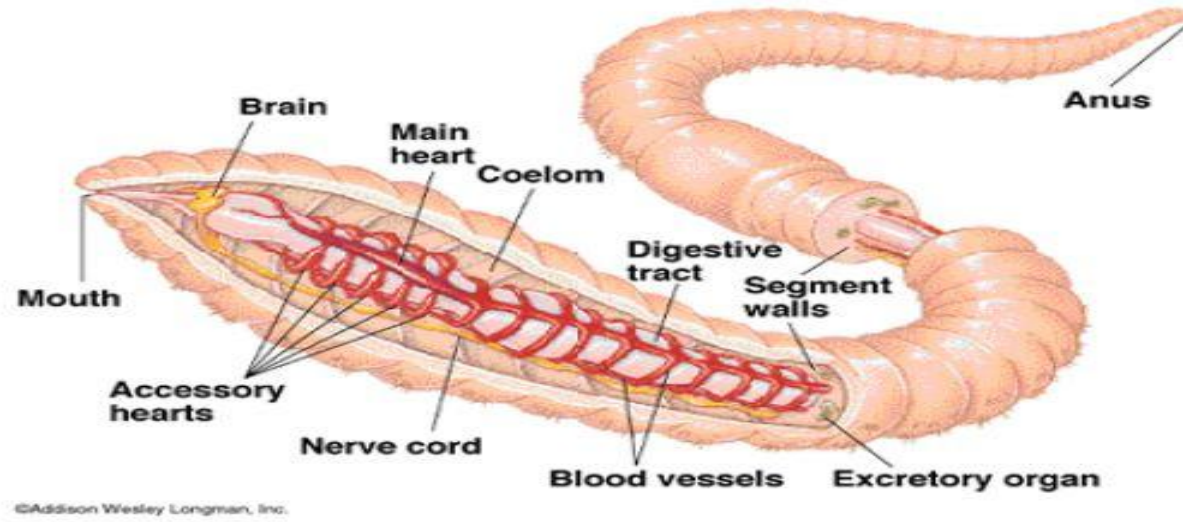
S.No.	Nutrient	Vermicompost	FYM
1	N %	1.4 – 1.6	0.50 – 0.75
2	P2O5 %	1.6 -2.5	0.17 – 0.20
3	K2O %	0.6 – 0.8	0.50 – 0.55
4	Ca %	0.44	0.91
5	Mg %	0.15	0.19
6	Fe (ppm)	175.2	146.5
7	Mn (ppm)	96.51	69
8	Zn (ppm)	24.43	14.5

9	Cu (ppm)	4.89	2.8
10	C : N ratio	15:1	31:1

Life-cycle of earthworms

One earthworm reaching reproductive age of about six weeks lays one egg capsule (containing 7 embryos) every 7 - 10 days. Three to seven worms emerge out of each capsule. Thus, the multiplication of worms under optimum growth conditions is very fast. The worms live for about 2 years.

ADULT WORMS



Types of earthworms

There are more than 1,000 different earthworm species, but they can be placed into one of three groups.

1. Litter dwellers or *epigeic species :-* *live in crop* or forest litter. They are not common in most agricultural soils. These species do not ingest large amounts of soil. The manure or red worm, ***Eisenia foetida****, is an example of a litter dweller.*

2. Topsoil dwellers or *endogeic species:-* *live in the* upper 2 to 3 inches of the soil. They live primarily from partially decomposed organic matter that is already incorporated in the soil. They eat their way through the soil, creating horizontal burrows that they fill with their excrement. These species ingest large amounts of soil that they mix with digested crop residue in their guts.

3. Subsoil dwellers or *anecic species:-* live in permanent vertical burrows that can be 5 or 6 feet deep. These earthworms need surface crop.

Earthworms eat the soil and various organic matters which undergo complex biochemical changes in their intestine and excrete out in the form of granular mass. Out of a large number of species of earthworms occur in nature, the commonly reared for commercial production of vermicompost belongs to ***Pheretima asiatica, Eisemia foetida, Eudrilus euginae*, and *Perinoyx excavatus***.

Vermi-beds

- Scientific bed side is 75 cm - 90 cm thick depending on the provision of filter for drainage of excess water.
- The whole bed area should be above the ground.
- The bed should have a uniform height over the entire width to the extent possible to avoid low production owing to low bed volumes.
- The proper bed width should not be more that 1.5 m to allow easy access to the centre of the bed.
- The beds are maintained at about 40 - 50% moisture content and a temperature of 20 – 30^0 c.
- The earthworms being voracious eaters consume the biodegradable matter and give out a part of the matter as excreta or vermi-castings.
- The vermi-casting containing nutrients are rich manure for the plants.

Steps in making vermicompost

Step 1: Cover the bottom of the cement ring with a polythene sheet. (Or use the sheet to cover the ground of the area you're using).

Step 2: Spread a layer (15-20 cms) of organic waste on top of the sheet.

Step 3: Prepare cowdung slurry (15kgs) and add the slurry as a layer on top of the mixture.

Step 4: Fill the ring completely and evenly with the layered material.

Step 5: Paste cowdung or soil over the top of the material.

Step 6: Allow the material to decompose for 20 days. After 20 days, put the earthworms on top. They will find the cracks and enter the material.

Step 7: Cover the ring with wire mesh or gunny bags to prevent birds from eating the worms.

Step 8: Sprinkle water over the whole mixture at 3-day intervals for 2 months, to maintain adequate moisture and body temperature of the worms.

Step 9: After 2 months, (or when the compost is ready), remove the ring and heap the material in a cone shape on the floor. Leave the heap undisturbed for 2-3 hours, to let the worms move slowly to the bottom.

Step 10: Separate the upper portion of the heap.

Step 11: Sieve the lower portion of the heap to separate the worms. They can be used again for preparation of more vermin-compost.

Step 12: Pack the compost in bags and store them in a cool place.

* Note: when the compost is ready, it is black, quite light weight and has a pleasant, earthy smell.

Benefit of Vermi composting

- **Soil**

- Improves physical structure.
- Enriches soil with micro-organisms (adding enzymes such as phosphatase and cellulase)
- Microbial activity in worm castings is 10 to 20 times higher than in the soil and

organic matter that the worm ingests.

- Improves water holding capacity.

➢ **Plant growth**

- Enhances germination, plant growth, and crop yield.
- Improves root growth and structure.
- Enriches soil with micro-organisms (adding plant hormones such as auxins and gibberellic acid).

➢ **Economic**

- Bio wastes conversion reduces waste flow to landfills.
- Creates low-skill jobs at local level.
- Low capital investment and relatively simple technologies make vermicomposting practical for less-developed agricultural regions.

➢ **Environmental**

- Helps to close the "metabolic gap" through recycling waste on-site.
- Large systems often use temperature control and mechanized harvesting; however other equipment is relatively simple and does not wear out quickly.
- Production reduces greenhouse gas emissions such as methane and nitric oxide (produced in landfills or incinerators when not composted or through methane harvest.

Unit Cost:

- **Tank Size : 10 ' x 6 ' x 2.5 '**

Sr.no	Particulars	Quantity	Rate	Amount (Rs.)
	I. FIXED COST			
1	Brick work in cement 1:4	72 cft	60	4320
2	Plastering (1:3)	184 sft	3.5	644
3	Bottom Plain Cement Concrete 1:3:6	30 cft	45	1350
4	Light Thatched Roof			500
5	Vermi bed (Broken stone, sand & soil)			280
6	Soil working implements			650
	Total			**7744**
	II. OPERATIONAL COST (For one cycle of 50-60 days)			
1	Cow dung or animal excreta	2000 Kg	0.25	500
2	Collection and transportation of agro and other waste materials	2000 Kg		200
3	labour Cost for digging soil	2	65/-	130
4	Labour for tank filling, spreading & turning and water sprinkling	5 md	65/-	325
5	Cost of earthworms	1.5 kg		160
6	Packing , harvesting, drying etc.			300
7	Miscellaneous like drying of earthworms etc.	53 Kg		100
	Total operational cost			1715
	Total Unit Cost = (Rs. 7744.00 + Rs. 1715.00)			**9459**
			Say	**9500**

ECONOMICS

1**. INCOME (from one cycle)**

i) Estimated production of vermicompost 1800 kg from one unit.

ii) Sale realisation @ Rs. 3.50 /- per kg Rs. 6300.

iii) Sale of worms 100 RS/Kg. (1 Kg/Cycle)

2. **OPERATING PROFIT**

Particulars	1 st year	2nd Year	3rd Year onwards
a) No of Cycles	3 cycles	4 cycles	5 cycles
b) Total income	19200	25600	32000
c) Working Capital	5145	6860	8575
d) Operating Profit	14055	18740	23425

3. **FINANCIAL ANALYSIS**

Particulars	1 Year	2nd Year	3rd year onwards
	3 cycles/year	**4 cycles/year**	**5 cycles/year**
Capital cost	9500	-	-
Recurring cost	5253	6860	8575
Total Cost	14753	6860	8575
Benefit	19200	25600	32000
Net benefit	4447	18740	23425

Revenue Model

Sr. No.	Heads	Unit(One cycle)	Amount / Quantity
1	Total Variable Cost (TVC)	1	1715
2	Total Production (Q)	1	1800
3	Average Variable Cost : AVC= (TVC/Q)		0.95
4	Average Revenue (AR=Price)		3.5
5	Total Revenue: Total Market Value of the produce (P*Q)		6300
6	Unit Margin (P-AVC)		2.54
7	Net profit per cycle (TR-TVC)		4585
	Breakeven point(7744/2.54)		3040
	BCR= (4585/1715)		2.67

Linkages and Institutional Support

Backwards Linkages	Forward Linkages	Institutional support

• **Farm Yard Manure** • **Crop residue** • **Financial support under IWMP**	• Nursery • Horticulture crop growers	• KVK • DWDU • Agricultural Universities.

3.14. Methods and Practices of Apiculture Development

Principles of Apiculture: Apiculture is an agro-industry, which uses bees as micromanipulators to harvest nectar and pollen from plant sources to produce honey and to store it in beehives. The hives housing the bees occupy minimal spacing and no effort in construction, which gives an incentive to beekeepers in their occupation. Apiculture today is the scientific management of a natural phenomenon covering a spectrum of areas of research and technology development to economic advantages. Though most plants in an ecosystem produce nectar and pollen, all of them are not beneficial resources to bees. From the vegetation, they identify plants for nectar and pollen and collect them for the sustenance of their colonial life. These resource preferences are distinct in natural and domesticated habitats. Honey production and its quality and quantity are fundamentally related to bee species specificity and the vegetation pattern around bee colonies. It is therefore imperative that knowledge of the bee ecosystem and its ramifications is an essential pre-requisite in apiary management and product development. The pollen contained in honey and honeybee pollen loads are the only taxonomically identifiable unit for mapping bee forage

Geographic Information System (GIs) from which the floral resources in honey production can not only be authenticated but will provide new directions in establishing apiary gardens with species producing nectar and pollen in succession throughout the year. Moreover, the well-demarcated eco-regimes such as forested high lands present an opportunity to generate the much-needed information on bee vegetation regimes.

Honeybees provide honey and other hive products like royal jelly, bee venom, bee pollen and propolis, which are of great economic value. Yet, beekeepers in lndia in general depend on beekeeping only for producing honey. To increase the profits from the apiary units, the beekeepers are required to exploit bees for the productions of these hive products. Honeybees can play a significant role in this direction. They act as cost free bio-inputs in farming and forest systems and increase cross pollination in cultivated as well as wild plant species. They maintain gene flow in ecosystems by cross-pollination. This leads to increased hybrid vigour, fruit and seed set and hence higher productivity, at the same time conservation of wild flora and sustenance of wild life. Honeybees are the only members of the pollinating insects that offer opportunities for management and manipulation by man. The need for exploiting this avenue is realistic. The native bee ***Apis*** cerana having coevolved with the local flora and fauna is better adapted to explore forage resources and to combat native pests and predators.

Bee keeping is an agro based enterprise, which farmers can take up for additional income generation. Honey bees convert nectar of flowers into honey and store them in the combs of the hive. Collection of honey from the forests has been in existence for a long time. The growing market potential for honey and its products has resulted in bee keeping emerging as a viable enterprise. Honey and wax are the two economically important products of bee keeping.

Advantages of beekeeping as an income generation activity

- Bee keeping requires less time, money and infrastructure investments
- Honey and beeswax can be produced from an area of little agricultural value
- The Honey bee does not compete for resources with any other agricultural enterprise.
- Beekeeping has positive ecological consequences. Bees play an important role in the pollination of many flowering plants, thus increasing the yield of certain crops such as sunflower and various fruits.
- Honey is a delicious and highly nutritious food. By the traditional method of honey hunting many wild colonies of bees are destroyed. This can be prevented by raising bees in boxes and producing honey at home.
- Beekeeping can be initiated by individuals or groups
- The market potential for honey and wax is high

Production process

Honey bees can be raised in boxes at the farm or home.

Fig: Equipment requirements for bee keeping

- **Hive:** It is a simple long box covered with a number of slats on top. The rough measurements of the box should be around 100 cm of length, 45 cm of width and 25 cm in height. The box should be 2 cm thick and the hive must be glued and screwed together with entrance holes of 1 cm wide. The slats (top bars) must be as long as the hive is wide in order to fit across and the thickness of about 1.5 cm is sufficient to support a heavy honey comb. The width of 3.3 cm needs to be given to give the bees the natural spacing they need to easily build one comb to each separate top bar.
- **Smoker:** It is the second important piece of equipment. This can be made from a small tin .We use the smoker to protect ourselves from bee stings and to control the bees.
- **Cloth:** to protect our eyes and nose from stings at the time of work near the apiary.
- **Knife:** It is used to loosen the top bars and to cut of the honey bars.
- **Feather:** To sweep the bees from the comb.

2. Species of honey bees

There are four species of honeybees in India. They are:

- **Rock bee** (*Apis dorsata*): They are good honey gathers with an average yield of 50-80 kg per colony.
- **Little bee** (*Apis florea*): They are poor honey yielders and yield about 200-900 g of honey per colony.

- **Indian bee** (*Apis cerana indica*): They yield an average honey yield of 6-8 kg per colony per year.
- **European bee** [Italian bee] (*Apis mellifera*): The average production per colony is 25-40 kg.

Stingless bee (*Trigona iridipennis*): In addition to the above, another species is also present in Kerala known as stingless bees. They are not truly stingless, but sting is poorly developed. They are efficient pollinators. They yield 300-400 g of honey per year.

3. Establishment of hives

- The apiary must be located in well-drained open area, preferably near orchards, with profuse source of nectar, pollen and water.
- Protection from sunlight is important in order to maintain an optimum temperature in the hive.
- Ant wells are fixed around the hive stand. The colonies must be directed towards east, with slight changes in the directions of the bee box as a protection from rain and sun.
- Keep the colonies away from the reach of cattle, other animal, busy roads and streetlights.

4. Establishing a bee colony

- To establish a bee colony, bees can be obtained by transferring a wild nesting colony to a hive or attract a passing swarm of bees to occupy it.
- Before putting a swarm or even a colony in a prepared hive, it would be beneficial to make the hive smell familiar by rubbing old brown comb pieces or some bee wax. If possible, the Queen bee can be captured from a natural swarm and placed under a hive to attract the other bees.
- Feed the hived swarm for a few weeks by diluting a half cup of white sugar in half a cup of hot water as this will also help in building the comb along with the bars rapidly.

- Avoid over crowding

5. Management of colonies

- Inspect the beehives at least once in a week during the honey-flow seasons preferably during the morning hours.
- Clean the hive in the following sequence, the roof, super/supers, brood chambers and floorboard.
- Observe the colonies regularly for the presence of healthy queen, brood development, storage of honey and pollen, presence of queen cells, bee strength and growth of drones.
- Look for the infestation by any of the following bee enemies.
- Wax moth (*Galleria mellonella*): Remove all the larvae and silken webbings from the combs, corners and crevices of bee box.
- Wax beetles (*Platybolium sp*.): Collect and destroy the adult beetles.
- Mites: Clean the frame and floorboard with cotton swabs moistened with freshly made potassium permanganate solution. Repeat until no mites are seen on the floorboard.
- Management during lean season
- Remove the supers and arrange the available healthy broods compactly in the brood chamber.
- Provide division board, if necessary.
- Destroy queen cells and drone cells, if noted.
- Provide sugar syrup (1:1) @ 200 g sugar per colony per week for Indian bees.
- Feed all the colonies in the apiary at the same time to avoid robbing.
- Management during honey flow season
- Keep the colony in sufficient strength before honey-flow season.
- Provide maximum space between the first super and the brood chamber and not above the first super.
- Place queen excluder sheets in between brood and super chamber to confine the queen to brood chamber.
- Examine the colony once in a week and frames full of honey should be removed to the sides of the super. The frames, which are three-fourth filled with honey or pollen and one-fourth with sealed brood should be taken out of brood chamber and in its place empty combs or frames with foundation is added.
- The combs, which are completely sealed, or two-third capped may be taken out for extraction of honey and returned to supers after honey extraction.

6. Harvesting of honey

- Harvest the honey by smoking the bees off the parts which needs to be harvested and cut the combs carefully.
- Harvests are normally possible during and shortly after the two main flowering seasons, namely October/November and February-June .
- A ripe comb is light in colour and filled with honey. More than half of the honey cells on both the sides are sealed with wax.

BEE MANAGEMENT AND PRODUCTIVITY

In India beekeeping is practiced in mountains, foot hills, forest, agricultural lands, mangrove forests etc. The technique involved in beekeeping varies from region to

region. The main harvest is from Apis dorsta, Apis cerana and Apis mellifera. Beekeeping with Apis cerana has been a growing industry in Central and Southern India. The Thai Sac brood disease wiped off cerana beekeeping in India. CBRTI has taken several steps to recover from the devastating disease. The critical surveys of natural bee populations and stock multiplication from disease resistance colonies, supply of disease resistance breed facilitated to revitalize cerana beekeeping especially in Suthern India.

Today, beekeeping is an important, sustainable, integral agricultural activity under the rural development programme in India, since it provides nutritional, economic, and ecological security and balance. The knowledge of agro climatic conditions, the diversified flora, changing agri/horticultural pattern of the crop, the types of bees, the management practices etc. play a pivotal role in transforming the beekeeping industry in the country. Beekeeping have to be encouraged for the economic upliftment of the tribal populations in the remote forest and hill areas. It helps in conservation of the resources, and also improves the health, nutritional and economic status of the people in these areas. Considering all these facts, appropriate and eco friendly management practices are developed and disseminated through extensive training programmes.

Honey collection and Bamboo clip

It is simple, cheap and locally available: a bamboo rod split into half having 2 to 2.5 meters length with arrow shaped edges is used as the clip to support the comb. The bamboo clip is placed just below the honey portion of the comb. Both the ends of the clip are tied to the branch of the tree. The honey portion is removed by cutting using a sharp knife. The cut honeycombs are lowered down from the trees or cliffs in the containers using a rope. The bees rebuild the cut portion and again store honey. Thus repeated extraction can be obtained from the same colony. The honey storage combs are given lateral cuts on either side of the midrib. These are then placed on a wire mesh kept in a container or tray. The honey drains out easily from the combs without any contamination of pollen, wax or any other material. The honey can be stored in food grade material.

Source: BEE MANAGEMENT AND PRODUCTIVITY OF INDIAN HONEYBEES, Daisy THOMAS*, N. PAL**, K. SUBBA RAO, Central Bee Reasearch and Training Institute, Khadi and Village Industries Commission, 1153, Ganeshkhind Road, Pune 411016, INDIA;

Honey As a Non- Wood Forest Product (NWFP)

In the global efforts to conserve forest bio-diversity, non-wood forest products (NWFPs) offer abundant opportunities, as the extractive reserves of such products provide ecologically sustainable economic security. Honey is a natural non - wood resource, with a multidirectional value to both the honeybee and man. It is a product of plant - insect interaction and unlike other non-wood forest products; its production and extraction do not adversely alter the species composition, population structure and regeneration of forest ecosystems. It has been noted that the honey gatherers are accustomed to various NWFPs to supplement their meager earnings from agriculture and other occupations and honey forms a major seasonal item of collection. Unlike other NWFPs, honey extraction has the least adverse effect on forest ecosystems. Moreover, the tribal people follow traditional management practices for maintaining sustainable extraction and such a native knowledge system lays the foundation for appropriate technology development in refining and improving the management practices. Hence, strategies for production, extraction and sustainable management of honey are to be modernized and imparted among the forest dependent people.

Chapter- 4
Forestry based activities

Introduction:

The main purpose of this component is to assist livelihood conditions of communities living in the under privileged areas near the forest and dependent on forest. This chapter also goes to explain the current forest based livelihood system and it gives a brief overview of how the current situations can be improved by minor changes in the existing pattern.

4.1 Overview

The geographical area of the Gujarat state is 196024 sq. km. There are 4 National parks, 23 sanctuaries, 1 conservation reserve. Total 18,962 sq km area of the state is covered with the forest (Source: Survey of Forest Department, Govt of Gujarat in 2004-05). The climate of the state is tropical; however, the same is considerably moderated due to the long coast line. The temperature ranges between 1 °C to 46°C. The rainfall received in the state varies from region to region, and on the basis of rainfall received, the state has been divided into 8 Agro-climatic zones, as shown below:

Table 4.1 Agro Climatic Zones of Gujarat

Zone	Name of Zone	Reported area in "00" ha.	% to total area
A.	Heavy rainfall zone of South (Average annual rainfall 1500mm) A-I : Sub-Zone hilly areas A-II : Sub-Zone plain areas	 6,300.7 2,748.9	 3.43 1.50
	SUB TOTAL :	6,049.6	4.93
B.	Moderate to heavy rainfall zone of South Gujarat (Average annual rainfall 1000-1500 mm)	10,290.8	5.61
C.	Moderate rainfall zone of Central Gujarat (Average annual rainfall 800-1000 mm)	22,312.1	12.15
D.	Dry zone of North Gujarat (Average annual rainfall 625-875 mm)	22,986.9	12.53
E.	Arid Zone of North-west Gujarat (Average annual rainfall 250-500mm)	57,462.8	31.32
F.	Arid cum dry zone of North Saurashtra (Average annual rainfall 400-700 mm)	34,966.9	19.06
G.	South Saurashtra zone (Average annual rainfall 750-1000 mm)	16,747.4	9.14
H.	Bhal and coastal areas zone (Average annual rainfall 625-1000 mm)	9,679.0	5.27
	Total	**1,83,495.5**	**100.00**

However, the forest area creates the importance while considering & proposing the livelihood activities in the districts covered under forest. Net Forest Cover increased by 3245 sq km continuously from 1991 to 2001.

Chart 4.1 The graphical representation of the Forest cover, 2001

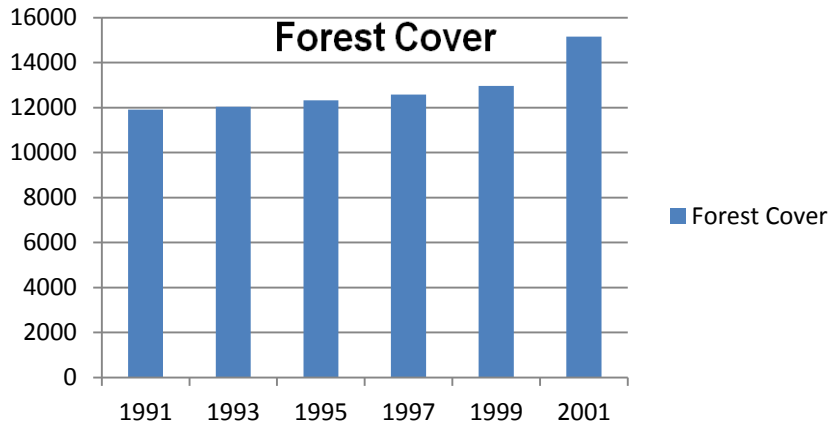
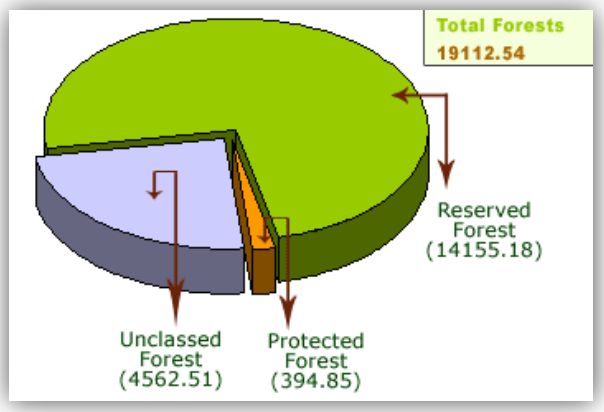


Chart 4.2 Forest Areas by Legal Status, 2003



Type	Area
Reserved Forest	14155.18
Protected Forest	394.85
Unclassed Forest	4562.51
Total	***19112.54 (of Country's Forest Area: 2.47%)***

Source: Gujarat Forest Statistics - 2003

Table 4.2: Types of forest, 2003

a) Tree Cover

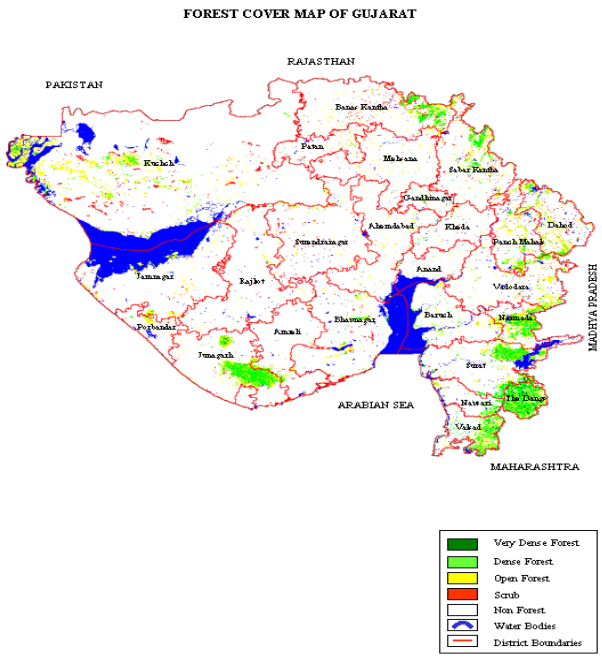
Culturable Non-Forest Area (CNFA):	151,926 km2
No. of trees per ha of CNFA:	14.1
Tree Cover:	10,586 km2
Of State's Geographic Area:	5.40%
Of CNFA:	6.97%

b) Total Forest & Tree Cover

Total Forest & Tree Cover	25,532 sq km
Of State's Geographic Area:	13.03%
Of Country's Forest & Tree Cover	3.28%
Per capita Forest & Tree Cover	0.05 ha

Source: http://www.fsi.nic.in/sfr2003/gujarat

The forest growth varies from scrubs and thorn forest of north and north-western part of Gujarat to luxuriant and valuable forest in south Gujarat. The occurrence of bamboo as an under-storey is a natural component of many of the forests.



There are 22 reported species of bamboos reported from the State; the dominant species are Bambusa arundinacea (Katas or Thorny bamboo) and Dendrocalamus strictus (Manvel or Solid bamboo). Dendrocalamus strictus is economically the most important. It is found in the dry deciduous forests over a large part of the State. Bambusa arundinacea is found in mixed moist deciduous forests as well as in the moist dry deciduous forest of the State.

Table 4.3 Distribution of bamboo bearing area in Gujarat (in sq km)

Sl no	Forest Division	District	Forest area	Bamboo bearing area
1	Valsad(S)	Valsad	557	365
2	Valsad(N)	Valsad & Navsari	628	426
3	Dang (S)	Dang	475	451
4	Dang(N)	Dang	563	563
5	Vyara	Surat	937	933
6	Rajpipla(W)	Surat/ Bharuch	709	543
7	Rajpipla(E)	Narmada	1,163	896
8	Chhotaudepur	Vadodara	723	162
9	Godhra	Panchmahals	1,106	417
10	Baria	Dahod	884	602
11	Sabarkantha(S)	Sabarkantha	587	214
12	Banaskantha	Banaskantha	1,107	165
13	Junagadh	Junagadh	382	91
14	Porbandar	Porbandar	192	39
Total			**10013**	**5,867**

Bamboo bearing forests exist all along the southern, eastern and northern borders of the State and in the hilly portions of Junagadh & Porbandar districts of Saurashtra. Of the 26 districts in Gujarat, bamboo forests are located in 13 districts. However, the major concentration of bamboos is in the southern districts of Valsad, Dangs, Surat and

Narmada. Within these districts is 4,177 sq km of bamboo forests, about two-thirds of the bamboo bearing areas of Gujarat.

Forest Type

On the basis of forest classification by Champion and Seth 1968, following four forest types, out of 16 major types found in the country are found in Gujarat. Out of 207 subtypes of forests, recorded by Champion and Seth, 31 subtypes, (14.7%) have been identified in the state.

Forest Type	Peculiarity	Districts
Type 3B Tropical moist Deciduous Forest	Annual rainfall of over 1200 mm, main source of commercial timber Teak, Haldu, Sisam, Khair, Katas, Manvel, etc	Surat, Valsad, Dangs
Type 5A Tropical Dry Deciduous Forest	Rainfall between 600 mm to 1200 mm	Bharuch, Vadodra, Panchmahals, Sabarkantha, Amreli
Type 6B Northern Tropical Thorn Forest	Rainfall less than 600 mm, species like Acacia and thorn bushes etc	Banaskantha, Rajkot, Bhavnagar
Type 4B Littoral and Swamp Forest	Mangrove forest, main species is Avicenia sp.	Kutch, Jamnagar and Junagadh

4.2 Non-timber forest products

Non-timber forest products (NTFP) are considered as any commodity obtained from the forest that does not necessitate harvesting trees. (NTFPs) are a collection of biological resources derived from both natural and managed forests and any land under similar use.

Examples: Variety of fruits, nuts, seeds, oils, spices, resins, gums, medicinal plants and many more products specific to the particular areas from which they originate. NTFPs are culturally important, cheap and often accessible to local people. Gathering NTFPs can be both opportunistic and casual, or alternatively planned expeditions. The decision to collect NTFPs is influenced by the urgency for money, the amount expected to be earned, the time that can be spared from other activities, the likelihood of obtaining significant volumes of product and the hardship entailed

There has been an increased attention on MFPs/NTFPs in the forestry, as a resource of livelihood to the forest & village dwellers including tribal's & as a potential source of employment & income generation through trade & industrial enterprises based on NTFPs have assumed great significance for socio-economic development & bio-diversity conservation

Classification of NTFPS/ MFPS

(a) Non – Timber Forest Produce of Plant Origin

1. Edible plant products
2. Bamboos
3. Spices and condiments
4. Canes
5. Medicinal plants
6. Fodder and forage
7. Aromatic plants
8. Fuel wood, charcoal and briquette make
9. Fatty oil yielding plants
10. Bidi wrapper leaves and bidis
11. Gum and resin exuding plants
12. Other leaves for platters, plates, and bowls
13. Tan yielding plants
14. Beads for ornaments and decoration
15. Dye and colour yielding plants
16. Saponin yielding plants and marking nut
17. Fibre and floss yielding plants

(b) Non – Timber Forest Produce of Animal Origin

1. Honey & bees wax xxii. Insects & animals
2. Lac & shellac, hides, skins & feathers
3. Tusser and other silks
4. Horns, bones, shells, ivory & musk

Objectives

c) To help the members of the Forest Produce Collectors to get proper prices of the collected NTFPs with major focus on Capacity Building for Self Sustainable institution.

d) To introduce economies of scale through pooling of the produce (Collective Action).

e) To enable Value addition of the pooled produce in such a way so as to fetch the best possible price for the NTFP.

4.2.1 Problem in NTFP Collection

1. Low payment to tribal and Exploitation by Middle Man
2. Irregular market forces & Seasonality Variation in Production
3. Loss of quantity and quality over a period of time
4. Difficulties or less scope in value addition
5. Less Bargaining Power
6. Lack of proper marketing Channel

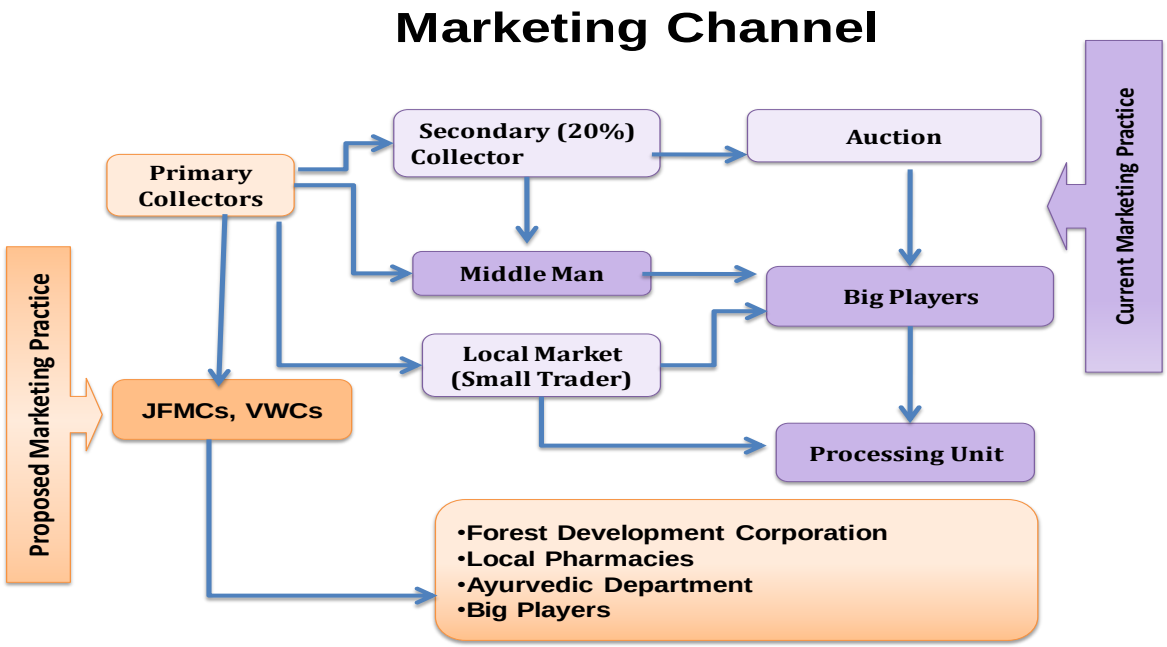
4.2.2 Probable Solution

1. Getting the benefit of economies of scale due to increased volume of goods/ produces being pooled as a part of collective business.
2. Enhancement of bargaining power and develops understanding of the market and the surrounding.
3. Preparing a Business Model with Proper Market Channel.
4. Facilitating Forward and Back ward Linkage
5. Value Addition in the Product for Better Price Discovery

4.2.3 Strategy for NTFP Business in the Watershed Cluster (Project Level)

i. Identification of asset-less people who are depend on forest based resources for livelihood they are termed as primary collectors exploring new territory and strengthening broad territories.
ii. Formation of user groups based upon the NTFP collected.
iii. Capacity building to the particular group in good collection practices, season specific collection for different types of produce.
iv. Provision of revolving funds to the groups (primary collectors) for sustenance in lean season, to release primary collectors from clutches of private buyers.
v. Arranging working capital from revolving fund established at its level at very low interest rates.
vi. Market Facilitation- Linking with the Forest corporation for assured selling and minimum support price in case of price fluctuations

The commercialization of Non Timber Forest Products (NTFPs) is not consistently successful in alleviating poverty by providing benefits to producers, processors and raders. In order to determine the characteristics associated with success in terms of NTFP commercialization a detail strategy must be formulated to suit the specific needs.



NTFP Collection at JFM/WC for Collective marketing

Individual Member Wise									
Name of the members			Name of the JFM /Watershed Committee				Slip no:		
							Advance:		
Sl no	Date	Name of the Commodity	Quantity(kg)		Rate per kg		Total Rate	Amount Paid	Sign
			Grade-1	Grade-2	Grade-1	Grade-2			
Special Comments:									
Signature of Head of the Family			Signature of Representative				Signature of In charge of CC		

4.3 Value Chain of few products

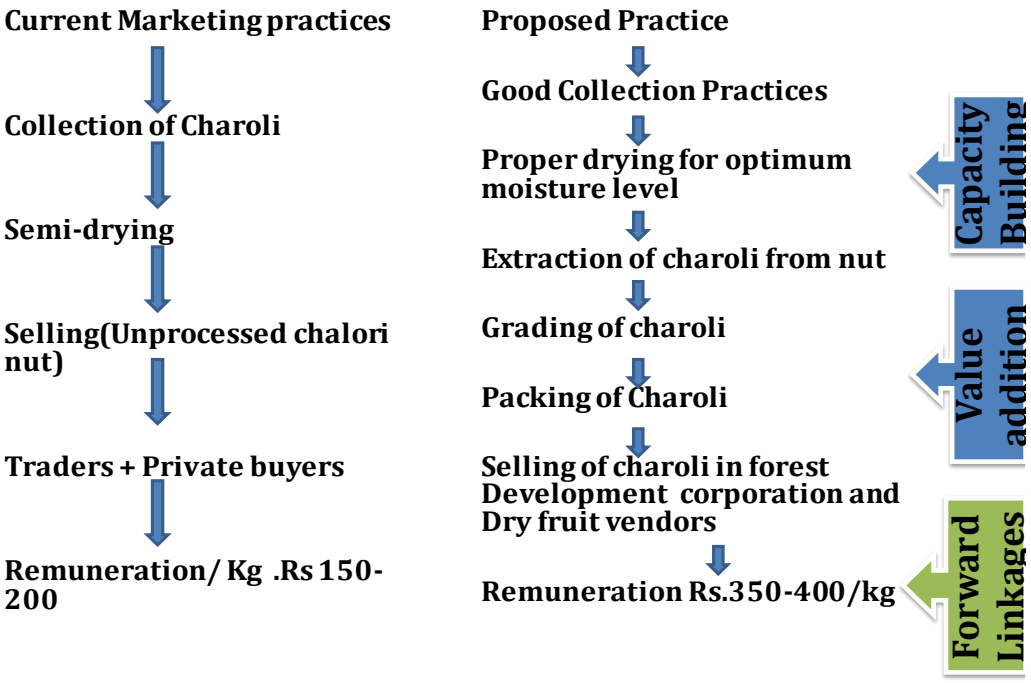
4.3.1 Charoli Value chain

Charoli also called chironji, are seeds of Buchanania lanzan used as a cooking spice primarily in India. Charoli are tiny almond-flavoured dried seeds of a bush called Buchanania lanzan, which is cultivated across India, primarily in the northwest. After the hard shell is cracked, the stubby seed within is as soft as a pine nut. They are commonly used in sweets in India. However, they are also ground into powders for thickening savory sauces and flavoring batters, and stewed into rich, meaty kormas. Charoli seeds are used in the Ayurveda and Unani system of medicine.

Example:

Particulars	
No. of tress in cluster (IWMP-1 Vadodara)	13500
Production/plant during season (Before drying)	6-7 kgs
Production/plant during season (After drying)	3-4 kgs
Season of Collection	April-June
Category of people	Asset less and marginal Farmers

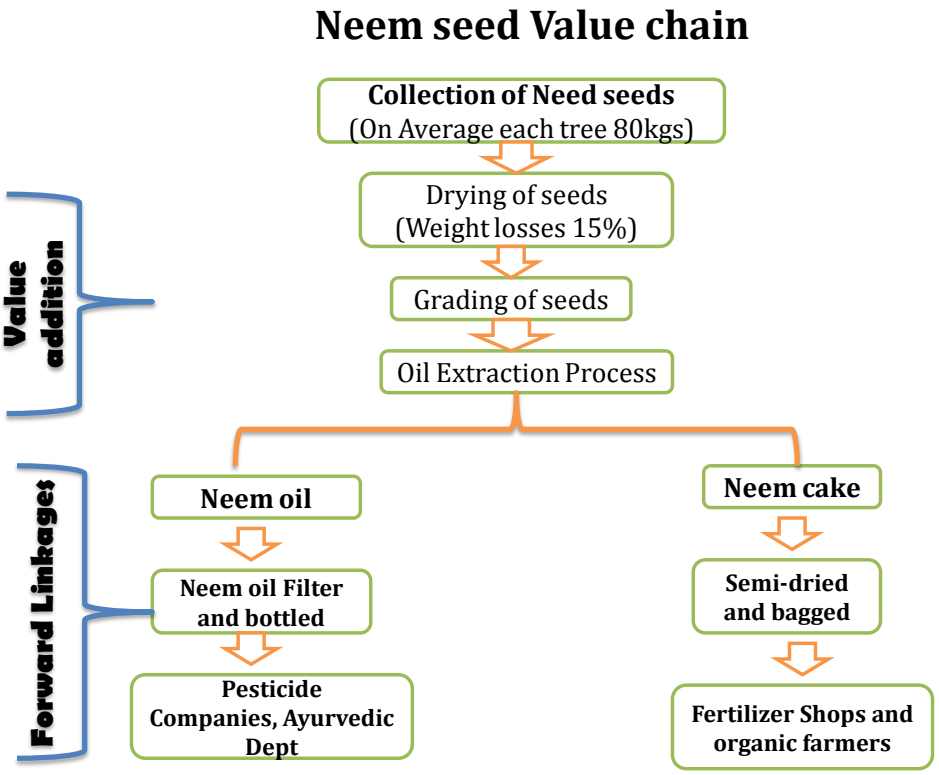
Value chain of Charoli



As shown in the above flow chart, the current marketing channel remuneration is too low as compared to the value chain created.

4.3.2 Neem seed oil/Extraction

With a large numbers millions of Neem trees already available for economic exploitation in rural, and many people in rural areas, particularly women, already trained and working in the collection and processing of Neem seeds, support to develop the Neem sub-sector could have an impact on the income generation in the rural economy. Additionally, there is a strong market for Neem and Neem based products, both on a local and a global scale, therefore indicating a potential to become competitive in this sub-sector. Despite many economic initiatives with the purpose of giving value to the Products of the Neem tree established over the years, the economic exploitation of Neem for commercial use remains a highly unstructured value chain in rural areas This is due to the fact that despite their involvement at different points in time, many actors have been involved for short periods, or only intermittently. The Neem tree is found in at least 78 countries, and is used in a further nine. The world biomass of the Neem tree is estimated at up to 91 million plants.



Marketing Linkage - Yash Exports, Mahesana

Neem Oil Production

Technical Details				
Sr No.	**Details**	**No.**	**Rate**	**Price Rs.**
	Fixed Cost			
1	Oil Extracting Machine	1	90,000	90000

2	Diesel Machine	1	25000	20000
3	Drums, Filter	6	500	3000
5	Store Room Rent(12Month)	12 Month	1000	12000
7	Open Plot Rent (12Month)1Thaogan Sqm	12 Month	0	25000
8	Water Storage Tank(2000 Litres)	1	10000	10000
	Total			**160000**
	Variable cost			
1	Raw material			50,000
2	Grading Expenditure For Neem Seeds	1	20000	20000
6	Miscellaneous(Diesel and Labour)	1	20000	20000
10	Administrative costs			50000
	Total			**1,40,000**

Total Expenditure		
Sr No.	**Details**	**Price Rs.**
1	Raw material	50,000
2	Grading Expenditure For Neem Seeds	20000
3	Miscellaneous(Diesel and Labour)	20000
4	Administrative costs	50000
5	Store Room Rent(12Month)	12000
6	Open Plot Rent (12Month)1Thaogan Sqm	25000
	Total	**1,77,000**

Net Benefit				
Sr No.	**Details**	**No.**	**Rate**	**Price Rs.**
1	Clean Neem Seeds Groth	50000 kg	3	150000
2	Neem Seeds Oil	25000 kg	100	250000
3	Neem Seeds Cake	20000kg	10	200000
	Total			**600000**
	Expenditure			**177000**
	Net Benefit			**4,23,000**

4.3.3 Agro forestry

Agro forestry is the system of land use that combines growing and raising of crops and/or livestock along with plants that belong to the forest. The land can be used to raise agricultural crops and trees and to rear animals. Some examples are shifting cultivation, growing of tea and coffee under the shade of trees, inter-cropping under

coconut trees, and home gardens. In fact, most farmers in India grow agricultural crops, rear animals and plant certain trees on their land, often on the boundary area.

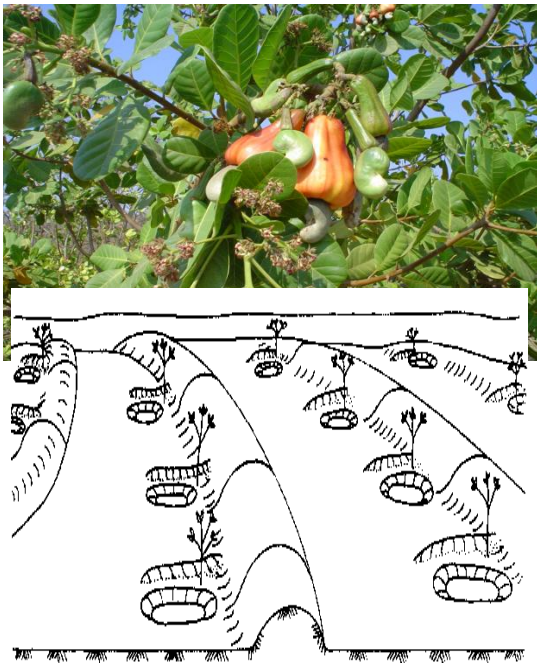
Agro forestry reduces the farmers' dependency on forests even as it provides them economic benefits. It results in more diverse, healthy, and sustainable land-use systems. It focuses on meeting the economic, environmental, and domestic needs of people on their private lands. For hundreds of years, farmers have nurtured trees in their fields, pasturelands and around their homes. Agro forestry is using trees on farms. Trees can provide many products such as fruits, timber, fodder, fuel wood, medicines, and oils. It also helps to conserve soil, enhance soil fertility, and provide shelter belts for crops and fruit trees.

Benefits of agro forestry

1. Research over the past 20 years has confirmed that agro forestry can be more biologically productive, more profitable, and be more sustainable than forestry or agricultural monocultures. Temperate agro forestry systems are already widespread in many parts of the India and are central to production in some regions.
2. They can control runoff and soil erosion, thereby reducing losses of water, soil material, organic matter and nutrients.
3. They can maintain soil organic matter and biological activity at levels satisfactory for soil fertility. This depends on an adequate proportion of trees in the system - normally at least 20% crown cover of trees to maintain organic matter over systems as a whole.
4. They can maintain more favourable soil physical properties than agriculture, through organic matter maintenance and the effects of tree roots.
5. They can lead to more closed nutrient cycling than agriculture and hence to more efficient use of nutrients.
6. This is true to an impressive degree for forest garden/farming systems. They can check the development of soil toxicities, or reduce existing toxicities - both soil acidification and salinization can be checked, and trees can be employed in the reclamation of polluted soils.
7. They utilise solar energy more efficiently than monoculture systems - different height plants, leaf shapes and alignments all contribute.
8. They can lead to reduced insect pests and associated diseases.
9. They can be employed to reclaim eroded and degraded land.
10. They can create a healthy environment - interactions from agro forestry practices can enhance the soil, water, air, animal and human resources of the farm.
11. Agro forestry practices may use only 5% of the farming land area yet account for over 50% of the biodiversity, improving wildlife habitat and harbouring birds and beneficial insects which feed on crop pests.
12. Tree biodiversity adds variety to the landscape and improves aesthetics.
13. They can moderate microclimates. Shelter given by trees improves yields of nearby crops and livestock. Shade in summer can be beneficial for livestock, reducing stress.

14. Agro forestry can augment soil water availability to land-use systems. In dry regions, though, competition between trees and crops is a major problem. Nitrogen-fixing trees & shrubs can substantially increase nitrogen inputs to agro forestry systems.
15. Trees can probably increase nutrient inputs to agro forestry systems by retrieval from lower soil horizons and weathering rock. ('Mining' minerals and trace elements)
16. The decomposition of tree litter and pruning can substantially contribute to maintenance of soil fertility. The addition of high-quality tree pruning (i.e. high in Nitrogen but which decay rapidly) leads to large increases in crop yields. The release of nutrients from the decomposition of tree residues can be synchronised with the requirements for nutrient uptake of associated crops.
17. In the maintenance of soil fertility under agro forestry, the role of roots is at least as important as that of above-ground biomass.
18. Agro forestry can provide a more diverse farm economy and stimulate the whole rural economy, leading to more stable farms and communities. Economic risks are reduced when systems produce multiple products.

Wadi Project under Agro-forestry



2]

Wadi Project Model (As per division of work)

(Project Expenditure Details for 1 acre)

Sl No	Name of Work	No. of Plants	Project Expenditure	Beneficiaries contribution	Total Expenditure
1	Digging pits in 3x3x3 fit size in 1 acre	No. of 40 plants	400	400	800
2	Purchase Mango saplings	No. of 40 plants	2100	0	2100
3	Transportation of Mango saplings	No. of 40 plants	1200	0	1200
4	Pits digging surrounding of Wadi for plantation of RATANJYOT no. of 700	No. of 700 plants	300	300	600
5	Preparation of RATANJYOT Plants	No. of 700 plants	900	0	900
6	Pits digging surrounding of Wadi for plantation of CASHEW, SITAFAL & SARGVA	No. of 100 plants	700	200	900
7	Fencing of forest plants surrounding Wadi project		300	500	800
8	Labour of filling fertilizer & medicine		600	700	1300
9	Care of plants after plantation		400	300	700
10	Facilities provide by irrigation & protection of plants during four year		4225	1575	5800
11	Exposure visit for beneficiaries		800	0	800
12	SMC works		1339	0	1339
13	Drip irrigation system		2000	500	2500
	Total of Project per acre		**15264**	**4475**	**19739**
	Project cost per Ha		**3771.734**	**1105.773**	**48775**

Wadi Project Model (Year wise)

Sl No	Name of Work	No. of Plants	First Year	Second Year	Third Year	Forth year	Total Expenditure
1	Digging pits in 3x3x3 fit size in 1 acre	No. of 40 plants	600	100	100	0	800
2	Purchase Mango saplings	No. of 40 plants	1500	300	300	0	2100
3	Transportation of Mango saplings	No. of 40 plants	800	200	200	0	1200
4	Pits digging surrounding of Wadi for plantation of RATANJYOT no. of 700	No. of 700 plants	400	100	100	0	600
5	Preparation of RATANJYOT Plants	No. of 700 plants	700	100	100	0	900
6	Pits digging surrounding of Wadi for plantation of CASHEW, SITAFAL & SARGVA	No. of 100 plants	700	100	100	0	900
7	Fencing of forest plants		500	100	100	100	800

	Surrounding Wadi project						
8	Labour of filling fertilizer & medicine		800	200	200	100	1300
9	Care of plants after plantation		400	150	150	0	700
10	Facilities provide by irrigation & protection of plants during four year		1500	1750	1750	800	5800
11	Exposure visit for beneficiaries		800	0	0	0	800
12	SMC works		500	300	300	239	1339
13	Drip irrigation system		2500	0	0	0	2500
	Total of Project per acre		**11700**	**3400**	**3400**	**1239**	**19739**
	Project cost per Ha		**28911**	**8401.4**	**8401**	**3062**	**48775**

Revenue Model of Wadi of 1acre land

Sl no	Particulars	Estimated Production at Economical stage (i.e. after 5yrs) kg/plant	No of plants	kg	rate/kg	Income generation (Rs.)
1	Raw cashew	6	100	600	40	24000
2	Mango	15	40	600	65	39000
3	Drumstick	12	700	8400	7	58800
	Total	**33**	**840**		**112**	**121800**
		OR				
1	Raw cashew	6	100	600	40	24000
2	Raw Mango	13	40	520	50	26000
3	Drumstick	12	700	8400	7	58800
	Total	**31**	**840**		**97**	**108800**

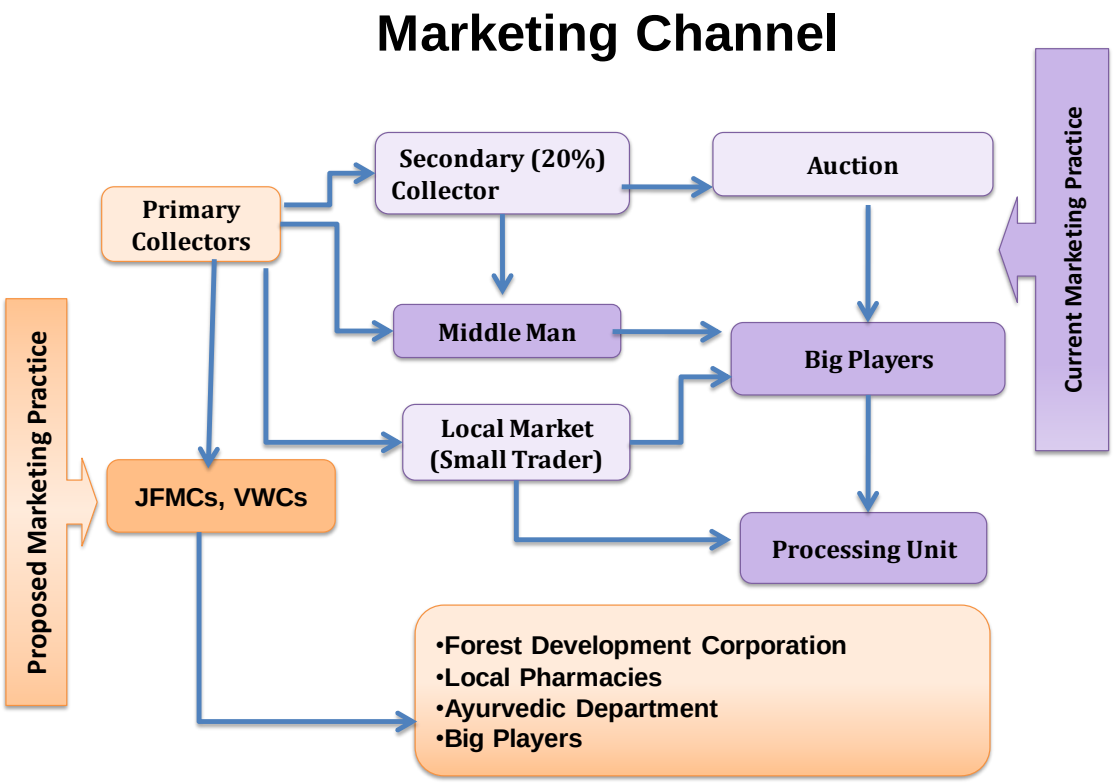
Total Expenditure chart

Sl no	Activity	Particulars	Expenditure (Rs.)	remarks
1	Total initial Investment up to four yrs		20000	
2	Harvesting expenditure*	five days	1250	* 250 per day
3	Post harvest treatment for mangoes	Rs. 50/kg	30000	
4	Post harvest treatment for cashew	Rs. 60/kg	36000	
5	Packaging cost	10kg, 5kg (Rs. 12/10kg packet)	720	
6	Transportation cost	Rs. 10/km	1400	approximately 140 km to & fro
7	Misc expenditure		5000	
	Total		**94370**	
	Net Profit earn from per acre wadi		**27430**	**(Cashew, Mango, Drumstick)**
			14430	**(Cashew, Raw mango, Drumstick)**

4.3.4 Mahuda oil extraction

Historically mahua has been the single largest indigenous source of natural hard fat in **soap manufacture** both by the small scale and organized sector. However the quantities of fat available do not commensurate the requirement White mahua fat is satisfactory for production of washing soaps, its utility as virgin fat in toilet soap

Seed Oil is used as ointment, in rheumatism and to prevent crack in the skin in winter. It is used for edible purposes **culinary, hair oil, illumination, lighting, keeps body glossy and warm.** The **fuel properties** of the Seed Oil biodiesel were found to be within the limits of biodiesel specifications of many countries. Fuel properties of diesel, mahua oil and blends are comparable. The calorific value of mahua oil was found as 96.30% on volume basis of diesel. It was found that mahua could be easily substituted up to 20% in diesel without any significant difference in power output, brake specific fuel consumption and brake thermal efficiency. The performance of engine with mahua oil blends improved with the increase in compression ratio from 16:1 to 20:1. Based on this study, it has been observed that esters of mahua oil could be used as a **substitute for diesel**.



The present of toxic and bitter saponins in mahua cake/meal preludes its utilization in poultry/animal feeds. Mahua cake can be used as **cheap organic manure**. It contains N=3.5%, Pro 50.51% and it can be used as cattle feed when treed from bitters and saponins, since it contains 20% crude protein. To be used as feed it must be supplemented with essential amino acids e.g. Arginine and trytophan. The saponin in the cake is a **powerful fish poison** and the cake can be used to control predatory fish present in the pounds and lakhs. The cake is a cheap and effective wormicide to maintain the turf, lawn and golf ground, free from earth warms.

The flowers are used as **vegetable, for making cake, liquor**; flower juice is used in the **treatment of enlargement of auxiliary grand, neurotic disorder and taken with cow's milk as an aphrodisiac, in cough and bronchitis.** The derived liquor desired from the fermentation of flowers is considered to be a tonic and nutritive.
Seed paste is applied to curve muscle fatigue and relieve pain in the muscle and joints to improve the texture and vigour of skin. Bark decoction is used in curing bleeding gums and ulcers.

Fodder: Leaves, flowers and fruits are lopped for goats and sheep. Seed cake is also fed to cattle.
Timber: The heartwood is reddish brown, strong, hard and durable; very heavy (929 kg/cu. m), takes a fine finish. It is used for house construction, naves and felloes of cartwheels, door and window frames
Erosion control: Mahua has a large spreading superficial root system that holds soil together
Shade or shelter: The wide spreading crown provides shade for animals. **Reclamation**: Mahua is planted on wasteland with hard lateritic soils in India.
Nitrogen fixing: Vesicular-arbuscular mycorrhizal associations and root colonization have been observed in mahua.
Soil improver: The seed cake has been used as fertilizer
Ornamental: Mahua is occasionally planted as an avenue tree.
Boundary or barrier or support: It is planted along the boundaries of fields.
Intercropping: M. latifolia can be raised with agricultural crops.
Cake has export value.
One of the few trees that may not need deliberate conservation efforts due to its assimilation in cultural identity. In the tribal belt the centre of the village is usually adorned with a huge Mahua tree, beneath which all the village meetings are held.

Chapter 5
Animal Husbandry - Dairy Development

Animal Husbandry sector is key economic activity in rural sector in India, specifically in Gujarat state. The sector has wide horizontal & vertical dimensions. It contributes about 30% of agricultural output in terms of value. The dairy is the most important farm enterprise in Gujarat. The sector has about 69% women participation in employment, whereas, the crop farming has only 36% women participation. The Gujarat is at forefront and among most developed state in the dairy sector. There are 12 district milk producers union, 10,725 milk cooperative societies which are collecting milk in different villages and provide it to Milk Unions for its further processing and dispensing. The daily milk production in state accounts to about 150 lakh lit/day. There are 20.84 lakh members of milk co-operative societies. Health care, cattle feed and artificial insemination services are provided by unions in their working regions though milk co-operative societies.

5.1 Gujarat an Overview

The major breeds which are identified in major regions of Gujarat which serves the best purpose of animal rearing and need to be further developed.

(1) Saurashtra region

Cow – Gir breed

Major identifies

- First calving: 45 to 55 month
- Milk production in one calving: 1500 to 1800 lit
- Milking period per calving: 300 to 315
- Inter calving period: 15 Months average

Buffalo – Jafrabadi breed

Major identifies

- First calving: 50 to 55 month.
- Milk production in one calving: 2000 to 2100 lit.
- Milking Period per calving: 320-350 days
- Inter calving period: 15-18 month

(2) Kutch region

In Banni grassland areas of Kutch the most profitable proposition is Banni buffalo rearing.

Major identifies

- First calving: 40 to 45 month.
- Milk production in one calving: 2900 to 3000 lit.
- Milking period: 290 to 360 days
- Inter calving period: 12 to 14 months.

In the case of cow the Gir and Kankrej breeds can be reared successfully according to regional proximity.

(3) Northern Gujarat

Cow- Kankrej breed

Major identifies

- First calving: 45 to 50 month
- Milk Production in one calving: 1200 to 1500 lit
- Milking period per calving: 275-375 days
- Inter calving period: 17 to 18 month

Buffalo- Mehsani breed

Major identifies

- First calving: 45 to 48 month.
- Milk production in one calving: 1700 to 1800 lit.
- Milking period per calving: 310 days average
- Inter calving period: 15 to 16 month

(4) Middle & South Gujarat

Buffalo- Surati breed

Major identifies

- First calving: 42 to 48 month
- Milk production in one calving: 1200 to 1500 lit.
- Milking period per calving: 300 days.
- Inter calving period: 15 to 18 Month

Cow Kankrej breed rearing can be success full of in some extent of areas gir rearing can give optimal results.

(5) South Hilly track

Cow- Dangi Breed

Major identities

- First calving: 50 to 55 month.
- Milk calving in one calving: 500 – 700 lit.
- Milking period per calving: 8 month
- Inter calving period: 15 years.

Though the milk potential is somewhat lower the bullock of this breed can be best for the draught purpose which is crucial in the hilly track agrarian families.

Buffalo- In this region surati buffalo rearing can be a successful enterprise but needs special attention to it.

These identified breeds of cow and buffalo are primarily evolved in to their current regions by adapting to the environment. These breeds if improved strategically & reared in their specified environment can be a successful enterprise for the livelihood security of people in this region.

Table 5.1: Milk Production of Gujarat State (Lakh Metric Tonne) (1980-81 to 2004-05)

Year	Milk - Production (LMT)
1980-81	21.53
1985-86	32.7
1990-91	35.2
1995-96	46.03
2000-01	53.17
2005-06	69.6

5.2 Major Problems

Though, the state is at forefront but at root level, there is vast scope for increase in milk production. Milk producing farmers face the some of the problems which needs to be resolved for higher milk production and better income opportunity and support to the farmer and livelihood security.

i) Lower productive breeds

The lower productive breeds are prevalent among the farmers, which is the main reason for the lower milk productivity in the farmers. The strategic breed improvement is neglected in most of the rural farmers, because they do not see the dairy sector as their livelihoods and non – availability of good genetic character breeds of the bull in the village, non-availability of artificial insemination in the village. This one factor accounts to about 60% increase in production potential.

ii) Health problems and Disease inception in Livestock

The health problems always persist in the livestock. These health issues if not tackled timely, they can become a major reason for the lower milk production. By some findings it is estimated that the production in milk has been reduced by up to 15% by health problems and disease inception in livestock. Major health issues which need attention are worms in the stomach, gynaecological or fertility related problems, foot and mouth diseases, and different diseases which need to be prevented under vaccine program according to regional diversification.

iii) Production management

Different practices are followed by the farmer community during production process. Wrong or faulty practices of feeding, Drinking water, cattle rearing and wastage of fodder are followed by farmers. Availability of fodder is also very low, and in most of areas of farm waste is not utilised efficiently. These faulty management practices cost about 25 % of production decrease, and if proper practises are followed can improve production significantly.

iv) Knowledge deficiency to the farmers.

All the problems identified above are caused mainly due to ignorance of the end producer/ farmer and non-attention to these issues, because of farmer's laziness. In which, the knowledge deficiency about key technical issues hampers most the production to a larger extent reason for poor production.

So for the Development of this sector further in the rural region, the broad goals need to be fulfilled which are identical to Problems Solving approach for issues which are identified earlier.

(1) Breed Improvement

The Major hurdles regarding the breed improvement activity are

(1) Treating the livestock as religious activity and not an enterprise by farmers.

(2) Stray or impure genetically qualities bulls are high in numbers in the rural region.

(3) Not giving the required attention to the breed improvement or not taking care of animals in heat for better breed inception.

(4) Non availability of artificial insemination facilities for breed improvement and ignorance among farmers on use of artificial insemination

(5) Credit un-availability for purchasing cross breeds.

These hurdles can be eliminated by proper sensitizing programmes for farmers and resource management.

The major problem in the animal rearing with the current breeds pattern is only 10-20 cows and buffaloes having their genetic qualities as pure and production qualities of other animals are sub optimal. The bulls of these sub-optimal genetic quality animals of same breed are used for further reproduction process, calves thus are having the lower production potential. This is occurring in the rural region due to un-abated rearing of these bulls and social and religious beliefs are making this process more uncontrolled. Also, lesser coverage of AI on rural areas is causing non-availability to technical help.

5.3 Point of Intervantion for breed Improvements

So the **Points of interventions** for the breed improvement in these areas are

1) Identification of the animals which are having good milk productivity and their off-spring bulls, whose fathers are also the off spring of better productive cows. Such bulls are identified and registered with milk co-operative societies. These bulls can be used for natural reproduction in the village, which has benefits apart from natural and aesthetic way is most accepted way by all villagers. It can be used when the owner is not willing for the AI.

2) Castration of other bulls in the village which are not having the better genetic characters and which are creating hindrance to the genetic improvement.

3) Incentives to the registered bulls in form of feed and free health care facilities and nutrients supply can be supplied. For this, Rs. 3000 for feed and health care fund can be allocated per year per bull.

4) Artificial Insemination coverage can be improved by selecting and training two persons per village who may be the milk co-operative societies members or other interested candidates for the artificial insemination. Strategic gene improvement can be done by providing them the AI kit and subsidizing per insemination which currently costs around Rs. 120 per insemination. This can be subsidized to cost farmers Rs. 50 per insemination and some incentive to the kit holder can be provided.

Table: AI Kit estimate after training to the interested persons

Sr.No.	Details of work	Quantity	Total Costs
1	Training for the interested persons	02	30000
2	Container (L.Nitrogen)	01	20000
3	Annual Maintenance	-	25500

So, the subsidy can be provided to the tune of Rs.70 per insemination and Rs.15 incentive to the kit holders per insemination with total coverage of 30% in village. So if village is having 1000 animals, the coverage per annum through artificial insemination can be taken about 300 animals and total annual expenditure allocated upto about Rs.25500.

5) Credit availability through banks for cross breed animals

The cross breeds have better production capacity which it gains from their genetic combination or cross breeding done in research or breeding farms. These cows and buffaloes can be made available to the farmers for better production and income opportunities. The credit can be made available through banks for these cross breed animals.

5.4 Health Care Facilities

The livestock suffers from different illnesses and diseases which needs to be treated or can be prevented through vaccination programmes. As per estimates, the total of 15 % yield reduction is observed due to health lapses in the animals. Animal health is very important in sense of animal productivity and animal fitness. In case of diseases in animals it hampers animal fitness, productivity and reproduction capacity.

For better animal health, green fodder, dry fodder, concentrates & sanitised water in recommended quantities should be provided. Also the environment in which they are kept should be clean and suitable for the animals. The animal should be subjected to regular vaccination programmes and health check up and treatment programmes to keep animal healthy.

The major issues which needs regular attention regarding health of animals & can be checked at community level for overall development of animal health in rural areas are,

1) Worm load check in Animals Stomach

The worm load in animals is of two types, internal, which is the animals own health status indicator and external, which it acquires from external source i.e. its feed & fodder. These both worm loads can be checked by arranging de-worming camps twice a year i.e. before & after monsoon season. The coverage in the village among all animals, around 40 % can be assumed which per animal costs around Rs. 200. So for a village with 1000 animals the animals to be covered is 40% i.e. 400 animals and total cost per year can be allocated upto Rs. 80,000/- and this camp can be arranged with collaboration from AH deptt.

2) Gynaecological issues

Different gynaecological issues related to animals, needs to be sorted out which hampers the fertility and pregnancy of healthy animals. According to the data around 10% animals are found to have gynaecological problems and it hampers overall of 5% milk production. An-stress, Repeat breeding, Pro–lapse and Matritis are major common problems found in the animals.

For treatment of these and other commonly found animal health issues, mass treatment camps can be arranged in village with collaboration from animal husbandry dept. Two camps per year with up to Rs. 25000 per camp are charged by AH deptt.

Through these camps a general awareness & training programmes are also arranged in village to check the health & nutrition issues among farmers & educate them about these issues.

3. Vaccination

Vaccination is very handy tool for prevention of some of the major diseases in region. Some major diseases identified are foot & mouth diseases (FMD), Brussels, Haemorrhagic septicaemia, Anthrax and other diseases. These Vaccination programmes can be arranged at village level in consultation with the local A.H. deptt. officials and at prevailing rates quoted by the deptt.

4. Fortified minerals Supplement

The Fortified Minerals supplement can be provided to the animals for supplementing general health affecting deficiency minerals. The major minerals which are found to be deficient in animals are B–complex, Calcium, Vitamin-D3 and other vitamins, Phosphorous, Magnesium, Sodium and Chloride. These minerals can be supplied to the animals of BPL families at subsidised rates which costs up to Rs. 300 per animals per year can be subsidised up to 40% i.e. Rs. 120 per animal per year for BPL families can be supplied in form of Fortified Minerals.

5.5. Improved Nutrient Management

Feeding plays pivotal role in realizing the genetic potential of milch animals. It is also considered critical in the overall success of dairy development programme, as feeding alone contributes more than 70 per cent of the total cost of milk production.

Objective of Feeding and Management

Penning and grouping strategies may also be used uniformly meeting the nutritional needs of cattle of a common age, sex or size. Homogenous groups (by weight and stage of production) allow the producer to utilize diets that more closely match the actual needs of all animals in the group, since there is less variation between animals. Overfeeding of nutrients within a group can thus be significantly reduced.

Another aspect of feed management takes into account nutrient losses during feed storage. Depending upon how feed and fodder are stored, nutrients may be directly lost to the environment as a result of poor feed storage condition.

The mineral content of the water supply should be considered with regard to the total intake of dietary minerals. Depending on the quality of water supply available, water intake may make a substantial contribution to daily mineral intake, particularly with regard to sulfur, and in some areas of the state salt.

Lacking part in animal feeding

- It is not being practiced in the farming community that feeding of the animal must be according to their age group like calf, drought animal, cow, milking cows etc.
- The proportion of the Nutrients is not being maintained according to requirement of the Animal age stage.
- Generally it is being practiced farmers are feeding sorghum and maize green fodder direct which is available for short period of time. This can be avoided by silage and hey for sorghum and maize green fodder can be maintained for a long time and without losing nutrients.

Knowledge of feeding to healthy and adult cow and buffalo

Sr no	Item	Kgs.
1	Concentrates	1
	Green Fodder	-
2	Pulses fodder	3
3	Cereals Fodder	10
4	Dry Fodder	5 to 7

Feeding of cow and buffalo weighting about 350 - 400 kgs.

Sr no	**Items**	**Without milking (kgs)**	**With milking**
1	Concentrates	1	For Cows 400 Gram extra /kg milk
2	Pulses Fodder	4	For Buffalo 500 Gram extra /kg
3	Cereals Fodder	8	-
4	Dry Fodder	6 – 9	as desired

Pregnant animal

Above described quantity could be given, but after six months of pregnancy quantity of feed must be 500 gm per fifteen days up to the 3-4 kg, and this system is called steaming up, after adaptation of this technique there is no need to feed more at the time of calving and due to this technique calf become healthy and production of milk also gets increased.

Table. Bullock feeding quantity (Approx. 400 – 450 Kgs)

Sr no	Particular	Capacity base (Kgs)	More than Capacity (Kgs)
1	Concentrate	1.5 - 2	3
2	Pulses fodder	5 -6	5 -6
3	Cereals Fodder	10 -15	10 -15
4	Dry Fodder	as desired	as desired
5	Sorghum Fodder	6 -8	6 – 10

*The weight of Bullock if it is 600 kgs. than 500 gm more feed must we provided

Table. Feeding quantity up to Three months age of calf

Sr. No	Age	Milk (Gram)	Skim Milk (Gram)	Calf Starter (Gram)	Good breed (Gram)
1	Fist 3 days	1 /10 as per weight	-	-	-
2	4 to 7 days	2500	-	-	-
3	Second weeks	3000	-	100	100
4	Third weeks	3250	-	300	500
5	Forth weeks	3000	-	400	600
6	Fifth weeks	1500	1000	500	700
7	Sixth weeks	-	2500	650	750
8	Seventh weeks	-	2000	800	850
9	Eight weeks	-	1750	1000	1000
10	Ninth weeks	-	1250	650	750
11	Tenth weeks	-	-	1300	1200
12	Eleventh weeks	-	-	1400	1300
13	Twelve weeks	-	-	1500	1500

Table. Calf feeding according to its weight

Sr. No	Weight – Kg	Mix pulses fodder	Green fodder		Dry Fodder
			Pulses fodder	Cereals fodder	
1	50	0.8	1.0	2.0	as desired
2	70	1.2	1.5	2.0	as desired
3	100	1.5	2.0	4.0	as desired
4	150	1.9	2.5	5.0	as desired
5	200	2.2	2.5	6.0	as desired
6	300	2.5	3.0	7.0	as desired
7	400	2.5	3.0	9.0	as desired

5.6 Fodder and Green Manure Availability:

Livestock rearing in Gujarat is changing with the requirement of time as is also evident that demand for milch breed of cattle is going up as compared to dual or draught breed. Indigenous breeds cattle are named as Sahiwal, Gir, Rathi and Kankrej and breeds of buffalo such as Murrah, Mehsana and Jaffarabadi. In this globalize / market economy dependent agri-economy, milk production has to compete for growing fodder on good or able land. Thus milch animals have to be of high productivity and reproductive efficiency.

1.1. Role of cultivated fodders:

i) Feed & fodder cost constitute about 60-70% of cost of milk production thus cultivated fodder has an important role in meeting requirement of various nutrients & roughage in our country to produce milk most economically as compared to concentrates

ii) It needs feed, which not only meet nutrient requirement but fills the rumen to satisfy the animal.

iii) In view of microbial digestion system, feeds have to meet requirement of cattle maintenance, production and requirement of microbes to promote digestion.

1.2. Cultivated fodder crops have a place of importance for feeding of ruminants in view of the following aspects: -

a) In view of the peculiar digestive system, provided by nature, ruminants need feeds, which not only meet their nutritional requirements but also fill the rumen and satisfy the animal.

b) In view of microbial digestion system the feeds have to meet requirements of the animal, its production as well as the needs of microbes for promoting digestion.

c) The fodder crops meet these requirements very effectively and hence are important for ruminant production system. As evident from reports that mixed with coarse roughages, like wheat straw, its intake and digestion are improved.

1.3. Fodder crops provide all the critical elements like highly digestible protein, carbohydrates, fats and minerals. Green fodders are a very good source of B-carotene (precursor of vitamin A).

i) Common cereal fodder crops like Maize, Sorghum and Oats are rich in energy and the leguminous crops like Lucerne, Berseem & Cowpea are rich in proteins.

ii) Leguminous crops, like Berseem, Lucerne & Cowpea, are a good source of major &micro minerals, so critical for rumen microbes as well as animal system

iii) Fodder cultivation has been traditional in most parts of the country since farmers feel that the fodder crops have some factor, which keeps the animal healthy and productive. And hence since generations farmers have marked out certain varieties and crops for fodder production and cultivate these, depending on availability of land and water.

1.4. The green fodder crops are known to be cheaper source of nutrients as compared to concentrates and hence useful in bringing down the cost of feeding and reduce the need for purchase of feeds/ concentrates from the market.

1.5. The stage of harvest of crop has profound effect on the nutrient contents of the fodder crop. The moisture and nutrient contents of the crop decreases and fiber content increases with maturity and hence harvesting at proper stage is crucial.

1.6. Fodder production programme should aim at selecting crops and varieties, which produce highest quantities of ' Nutrients per unit of land and time period' and hence a continuous search for improved varieties is crucial.

i) Grasses like Hybrid Napier and Guinnea grass are known for high yields and their new varieties produce good quality fodder. These grasses being perennial and high yielding are useful.

ii) Shrubs and small trees (like Gliricidia, Desmanthus, Leucaena, Sesbania spp.) are very good and cheap source of protein and minerals and can be introduced between farm plots and have multipurpose utility.

1.7. In case surplus fodder is available in some season it can be stored in form of silage or hay for lean season.

1.8. Leguminous crops like Lucerne and Berseem are useful in promoting ruminal development in calves.

5.7 Role of common property resources in meeting feed requirement of livestock:

It has been tradition in Gujarat to have community pasture land in each village, which has been an important source of feed for cattle particularly of weaker sections like landless / small / marginal farmers. Each family has equal access to these resources in the village. In the past, group of villagers were taking care of such lands and maintaining them, but after abolition of this system, these properties became no body's property and are now in denuded condition and encroached upon by influential or sold by Panchayat to mobilize resources. Various type of natural CPR is as below: -

2.1. Natural CPRs:

These are nature-gifted and include:

a) Land resources:

i) Gochar (plot of land left vacant for livestock grazing)

ii) Banjar (degraded and wastelands, under individual or group ownership but used as resting place by livestock of the community).

iii) Gaura (plot of land where milking of milch cattle is done)

iv) Khaliyan (land where all the members of the community store their crop produce together)

v) Nistar (land reserved &SSS left vacant for fairs, haat market, cultural ceremonies etc).

b) Forest resources:

1) Kakad bani (plot of land with vegetative cover specially between two village boundaries)

2) Devbani (plot of forest land left by the community in the name of god and used only in the vent of natural crisis / disaster)

3) Rakhabani (plot of forest land left by consensual decision of the community used as the last resort)

4) Devaranya (plot of forest land for god)

5) Waal (forest land owned by zamindars or temples, may be used for cultivation)

6) Beed (mostly private dense forests used by the community at the time of crisis)

7) Rundh (private dense forests which could be used by the community after paying taxes)

5.8 Use of agriculture waste straws to meet nutrient and feed requirement:

Cereal and legume crop straws have been traditional source of feed for Gujaratn livestock. These straws have not been valued much in the past but with competitive milk production, its importance as source of feed has gone up tremendously. Therefore, there has been greater emphasis and efforts to enhance nutritive value of these straws with methods of treatment like: -

i) Urea treatment

ii) Alkaline treatment

iii) Ammonia treatment

iv) Thermal treatment (steam pressure treatment)

Though different methods of treatment have been developed but have not been taken or adopted by farmers yet. Now there is emphasis on, treating straws with biological agents like fungi. However, it should be clear that no toxic residues must be left by these substances, which are harmful to the ruminant and rumen microbes.

The net effect of any treatment is a result in reduction in rigidity of cell structure and swelling of cell walls, so that electrolytes and cellulslytic enzymes from rumen microbes can penetrate these cells. These microbes can then colonize the vegetal matter and decompose it more quickly because hydrolysis has already taken place.

3. Feed Supplements:

Similarly, lot of work has been done to provide supplemental feed to not only cattle through urea / molasses block but it also enhances nutrient supply to rumen microbes. Thus making it more efficient to digest forage. Most common supplements consist of:

i) Urea strategic ingredient
ii) Molasses
iii) Mineral
iv) Fibrous feed
v) Cementing material

If all the treatments are given with recommended dosages, rumen microbes has been found to be efficient to convert these feed into nutrients without any residual effect on cattle rumen microbes and milk.

4. Future Policy Directions:

Changing agriculture production practices, globalization of economy, market oriented production system, decentralized / democratic form of governance etc, have its impact on livestock production system in the country. Its production may be milk, dung urine, it has to compete in economic terms for allocation of resources of production with other competing options of crops. Secondly, in Gujarat agriculture and livestock has been a livelihood issues and not only economic issue, for many families especially landless, small and marginal farmers etc. Therefore our policies should ensure both these aspect. Following policies may be focused in future.

i) Look for good indigenous milch breeds of cattle particularly for semiarid / arid climates; upgrade these breeds through recent techniques as animal husbandry is main activity in such areas

ii) Adopt intensive and well-defined mile stones to achieve growth in productivity of indigenous breeds in such areas.

iii) Adopt breeds / cross breeds in areas commensurate with productivity of land i.e. in case of high agriculture production area, cross breeds with high milk potential will be able to compete with agriculture crops

iv) In future when need for fat is going to go down and cheaper fats are likely to come from different countries it is certain that cow milk production will be preferable to buffalo milk.

v) There should be focused programme on regeneration, promotion of silvipasture or Gochar, revenues and wastelands, which will not only meet shortage of feed and fodders but will give equal access to poor and improve environment also.

vi) There is need to promote fodder crop production through improved agronomic practices and use improved seed. Extension in this sector is totally neglected because it is part of animal husbandry department for which it has never been a priority. Thus we should look into the possibility of attaching it to agriculture department

vii) Promotion of techniques of treatment of straws and feed supplements as entrepreneurial activity than treatment at farmer level.

viii) Though more than 120 varieties of cultivated fodder have been developed but seeds are not available because it is trapped in vicious cycle of lack of demand due to lack of extension, which inhibits production of seed etc. Thus this cycle need to be broken through proper extension.

ix) Presently research has been mainly conducted on cultivation of green fodder in irrigated areas but focus has to be given to dry land fodder or partially irrigated fodder crops.

x) Extension to promote balance feed, feeding chaffed feed and proper storage of fodder to avoid losses need also to be emphasized.

MINERALS

Table 1. Summarization of minerals in dairy rations.

Mineral	**Functions**	**Deficiency Symptoms and Associated Problems**	**Food Sources for Dairy Cattle**
Calcium (Ca)	Bone and teeth formation, blood clotting, muscle contraction, 12% in whole milk	Rickets, slow growth and poor bone development, easily fractured bones, reduced	Alfalfa and other legumes, ground limestone, dicalcium phosphate, steamed bone meal

		milk yield	
Phosphorus (P)	Bone and teeth formation, involved in energy metabolism, part of DNA and RNA, .09 percent in milk	Fragile bones, poor growth, low blood phosphorus, depraved appetite, poor reproductive performance	Phosphates, steamed bone meal, cereal grains, grain by-products, oil seed meal
Sodium (Na)	Acid-base balance, muscle contraction, nerve transmission	Craving for salt, reduced appetite, incoordination weakness, shivering	Common salt and butter products
Magnesium (Mg)	Enzyme activator, found in skeletal tissue and bone	Irritability, tetany-increased excitability	Magnesium oxide, forages and mineral supplements
Sulfur (S)	Rumen microbial protein synthesis, found in cartilage, tendons, and acids	Slow growth, reduced milk production, reduced feed efficiency	Elemental sulfur, sodium and potassium sulfates, legume forages
Potassium (K)	Maintenance of electrolyte balance, enzyme activator, muscle/nerve function	Decrease in feed intake, loss of hair glossiness, lower blood potassium	legume forages, potassium chloride, potassium sulfate
Iodine (I)	Synthesis of thyroxine	Big neck in calves, goitrogenic (enlargement of thyroid gland) substances may cause deficiency	Iodized salt, trace mineralized salt and commercial supplements
Iron (Fe)	Part of hemoglobin, part of many enzyme systems	Nutritional anemia, pale mucus membrane	Forages, grains, trace mineralized salt, ethylene diamine dihydroiodine
Copper (Cu)	Needed for manufacture of hemoglobin, coenzyme	Severe diarrhea, abnormal appetite, poor growth, coarse, bleached hair coat	Trace mineralized salt and commercial supplements
Cobalt (Co)	Part of vitamin B_{12}, needed for growth of rumen microorganisms	Failure of appetite, anemia, decreased milk production, rough hair coat	Trace mineralized salt and commercial supplements
Manganese (Mn)	Growth, bone	Delayed or	Trace mineralized salt

	formation, enzyme activator	decreased signs of estrus, poor conception	and commercial supplements
Zinc (Zn)	Enzyme activator, wound healing	Decreased weight gains, lowered feed efficiency, skin/wound problems	Forages, trace mineralized salt, zinc methionine
Fluorine (F)	Not known if it is essential for ruminants, although essential for lab animals	Severe reduction in feed intake, stiffness in legs, enlarged bones	Rock phosphate mineral
Selenium (Se)	Functions with certain enzymes, associated with vitamin E, immune system	White muscle disease, retained placenta, lessens subclinical mastitis	Oil meals, alfalfa, wheat, oats, corn, commercial supplements
Molybdenum (Mo)	Part of the enzyme xanthine oxidase	Loss of weight, emaciation, diarrhea	Widely distributed in feeds, deficiency rarely a problem

5.9 Strengthening Institutions like Milk Co-Operatives

Strategy:

- Recruit, train and motivate increasing numbers of women to work for cooperatives to achieve significant improvements in dairy husbandry, as they primarily shoulder animal husbandry related responsibilities in rural Gujarat
- Consolidation and growth in milk and milk product marketing, promoting better equity for regional cooperative brands and developing qualified and skilled manpower
- Education of producer members, opinion leaders and trained professionals to be expanded and strengthened
- Empower local leaders, strengthen societies and equip their staff and members with the skills and information they need.
- Persuade the State and Central Governments to remove the shackles on cooperative laws so cooperatives can compete on equal terms with other forms of enterprise.

Action Plan:

Institution Building Development

- Orientation/induction programmes for farmers

- Training of Management Committee Members and Society Secretaries in preparing business plans and its implementation
- Reorientation of union staff to new roles identified to meet Perspective 2010 goals

Strong Financial Base

- Increase in dairy cooperative owned funds
- Increase in cooperative contribution to union share capital

Expanding Marketing

- Assistance in planning, implementation and monitoring of business plans of milk unions geared to meet the targets envisioned in Perspective 2010
- Offering financial and technical help to milk unions and federations in areas such as sales promotion, consumer education, distribution infrastructure development etc.
- Standardisation of artwork, colour, logo and retail outlet design across regional cooperative brands with a view to promoting better recall by consumers under a common mnemonic umbrella
- Introduction and improvement of marketing systems and processes necessary to perform better in a competitive marketplace
- Training and development of management and staff of milk unions and federations

Legislative Framework

- Supporting efforts aimed at enactment of progressive legislative framework for the cooperatives at the State and the Centre
- Encouraging and assisting dairy cooperatives in incorporation under progressive and enabling laws

Women's Participation

- Increasing women membership in dairy cooperatives to 50 per cent recognising the potential of this segment as decision makers having practical knowledge about animal husbandry practices
- Undertaking measures for significantly improving women's participation in the governance of dairy cooperatives at all levels
- Promoting organisation of women's thrift and credit groups/cooperatives

5.10 IMPROVEMENT OF EXISTING LIVESTOCK

Strategy:

- Improve the production potential of indigenous breeds of cattle such as Sahiwal, Gir, Rathi and Kankrej and breeds of buffalo such as Murrah, Mehsana and Jaffarabadi through appropriate selection programme
- Cross non-descript cattle with Holstein Friesian in areas with adequate feed and fodder and with Jersey in resource-poor areas
- Increase the production and use of high quality feed appropriate to local conditions
- Increase production and availability of green and ensiled fodder
- Encourage unions, NGOs and cooperatives to put common property area under improved pasture and fodder tree
- Expand first-aid coverage through village level societies
- Increase vaccination of animals against HS, BQ and FMD
- Develop Mastitis and Brucellosis control strategies
- Develop National Animal Production and Health Information System and Disease Free Zones in the country

Action Plan

Breeding

- Increase productivity of cows and buffaloes
- Increase percentage of animals in milk
- Expand AI coverage
- Increase inseminations
- Reduce AI per conception
- Take up genetic improvement programmes in selected milksheds to supply semen of evaluated bulls to all milksheds

5.11 Animal Health and Veterinary Services

Create first-aid facilities in DCSs

1. Increase vaccination for Haemorrhagic septicaemia and Black Quarter

- Increase de-worming of animals
- Promote mastitis control

- Undertake Brucellosis control activities in affected areas
- Promote use of GIS in AI and veterinary health services
- Create Disease Free Zones by

  -Undertaking mass vaccinations
  - Ear-tagging and passbooks
  - Animal movement management
  - Effective outbreak management
  - Sero-monitoring

- Disease control in Animals

  - Enactment of national legislation for Prevention of Infectious and Contagious Diseases in Animals

Animal Nutrition

- Raise installed cattle feed plant capacity
- Raise cattle feed plant utilisation capacity
- Increase and strengthen quality control laboratories
- Increase number of mineral mixture plant
- Increase production and utilisation quality fodder seeds

Husbandry Extension

- Enable dairy cooperatives to operate as full-service extension centers for their members by providing

- Introduction and support of technology
- Link actively with union's technical experts.

5.12 Linkages with Local Dairy:

Amul Research and Development Association

As a part of milk production enhancement programme and improve cattle breeds of farmer producers Amul initiated various development programmes. Amul Research and Development Association is a step towards it.

While the breeding programme was initiated as back as in 1952 with two Surti bulls from the Kanjari village of Kaira district, visionaries like Dr Kurien, Father of White Revolution in Gujarat, realized that without a scientific and professional approach in management of breeding and animal health care development cannot take place. As a result of this, a new centre was established in 1964 and registered the same under Societies Act of 1860 as Amul Research & Development Association (ARDA).

ANIMAL HUSBANDRY ACTIVITIES

Animal Husbandry activity is one of the programmes envisaged by Amul for enhancement of milk production and to take care of farmers that they do not incur economic loss by want of health care service to their cattle holdings. In the beginning itself it was felt that cattle's health is wealth of farmer as well as of the dairy as it brings growth to farmers and the organization.

ANIMAL NUTRUTION

In the beginning, to take care of the nutritional requirement of cows and buffaloes owned by the milk producers Amul procured and distributed cotton seeds. The Cattle Feed Plant of Amul was set up with the assistance of OXFARM under the Freedom from Hunger campaign of Food and Agriculture Organization to produce 50MT of balanced cattle feed. This plant was inaugurated by late Shri Lal Bahadur Shastri, then the Prime Minister of India and dedicated to the farmers on 31st October 1964.

The plant has since then grown in size to become Asia's largest cattle feed plant producing more 1100MT of feed daily. Amul has plan to further expand its capacity in the coming years. Supply of regular balanced cattle feed has significantly helped farmers to over come economic losses due herd health problems, reduced reproductive efficiency, infertility etc. The plant today manufactures following products: Amuldan (Bypass Protein Feed), Calf Starter, Milk Replaced, Mineral Mixer, Medicated Feed, Urea Mineral Molasses Block.

In order that the feeds supplied to the farmers are cost effective raw materials are procured during seasons from all over Gujarat. The following material form part of various feed manufactured by the plant: Cotton seed extraction, Groundnut extraction, Sunflower extraction, Rapeseed extraction, Maize gluten, Maize oil cake, Goar bhardo, Cotton seed oil cake, Mango seed extraction, Palm kernel extraction, De-oiled rice bran, Rice polish fire, Rice, Jower, Salt Dicolciom phosphate (D.C.P.),, Vitamin AD3, Calcite

TRAINING AND DEVELOPMENT:

Training and Development programme of Amul is an ongoing programme since its inception as it believes the development of the institution lies in the development of the people – producer members. It organizes various training programmes based on the need and a few of these are as follows:

VMS Workshops: This programme aims at to create a document on Vision, Mission and Strategy for Village Dairy Co-operative Societies. This process has helped to involve and

develop dairy farmers for their future planning and review of the growth thereby improve their income and quality of life.

Milk Day Celebration: This programme aims at bringing together all members, including Chairman, Management Committee Members and respective producer members of Dairy Co-operative Societies to identify and solve their problems. This programme is attended by the respective Board of Direct and Chairman from the District Union, Internal Consultant of Co-operative Department of District Union.

Amul Darshan: This programme aims at exposing producer members to various facets of dairy operations to keep them informed and aware of the development and adopt to good management practices in production of milk. The exposure visits include visit to Cattle Feed Plant, Dairy Plant, Chocolate Plant, Dairy Demonstration Farm and presentation by the Co-operative Development Group.

Management Development Programme: This programme aims at capacity building of Secretaries of Dairy Co-operative Societies in better management and maintenance of ISO standards. For the Management Committee Members it imparts training on management strategies, co-operative laws and their roles and responsibilities.

Zonal Meeting: This programme aims at review of internal audit on Quality Management System and Cleanliness of Dairy Co-operative Societies for continuous improvement. This helps in knowing achievements and identifying grey areas for improvement.

Village Group Discussion: It aims at encouraging discussion among dairy farmers on scientific animal husbandry practices and its application. The discussions are facilitated by the Internal Consultant of District Union.

Awareness and Refreshers Training: It aims at training of Dairy Co-operative Society personnel on Quality Management System in order that the ISO is effectively followed.

Dairymen Training: This programme aims at building managerial skills of progressive farmers who have more than five milch animals to bring more success in their dairy husbandry.

Development Review: This programme aims at District Union's review of the comparative progress of five year programme of Dairy Co-operative Societies and suggests remedial measures.

This programme aims at building capacity in the Internal Consultants to discharge their duties as consultant as also change agent.

Self Managing Leadership Programme: Amul undertakes Self Managing Leadership Programme for women resource persons through Brahmakumari Iswariya Vishwa Vidyalaya at Mt. Abu to bring a value based approach in development process.

Amul Patrika: It is an in-house Newsletter distributed monthly to producer members to strengthen their knowledge on scientific animal husbandry practices, quality of milk and sharing success stories.

5.13 Equipment/Plant and Machinery for Animal Husbandry:

i) Chaff cutter
ii) Silo pit
iii) Milking machine
iv) Feed grinder and mixer
v) Milking pails/milk cans
vi) Biogas plant
vii) Bulk coolers
viii) Equipment for manufacture of products
ix) Truck/van (price quotations for the above equipments).

5.14 Fisheries

Introduction:

Fish is the cheapest and most easily digestible animal protein and was obtained from natural sources from time immemorial for consumption by human beings. However, due to over exploitation and pollution, the availability of fish in natural waters have declined considerably forcing scientists to adopt various methods to increase its production. Fish farming in controlled or under artificial conditions has become the easier way of increasing the fish production and its availability for consumption.

Farmers can easily take up fish culture in village ponds, tanks or any new water body and can improve their financial position substantially. It also creates gainful employment for skilled and unskilled youths. The technology developed for fish culture in which more than one type of compatible fishes are cultured simultaneous is the most advanced and popular in the country. This technology is known as Composite Fish Culture. This technology enables to get maximum fish production from a pond or a tank through utilization of available fish food organisms in all the natural niches, supplemented by artificial feeding. Any perennial fresh water pond/tank retaining water depth of 2 metres can be used for fish culture purpose. However, the minimum level should not fall below one metre.Even seasonal ponds can also be utilised for short duration fish culture.

5.14.1. Fish species involved in composite fish culture

Depending on the compatibility and type of feeding habits of the fishes, the following types of fishes of Indian as well as Exotic varieties have been identified and recommended for culture in the composite fish culture technology :

Species Feeding habit Feeding zone

Indian Major Carp

Catla	Zoo plankton feeder	Surface feeder
Rohu	Omnivorous	Column feeder
Mrigal	Detritivorous	Bottom feeder

Revenue Model:

Sr. No.	Cost Head	Unit	Unit cost	Total
I	Fixed Cost			
a	Land/Building	1 Ha Pond	-	0
b	Equipment			
	Fishing Net	1	0.17	17000
	Total: Fixed Cost		**0.17**	**17000**
II	Variable Cost (One production cycle)			
a	Fingerlings	8000	8000	8000
b	Feed Requirement	5100 Kgs	7.5	38251
	Total Variable Cost			**46251**

One Production Cycle:

Sr. No.	Heads	Unit	Amount / Quantity
1	Total Variable Cost (TVC)	-	46251
2	Total Production (Q)	-	3087.5
3	Average Variable Cost : AVC= (TVC/Q)	-	14.98
4	Average Revenue (AR=Price)	-	80
5	Total Revenue: Total Market Value of the produce (P*Q)	-	247000
6	Unit Margin (P-AVC)	-	65.02
7	Net profit per cycle (TR-TVC)	-	200749

- **Break Even Point= Total Fixed Cost (or, Investment) / Unit Margin**

  = 17000 / 65.02 = 261.45

- **Benefit Cost Ratio (BCR)= Net Benefit / Net Cost**

  = 200759 / 63251

  = 11.8

5.15 POULTRY

Poultry is one of the fastest growing segments of the agricultural sector in Gujarat today. While the production of agricultural crops has been rising at a rate of 1.5 to 2 percent per annum that of eggs and broilers has been rising at a rate of 8 to 10 percent per annum. As a result, India is now the world's fifth largest egg producer and the eighteenth largest producer of broilers. Driving this expansion are a combination of factors - growth in per capita income, a growing urban population and falling real poultry prices.

Poultry Revenue Model:

Sr. No.	Cost Head	Unit	Unit cost	Total
I	**Fixed Cost**			
a	Construction of brooder cum grower house	300 Sq. Ft.	35	10500
b	Purchase of equipment for water	15	25	375
c	Purchase of equipment for feed	15	25	375
	Total: Fixed Cost	**-**	**-**	**11250**
II	**Variable Cost (One production cycle)**			
a	Labour charges	300	9	2700
b	Cost of 2 weeks old chicks	300	20	6000
c	Cost of feed upto 25 Weeks	2250	16	36000
d	Cost of medicines & miscellaneous expenses upto laying	300	10	3000
	Total Variable Cost	**-**	**-**	**47700**

One Production Cycle:

Sr. No.	Heads	Unit	Amount / Quantity
1	Total Variable Cost (TVC)	300	47700
2	Total Production (Q) (Kg)	300	750
3	Average Variable Cost : AVC= (TVC/Q)	-	63.6
4	Average Revenue (AR=Price)	-	100
5	Total Revenue: Total Market Value of the produce (P*Q) (Incl Manure * Bags)	-	75000
6	Unit Margin (P-AVC)	-	36.4
7	Net profit per cycle (TR-TVC)	-	27300

Break Even Point= Total Fixed Cost (or, Investment) / Unit Margin
= 11250 / 16.4 = 309
Benefit Cost Ratio (BCR)= Net Benefit / Net Cost
= 27300 / 11250
= 2.4

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Chapter 6
Special Skill Based Activities/Local Skill Based Activities

6.1 The Current Situation

In the last few decades, these traditional crafts have undergone tremendous change. As local villagers seek cheaper mass produced functional wares, artisans are compelled to find new markets. Fortunately, sophisticated urban markets have welcomed the concept of traditional crafts. However, traditional work must adapt to the new clientele. In addition, since the market has expanded, innovations must now be faster and less subtle. While enterprising, artisans do not always have adequate information about the tastes of new markets. For a myriad of reasons including social attitudes, they do not have access to the better markets. Commercialization in this situation has induced a downward spiral of declining quality. In efforts to revive quality, it has been recognized that new design is needed to make craft sustainable. But conventionally, this has been perceived as a need for design intervention, in the form of trained designers giving new designs to artisans. The implication is that designers have knowledge, while artisans have skills. When design, or art, is separated from craft, or labour, the artisan is essentially reduced to a labourer, reinforcing the low social status of craft. Further, most commercialized craft aims for quick, standardized and low cost replication. This emulates the factory model. The strength of hand craft, the personal, hand made quality, is forgotten. The net result is that even when artisans can earn a living by producing contemporary versions, most do not wish their children to be artisans. Surely, design input is needed for new markets. But KALA RAKSHA believes that the approach must be altered to enable the artisan to be significantly involved in both design and craft.

6.2 Kutch, Craft

Culturally, Kutch is very rich. A great range of ethnic communities live in the region, most maintaining traditional dress and crafts of many sorts, including weaving, dyeing, printing, bandhani (tie-dye), embroidery, leather work, pottery, woodwork, and metalwork. Originally, crafts existed integrated into local social systems. The user of the craft was intimately known. Design was an integral part of craft, as the artisan was designer, producer and marketer simultaneously. Designs evolved; innovation is critical to living art. But the changes were slow and organic.

Kutch has a wealth of traditional crafts, not only in textiles, but also woodcarving, cast silver work, lacquer work, terracotta pottery. Houses are often decorated with designs made from mud, cow or camel dung, clay slip, and mirrors. The major textile techniques for which Kutch is famous are listed below:

6.2.1 Block printing

There are five main block printing techniques done in Kutch:

● Direct block printing is just that. The block is dipped into dye and printed directly onto the fabric.

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Resist block printing is achieved when the block is dipped into a dye resist paste, usually tamarind seed paste and lime, then printed onto fabric which is then dyed and the resist paste is removed to reveal the undyed fabric underneath.

● Ajrakh block printing is a special style of direct block printing for which Kutch is particularly famous. Traditional Ajrakh designs can be traced back several centuries to Persia (Iran). Real Ajrakh is done with natural indigo and madder dyes.

● Discharge block printing is a chemical process whereby the fabric is first dyed with one color, then printed with another.

6.2.2 White metal desk accessories

Copper bells from Jhura in Kutch. Pen stands and desk accessories with traditional inlay work known as Marquetry of Surat.

6.2.3 Embroidered file covers and folders

File covers and folders made from a variety of fabrics and embroideries. Telephone index books, spectacle covers, pass books, writing pads, weekly planners. A range of desk utilities, cloth bound in the entire ethnic fabric range.

6.2.4 Bandhani (Tie and Dye) Fabric

The tie-dyed fabrics of Gujarat are perhaps the best produced in India. Also known as Bandhej, it is produced on superfine cotton mulmul, muslin sometimes combined with gold checks and motifs worked in the jamdani technique. The highest intensity of Bandhini dyeing is in Kutch, but some of the best works are from Jamnagar and Saurashtra, on the Southern coast of Gulf of Kutch. The printed portion of the fabric are pinched and pushed into small points and then knotted with 2 or 3 twists of thread. The knotted parts remain uncoloured and the fabric is dyed in the lightest shade first, retied and dyed in the darker colour. The fabric may be tied and dyed several times, depending on the number of shades in the final colour scheme. The price of the bandhini depends not only on the fabric, but also on the number of times it has to be tied and dyed and the intricacy of the design. Bandhini sarees are easily available in all the bazaars and shopping centres of Jamnagar and here you can also find them brocaded with fine

gold thread zaris. Dress materials in a variety of embroidery styles- Garments, Salwars, kurtas, ghaghras, cholis, odhanis, skirts and jackets are some of the garments available. Each of these garments is created from authentic hand block-printed material, imaginatively embellished with appliqué patterns and embroidery, collected from remote villages of Gujarat.

6.2.5 Batik:

The word Batik has been deciphered in many ways. Some sources say it means "to dot", some translate it as "wax writing" or "drawing with a broken line". Batik is the art of waxing a surface, usually cloth, to make it resist dyeing, and then removing the wax, re-waxing, re-dying and creating intricate patterns and designs. It is a very old form of art. Evidence of early batik has been found all over the Middle East as well as India and Central Asia from about 2,000 years ago. Batik is one of the most attractive and important crafts of Kutch. In this printing, paraffin-wax is used as the resist material. In the 18th and 19th century, the East India Company used to export batik. Nowadays, the craft depends more on local demand than on the export market. This craft is done in the region of Mandvi and Mundra talukas of Kutch. Batik work is done by applying a resist of wax with wooden blocks or by brush and dyeing of the fabric. However, the designs have remained the same for many years. Therefore, a massive dose of new designs need to be created to infuse a fresh lease of life to this art form.

6.2.6 Leather Works:

Artisitic leather work is a traditional craft of Kutch especially of the Banni. Locally available hide is kept in a big jar, immersed under earth for a long period containing water, latex and time. Sometimes the vark od babul tree is added to the mixture to give the leather a red tinge. Then the hair is removed the skin is stitched at edges like a bag and is filled with a solution of babul (Chillka of babul soaked in water for few days) for a further period of 3 to 4 days. After this stitches are freed and the leather is used for manufacturing various articles. Designs of fish, peacock, flowers, etc. are common decorations. Main craft pockets are the villages of Bhirendiara, Khavada, Dinara, Kuran, Kunaria, Hodko, Dumado, Gorewali and Dhordo.

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6.2.7Other Local Activities Practised by Local People:

Some of the major local activities practiced by local people in Kutch are as follows:

Lacquer work :

It is simple reflection of Zigzag patterns creating waves of colors mixing with one another and adorning simplest of the products with vigor and exquisiteness.

Even though the craft forms and technique are the same the design motifs differ while the Sindh artists use bold patterns and thick shades generations of exposure to different communities and designs in India led the Kutchi Wadha to leave the traditional patterns behind and move on to new abstract patterns. Earlier the communities in Kutch used to cater only to the local market but exposure through government schemes and tourism has widely increased their repertoire also bringing positive changes in their livelihood patterns.

Multihued vibrant wooden kitchen cutlery which includes mortar and pestle to the rolling pins for rolling the dough, furniture elements to cabinets and chests, window panels to thread wrapper, the paraphernalia and creativity of Lacquer craftsmen of Nirona consists it all.

Teracotta Works

Terracotta of Kutch is famous for its lovely craft workmanship. Artists here dry the clay in the bright sunlight and later these articles are painted and baked. Thanagarh is famous for ceramic items and clay items such as pottery, animals etc. Tribals are expert in making the items on the wheel. Whistles, pots, toys, animal figures, dolls, are the famous objects. Designs are created with hand and famous motifs are leaves, lines, flowers and figures.

Mud Mirror Works

Mud mirror work or Lippan Kam is a decorative art done by common people mainly women. It is generally done inside bhungas/mud huts in villages of Kutch, Gujarat but sometimes it is found on outer walls too.

Generally harijan and Rabari women make birds, trees, animals, peacock, human figures etc in lippan kam. It is done with a mixture of clay and camel dung. Now gum is used to stick mirrors. Originality of lippan kam lies in adding no colour or only whites. Small round, diamond-shaped or tringle mirror pieces are essential for lippan kam. Many a times mirror pieces are also little embroidered.

6.2.8 Backward and Forward Linkages

Today market needs for handicrafts is intensively increasing. Living standard of people is not only upgraded in context of their appearances but also in their visions for decorating their homes and making it different by using handicrafts or traditionally manufactured items. Kutch is already well known for its culture and handicrafts, but to keep it maintained for backing up the market needs is really essential now a days. People involved in handicrafts are now days facing various challenges like:

- Preservation of traditional crafts of Kutch
- Craft Production management to meet market needs
- Involvement of new generation in craft
- Right returns for artisans to continue practice of craft on a professional level
- Sustainable Market
- Lack of resources such as Capital, Tools , Work sheds for artisans to become strong entrepreneurs
- Lack of resources for development of craft in a organized way

These challenges have put livelihoods of this poor local people in a big trouble. To meet up these challenges it is really necessary to arrange some backward and forward linkages as follows:

Backward Linkages:

- Capacity Building of Artisans
- Accessing diverse raw materials
- Enterprise development
- Training and Skill up gradation / Skill Extension for profitable marketing.
- Funding, Finance and Credit support for above activities

Forward Linkages:

- Skill development for contemporary markets
- Design development for contemporary market
- Market development
- Value addition.
- Exploring market availability.
- Marketing and providing linkages. (Gurjari, Delhi Hat, NIFT, etc.)
- Online Tradings and Advertisements.

Chapter 7
Agro-processing Unit/Micro Enterprise Development

7.1. General Definition of Micro Enterprises (MEs)

Micro enterprise defies a definition. International agencies like Asian Development Bank and World Bank consider such enterprises as micro enterprises those employ less than 10 persons (other conditions also apply). In Indian context, the Micro, Small and Medium Enterprises Development Act, 2006 defines micro enterprises as those engaged in the manufacturing or production of goods where the investment in plant and machinery does **not exceed twenty five lakh rupees**; in case of service industries, the limit of investment is ten lakh rupees.

Major characteristics of MEs are:

- Having limited capital
- Being managed by the owner who is also involved in operations
- Consisting of one self employed individual member of a family or have a few employees
- Providing either supplemental income to make ends meet or the main source of family income
- Lack of advanced skills or technology and the ability to corner the market or influence buying patterns of consumers
- Most often operating outside the limits of regulations and the formal market

Factors for potential for higher returns:

- Family labour
- Low infrastructural cost
- Low capital cost / interest cost
- No taxes / legal costs

Major constraints in micro-enterprise sector:

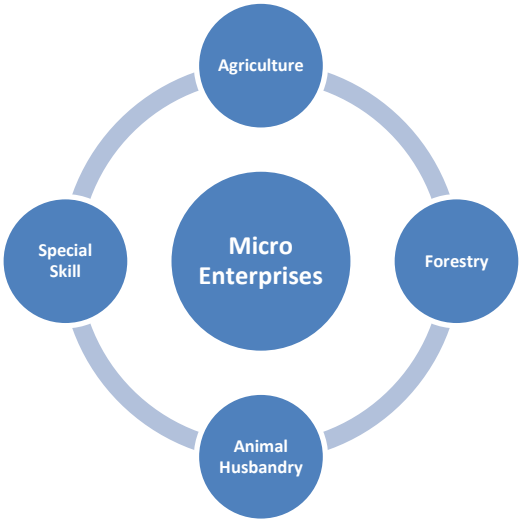
- Timely Credit / funds / finance
- Technical know-how / skills
- Competition from bigger players
- Quality (marketability of products / services)
- Marketing
- Risks

7.2. Types of micro enterprises:

Generally, Micro Enterprises are of the following types:

- Processing/manufacturing: converting raw materials into finished product, e.g. processing ground nut into oil, wheat into flour
- Trading: buying and selling of the same product(s), e.g. cattle feed shop, fertilizer, compost shop, seed shop ,grocery shop, market stall
- Services: main line of business is providing a service e.g. farm machinery services, cattle health services, orchestra services, barber shop, transportation

The diagram above says that the different types of micro-enterprises while being different can have some overlapping, either by design or by default. For example, a unit that is primarily engaged in processing of a certain agricultural product may also start providing services for the same. Further, these enterprises may belong to any of the main thematic areas in rural setting, viz. Agriculture, forestry, animal husbandry or special skill based. This is depicted in the diagram below.



Further, the activities may be of following types

- Existing activities which need to be supported
- New activities likely to be introduced
- Cluster level activities

7.3. Need of Micro Enterprise Development in IWMP:

The ultimate aim of Integrated Watershed Management Programme (IWMP) is improving the standard of living of the rural populace by enhancing sustainable livelihood opportunities. Standard of living can be improved only if the income stream of the people becomes more reliable in the long run. The basic activities under the watershed development programme, like conservation of natural resources can lead to a sustained increase in income flow through a number of relevant micro-enterprises. A carefully chosen set of micro-enterprises can optimize the results achieved through resource conservation on one hand and development of the land-less and asset-less on the other. Thus the need for micro-enterprises under IWMP can be listed as below:

- To improve the scope of livelihood for asset-less and land-less in particular
- To optimize the resource conservation activities
- To add value to the production system at the village level

7.4. Steps in Micro-Enterprise Development:

Although capital requirement of a micro-enterprise is low, to the poor it is still high. Therefore, the risk of undertaking micro-enterprise is not low. For the poor it is very hard to recover from failure of the micro-enterprises. Thus, as one should be very careful while planning and designing a micro-enterprise for the poor/asset-less. A number of steps are described below to guide an implementer regarding how to go about setting up and managing micro-enterprises.

The four principal steps in micro-enterprise development are:

a. Opportunity Scanning

- Understanding available resources at village level by Baseline Survey, Resource Mapping, Focused Group Discussion, etc

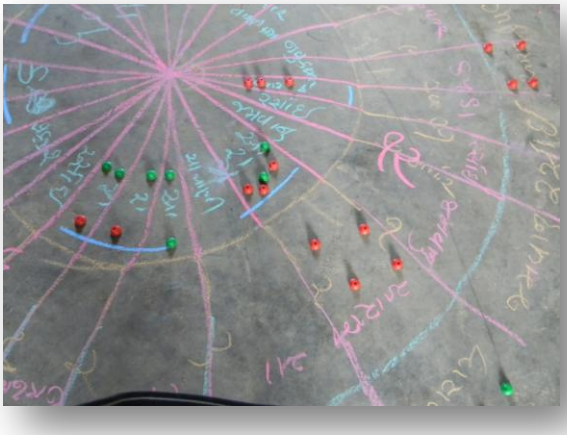
Resource mapping

Micro plan of villages gives ample details about all kind of resources. However, it is advised that member of PFT responsible for MED must undertake a "traject walk" in the village focusing on gathering relevant details in respect of MED (not available and amplified in micro plans) as required for preparation of micro enterprise table (refer step 3) and also for validation for some key information given in the micro plan.

Land and Water Resource Mapping

Cattle and fodder resource mapping

Time resource mapping



Infrastructure availability map

- Making a thorough SWOT (Strength, Weakness, Opportunity, Threat) analysis of the sector
- Analyzing income and expenditure of village and group
- Identifying the point of intervention from income and expenditure analysis
- Understand the gap between production (supply) and demand of market
- Preparing a potential list of activities that can be taken up
- Making detailed study of each of the potential activities in following terms:
    - **Check its feasibility**

- ✓ Economic (demand conditions)
- ✓ Social
- ✓ Political
- ✓ Environmental
- ✓ Infrastructure
- ✓ Source of raw material

- **Check its viability**
  - ✓ Availability of Technology
  - ✓ Project cost / financing
  - ✓ Marketability
  - ✓ Profitability of the product
    - Revenue maximization (sales)
    - Cost minimization
  - ✓ Degree of risk
  - ✓ Gestation Period
  - ✓ Government policy

· Zeroing on a few activities to be focused and supported intensively; taking up a few activities intensively can have far greater benefits in terms of increasing family incomes significantly than taking up a large number of small incoherent activities. Only those activities should be selected which are both feasible and viable.

On the basis of data available from micro plan and additional information about marketing channels, WDT and villagers should draw one Micro Enterprise Table for each village. A sample table for illustration is given below:

Micro Enterprise table

Activities	Nos of entrepreneurs	Raw material availability	Support services	Sales possibility			Skill level	Suggested activities
				village		Hatt		
				In	out			
Candle making	5	N	NA	N	Y	N	Y	N
Vermi-composting	35	Y	NA	Y	N	Y	Y	Y

In the above table Y, N and NA means Yes, NO and Not Applicable respectively. For suggesting activities to be promoted, the criterion to be adopted is that if Y appears in all columns, then that existing activities may be promoted. However, following caveat must be kept in mind before taking a decision.

Matrix ranking is also one of the tool for understand the feasibility of the different enterprise options at village level.

In spite of any activity satisfying the above criterion, the same should not be promoted in following situations.

- **Market saturation** – Some activities like grocery and tailoring cater to needs of one or two villages only .For such activities market saturation factor must be considered before suggesting and promoting such activity.
- **Social factor** – Some activities such as carpentry, barber shop are caste based occupations. If there are not adequate persons of that caste available in any village then particular activity should not be suggested in the village even if all columns in the micro enterprise table have recorded Y.

Identification of new activities

This will emerge out of focused group discussions during which many members of the target group may express intention of starting some new activities guided by observing sale of some products in the local market or he or she might have acquires some special skill for making any specific product. In such a situation the selection of such activity would be guided on touch stone of market potential. However, other factors guiding selection of any activity would also be kept in view.

The role of WDT is to convert intention into reality but on the basis of rigorous analysis. The analysis would be based on general factors to be considered for identification of any activity (refer page 7 para 3.2.1). As any new activity has got higher risk component, following points would merit deeper understanding and analysis WDT.

- **Possibility of marketing linkages**

New product/service may have got huge demand in state/national market. But being situated in a remote area, the unit may not be able to link with the market on account of

logistic constrained. In such a situation, WDT and MDT must explore and examine the possibility of linkages before coming to a conclusion.

- **Re-look about skill & proficiency**

Any member of target group may have acquired a level of skill for making a new product. The level of skill and proficiency may not be adequate for making quality product accepted by the market. In such a situation, survival of unit would be threatened. To avoid this eventuality, WDT must validate and satisfy himself about skill level of prospective entrepreneur with reference to quality specifications. If needed, training may be provided to such category of entrepreneurs.

- **De-risking**

As new activities have element of higher risk, WDT must explore strategies for de risking in respect of such enterprises. One of the probable strategies may be to support such activities on group basis. The other strategies would be dependent on ground situations to be explored by WDT and MDT.

The above categories of activities may be promoted for individuals as well as for groups. The information about existing groups in villages are available in micro plans and should be utilised.

Identification of activities at cluster level

This is an exercise to explore possibility of up scaling of existing activities and also improving the profitability of existing activities by initiating measures like going for collective purchase of raw material etc. and also opening new windows for marketing.

Such activities are selected which are ongoing in maximum number of villages and in which more number of people are involved.

Step 1: All suggested activities are listed which appear in the micro enterprise tables prepared for all villages in the cluster

Step 2: Number of entrepreneurs from micro enterprise tables of all villages in the cluster in respect of a particular activity are added

Step 3: Villages where any particular activity is being pursued are identified

These are compiled in a table and then 2/3 key activities are selected on the basis of criteria listed above. One sample table is given below for illustration:

Identification of cluster level activities

Name of activity suggested in micro enterprise table	Number of entrepreneurs	Number of villages where the activity has been suggested
Milk processing	200	6
Grocery	150	1
Tailoring	50	2
Pickle making	100	5

It would be apparent from the above table that milk processing and Pickle making may be identified as activities to be pursued at cluster level. For such type of activities to be supported at cluster level, it is necessary that business plans should be prepared for each selected activity. Business plan is a comprehensive document detailing production processes, availability of resources, support services, financial requirement, need for inputs, market and value chain analysis , action plan and also implementation mechanism.

b. Business Planning

Before starting up any activity / enterprise, Business Planning is a must. Though a Business Plan is not any guarantee against failure, it certainly helps in better planning and making the entrepreneur mentally ready for the things to expect. A typical Business Plan should include the following:

- Background
- Need for the enterprise (Demand conditions)
- Costing

A model costing format is given below:

Sr. No.	**Cost Head**	**Unit**	**Unit cost**	**Total**
I	Fixed Cost			
a	Land/Building			
b	Equipment			
c	Other infrastructure			
	Total: Fixed Cost			
II	Variable Cost (One production cycle)			
a	Labour			
b	Raw material			
c	Rent			
d	Interest			
e	Miscellaneous			
	Total Variable Cost			

- **Production plans**

- **Marketing plans**
- **Linkages**
- **Finance plans**
- **Revenue Model**

  A model format for preparing a Revenue Model for one production cycle is given below:

Sr. No.	Heads	Unit	Amount / Quantity
1	Total Variable Cost (TVC)		
2	Total Production (Q)		
3	Average Variable Cost : AVC= (TVC/Q)		
4	Average Revenue (AR=Price)		
5	Total Revenue: Total Market Value of the produce (P*Q)		
6	Unit Margin (P-AVC)		
7	**Net profit per cycle (TR-TVC)**		

Further Analysis:

- Break Even Point= Total Fixed Cost (or, Investment) / Unit Margin
- Benefit Cost Ratio (BCR)= Net Benefit / Net Cost
  - should be greater than 1
- Internal Rate Return (IRR)

c. Hand-holding / Monitoring:

Handholding services start after selection of activities and continue during phase of identification of entrepreneurs and mentoring support during setting up MEs and its working up to one year after disbursal of assistance. Identification of asset less micro entrepreneur at village level needs some exercise like wealth ranking, FGD with asset less to understand their livelihood pattern.

It is one of the learning of Phase -1 that there was no effective system for providing hand holding services to MEs. Experience suggest that mortality rate of MEs are highest in first year of their existence.

Especially in context of project area and profile of entrepreneurs, there is need for a framework and developing system of nurturing and developing entrepreneurial skills follow –up and for providing such non financial services to MEs during their first year of existence. It needs to be institutionalized for becoming effective.

Major components of the framework and steps to be taken by WDT/MDT are listed below:

- After selection of activities, WDT must identify potential entrepreneurs. It would include two categories of the target group. One category will include those who are already running their MEs. The second category of such persons going to start their venture first time. Selection of entrepreneurs should be based on observations (though psychological tests are available but not recommended to make operation simple and doable) in respect of following personality traits :
  - ✓ willingness to take calculated risks
  - ✓ Educational qualification
  - ✓ Skill & proficiency in any particular field
  - ✓ Age group (preferably below 35-40 years)
  - ✓ Achievement motivation
- After identification of entrepreneurs (both the categories) , one small duration (2 – 3 days) entrepreneur development programme for about 10-15 persons be organized preferably prior to disbursal of assistance. Standard module for such programme should be developed and used by EDII.(which is our training institute as per capacity building manual)
- WDT must contact the entrepreneurs at least once in a month upto one year from date of disbursal of assistance and play the role of mentor. This will also provide them a menu of services needed by MEs to be delivered by experts.
- Sector specialist must visit 5-10 % of assisted units every months
- Feedback of visits must be recorded
- Based upon the identified needs, WDT should prepare a calendar of training programmes for MEs in different functional areas to be conducted by experts

- Once in six months a rapid survey of such MEs assisted during that period should be got conducted by independent consultant to ascertain their health and their needed services.

Identification of intervention

For each category of activities, a set of interventions need to be identified. The scope and magnitude of such type of interventions would be more in respect of cluster based activities. Business plans prepared in context of cluster level activities would provide adequate details of such interventions.

- Back ward linkages(exp. farm machinery services, compost, seed, fertilizer and pesticide in agriculture, fodder, cattle feed, medicine etc. in animal husbandry)
- Forward linkages (storage facility, collective marketing services etc...
- Value addition(grading, packaging, processing on raw product)
- Increases marketing capacity of Traditional art (embroidery, bandhani, bamboo craft, pot making etc..)

After identification of such interventions, WDT should categories such interventions. One category of interventions may be such which can be addressed within project funds. The another category would include such initiatives which would require convergence approach and same can only be accomplished with the help of the community and departments of the government and Gujarat livelihood promotion company.

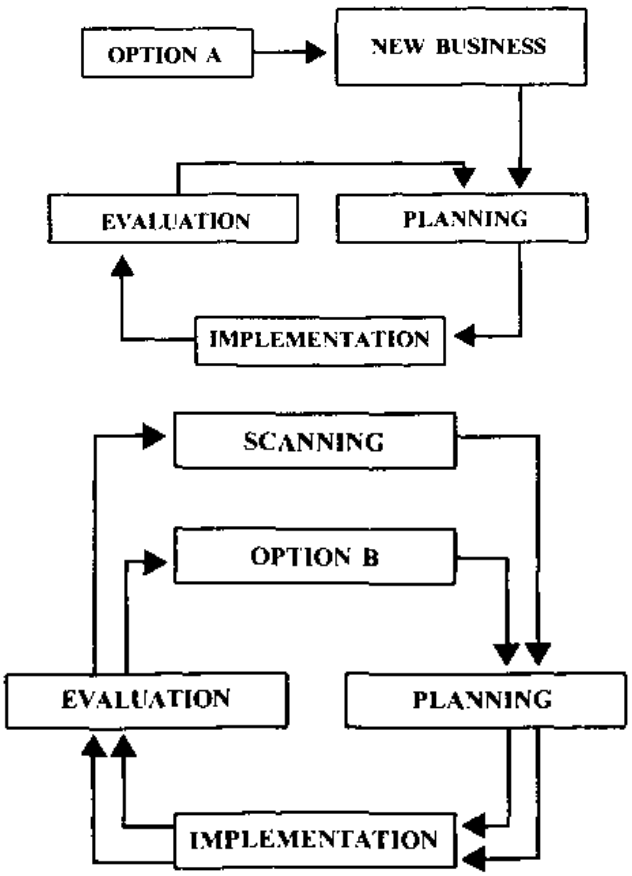
Business Cycles:

A typical Business Cycle goes like this:

Business Planning ⟶ Start up ⟶ Expand / Diversify

Once an enterprise has completed a business cycle there are three choices:

- ✓ to open a new business (diversify)
- ✓ to continue with the existing business (expand)
- ✓ to cease to operate the existing business (close)



7.5. Sustainability Factors:

Sustainability of the enterprises taken up is more important and a larger issue than the enterprise itself. Because an enterprise not managed properly, if fails prematurely, it may result in the beneficiary getting worse than before. Thus, the implementer should take care of certain important factors listed below so that the enterprises become sustainable.

- ✓ Pre-business mental preparedness
- ✓ Capacity building / skill development
- ✓ Ensuring margins/profits
- ✓ Demand-supply management
- ✓ Risk management
- ✓ Linkages
- ✓ Enabling institutions
- ✓ Infrastructural development
- ✓ Business Development Services
- ✓ Proper accounts and audits system

Chapter 8
Institutional Framework

8.1 Introduction:

Watershed Programme encourages promotion of social and existing specialised institutions for deriving economies of scales, backward and forward linkages, and access to information, credit, technology, markets etc. These community institutions play a vital role to implement the programme successful and achieve the goal for the sustainable development. Existing tribal institutions in the rural area has its own value and distinct identities with a strong potential to implement the programme properly but due to glamour of modernization and selfishness attitude among the rural inhabitants, the governance and the systems are politicized and become exploitative in nature.

Institution is a structure of social order which governs the behaviour of the set of individuals in a certain human community. It is very much necessary to strengthen the existing and new institution in the village to sustain the impact of the projects in long run. Institutions are governed by certain rules and regulations.

Sustainable rural development requires an efficient and effective governance framework. Rural governance refers to the management of social affairs by institutions to improve the quality of life in an inclusive, transparent and accountable manner. The 'good tribal/rural governance' is characterized by equity, efficiency, transparency, accountability, social engagement and security of people and environment. Good rural governance creates a large pool of 'social capital'.

As per the dictionary, the concept of social capital highlights the value of social relations and the role of cooperation and confidence to get collective or economic results. The term social capital is frequently used by different social sciences. It is a wide term, and that is why it can be defined accentuating different aspects depending on the perspective. In general terms, we could say that social capital is the fruit of social relations, and consists of the expectative benefits derived from the preferential treatment and cooperation between individuals and groups which helps to sustain the institutions.

8.2 Different Existing Institution

Existing institutions are categorized into two subheads like Informal Institutions and Formal institutions. The institute or structure which governs by the social means, social rules and regulations and not documented properly in paper, are includes in informal institutions where as the Institutions having proper & systematic documented rules regulations are in formal Intuitions. Family, marriage, kinships structures are in Informal institutions where as formal institutions are Gram Panchyat, SHGs, WCs, Co-operatives, NGOs, BANKs etc.

1. **Formal Institutions**
   - ❑ SHG

- ❑ Panchyat
- ❑ User Groups of Different Govt. Schemes
- ❑ JFMC in Forest Villages
- ❑ Various co-operatives
- ❑ Education Institutions
- ❑ Health Institutions

2. **Informal Institutions**
   - ❑ Religious Committees
   - ❑ Social-based committees
   - ❑ Family

8.2.1 Characteristics of Traditional Institution and Modern Institutions

Traditional institutions or Existing are generally high degree of personal intimacy with strong moral commitments. Norms of these institutions are sacral, traditional, male dominated, emphasizing on communal harmony and equitable growth, usually strong respect of nature and sustainable values, including concern for future generation. These are respects habits and traditions. Social ostracism is one of the powerful tools to influence the community.

Modern Institutions are individualism with written contractual commitments. The norms are secular, democratic, gender sensitive, emphasize on common goals and vision of equitable development for all members and organisation, and depend on the objectives of the institutions. Power only limited to domain not to the social life. Can expel a member from the institution but can't ostracise from community. These institutions are having strong respect towards the goal and achieve the objective at any means in transparency and accountable.

Both traditional and modern institutions are having their own identity. Some researchers gave importance to the traditional institutions due to the social cohesiveness and sustainable in nature where as some of them gave strong support to the modern institution for rural development.

As stated in the LARA, Volume-1 in chapter-9 "Social Capital for NRM intervention"- Now the institution are initiated accepting the both values to provide maximum benefit to the people. So it's necessary to adopt the policies to local realities and conditions in order to maximise the positive impact on sustainable development. Incorporating informal institutions in development strategies will be instrumental in improving development outcomes.

8.3 Activities to Generate Good Will or Social Capital in the Village

Social Capital can't be generated by direct investing rather it automatically comes with time through generating good will in a society. In practical terms, social capital is developed over time through:

- Engaging in networks, relations, and collective activities;
- Practising relations and activities;

- Learning and experiencing how to interact and cooperate, overcoming difficulties;
- Benefiting from collective gains, creating positive results and externalities;
- Institutionalizing the norms and habits of cooperation;
- Placing social capital in the context of the other resources for rural development.

There are crucial steps in the formation of social capital which cannot be omitted. Firstly, it is important to become connected to the informal networks that allow one to engage in initiatives and shared practices. Secondly, it is crucial to get connected to the institutions and organizations that provide support and a kind of security net. And thirdly, it is essential to get connected to common identity platforms (ethnic, territorial, social etc.). If activities, institutions and platforms can be aligned there is a good chance of forming solid social capital.

On the other hand, the factors that hinder formation of social capital can include: civic passivity, scepticism towards public institutions, technical factors (such as distance, inadequate infrastructure for communication) and social factors such as belonging to a disadvantaged group, lack of education and skills etc.

Good Will / Social capital can be created and strengthened in watershed areas through practicing the following things in each steps of milestone:

- Good Attitude and Behavior
- Punctuality
- Un-biasness
- Listen their problems and difficulties
- Not giving false promises
- People's Participation and Involvement
- Exposure Visit
- Involvement in cultural program
- Respect towards local culture and system
- Learning and experiencing how to interact and cooperate, overcoming difficulties

Although many institutions have evolved over the years for adequately and efficiently managing natural resources, there is a need for a more stable institutionalised framework that will incorporate new actors that have been traditionally left aside and the values that traditionally sustainable.

The term “institutional framework” refers to a set of formal organizational structures, rules, regulations and informal norms for service provision. Lack of sound institutional frameworks is the root cause of failures in implementation and sustains the project in the village. Such institutional weaknesses often results from the lack of a clear institutional framework for planning and management, together with limited capacity within institutions to co-ordinate and manage initiatives.

We need a proper framework to strengthen the institution due to the following reasons:

- Accepting the social values to provide maximum benefit to strata.

- To increase income to eliminate the middle man
- To sustain the project impact for long period through institutions
- Incorporating Public Private Partnerships (PPPs)

8.4 Different Institutions in Watershed Area

- SHG
- User Group
- WC
- Farmers Organization
- Agri-allied Committees
- Different co-operatives
- MFP-NTFP Committee
- Weavers Committee
- Different Handicraft Committee
- Societies
- Producer Company

8.5 Institutional Choices

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Institutional analysis for rural development should focus on the ways in which institutions influence poverty and the livelihoods of poor people. In order to arrive at such an understanding, we need to understand the poor and recognize that they are not homogeneous but rather an extremely diverse group with different key characteristics. Gender, age, social and economic class, ability, ethnic background, history and geographic location are among the characteristics of different groups of poor people

that must be taken into account. Institutions take many forms, but concretely we can identify two types of institutions that are of critical importance to poor people – **service providers** that provide goods and services, and **enabling agencies** that establish the policy and legal framework, set the rules and determine how resources are distributed. In order to understand these, we need to understand not just the structures and capacities of the organizations and agencies that fall into these two categories, but also the quantity and quality of relationships between these institutions and poor people.

Following institution choices can be formed in the villages

- **Revive Traditional Institutions (Social Institutions):** Traditional institutions which already exist in the villages can be revived incorporating rules and regulation to achieve the project goal and generating income.
- **Reorient Exiting Institutions (SHG, UG, Co-operatives etc):** Existing dead or neutral formal groups such as non-working SHGs, co-operatives etc. can be reoriented or revitalized or recharged through continuous capacity building and making the aware and understand about the project and income generating activities.
- **Create New Institutions:** As per the project need, some institutions can be created in the villages and engaged in income generating activities which will help the project sustain after the completion as act as a hand-holder institutions.
- **Excusive Institutions for Marginalized:** It's very much important to understand that 'Common Guideline 2008' focuses in the marginalized exploited poor assetless people. So there must be exclusive institutions for these sections of people to facilitate to co-ordinate in livelihood activities; such as artisan groups, weaver group etc.

8.6 Formation of Institutions in Different Stages

Understanding the livelihoods of the poor is essential to understanding how institutions affect those livelihoods. The Sustainable Livelihoods Framework provides a useful framework for understanding the livelihoods of the poor. It focuses on their strengths, capacities and assets and the vulnerabilities they have to deal with, and how these shape their aspirations and their perceptions of opportunities. It also seeks to understand how these shape the actions or strategies that people adopt and the outcomes they achieve.

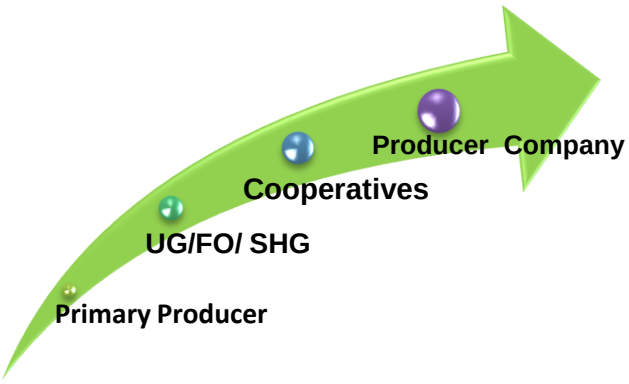
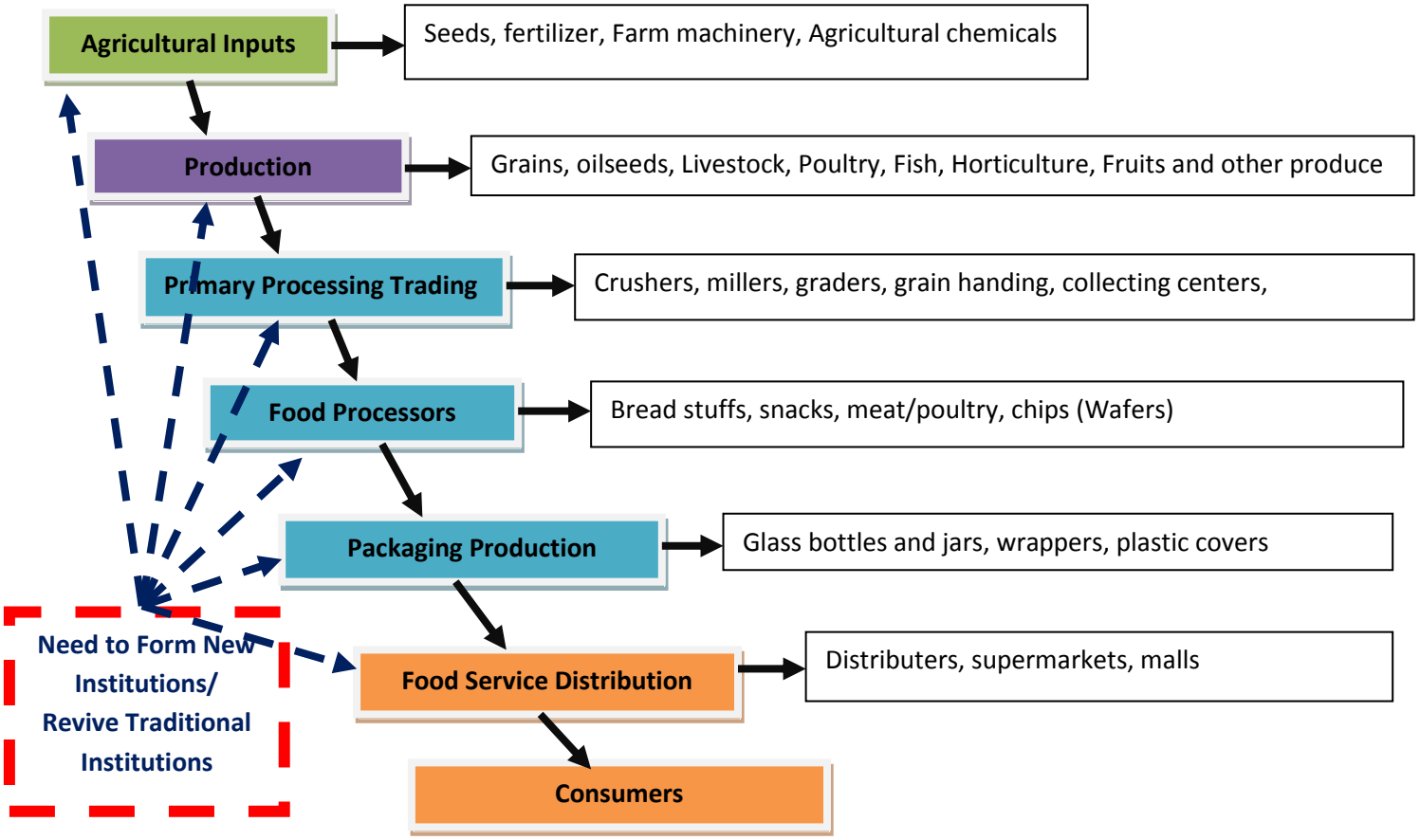


Diagram: Formation of Institutions wrt Time

Following example of agricultural value chain shows how the institutions play a vital role to increase the income. The picture shows that in every stage an institution need to

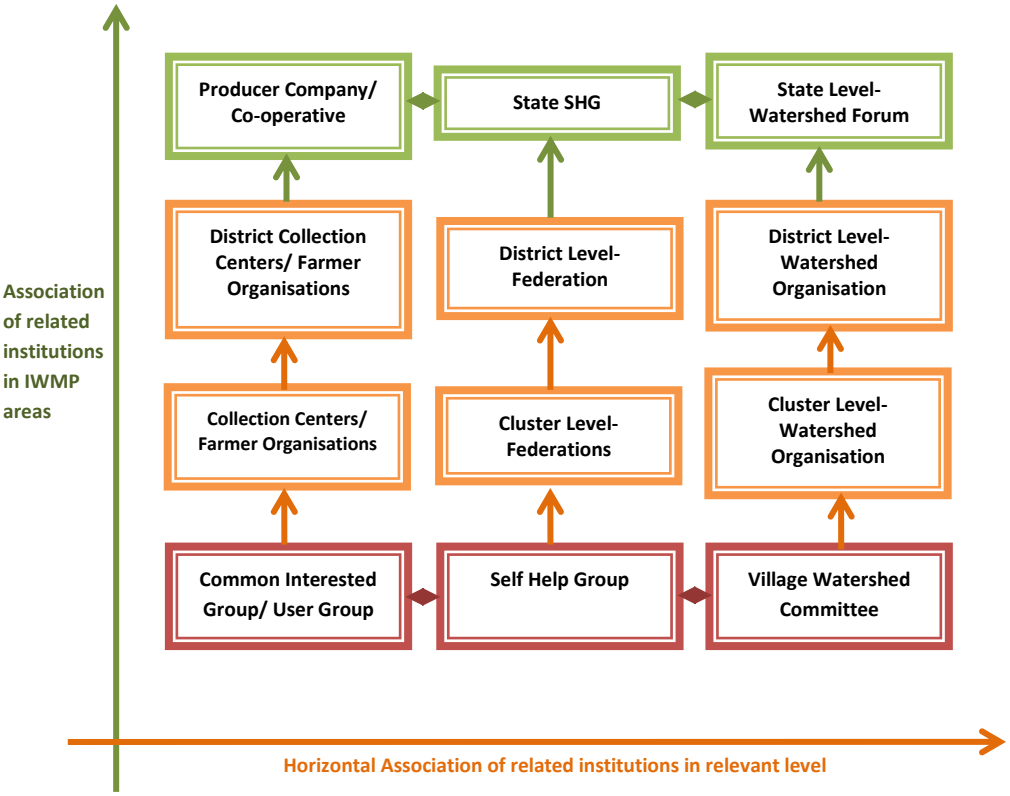
bargain the price and make a proper flow. There is a need of collective action through an institution rather doing the activities individually which has been seen in the villages till now.

EX: A Typical Agricultural Value Chain & its Institution



Institutions like Farmer organisation (FO), SHG, Co-operatives, Producer Company can be formed as per the suitability of the require environment, time and the knowledge of the stakeholders.

Side figure also give a idea of the association of institutions in various level. Brief discussion of federations, Producer Company and Farmers organisation are illustrated as follows:



8.6.1 Federations:

Main functions of federations are as follows:

- Strengthening SHGs
- Providing value added services
- scaling up programmes
- Facilitating woman's emplowment
- Taking over some of the functions of promoting organisation

Some key principles need to understand while designing the federations or institutions are described below:

i. Choice and organisation of the functions:

Federations are divided according to their functions, sometimes federation are choose to take up purely commercial functions where as others choose purely social welfare function & remaining tries to combine both.

Some federations, focused on different issues according to their different layers. For example, in the DHAN (a federation) functions as nested institutions, the lower tier of the federations focuses on financial intermediation, the second tier works on capacity building and the apex body works on linkages with other government departments.

ii. Size of the federations:

Size of the federations varies at all level but the ideal sizes of the membership of SHGs at all levels in IWMP projects of Gujarat state are given as below:

Federations	Membership Units	Range size of Memebership
Unit at Village level	Individuals	10-25
Cluster level/ Primary level federations	SHGs	7-50
District Level/ Secondary level Federations	SHGs	50-80
State level/ Apex level Federations	SHGs	1000-3000

(Note: The size of the federations may varies as per the sitiatution, objective and purpose of the institions)

It is hard to say what should be the ideal size for the aggregation of SHG to form a federation, because it will depend on its purpose, objectives and the local situations.

If the purpose of aggeregation is the collective marketing of agricultural produce, the minimum quality of produce the needs to be maintained in order to gain the bargaining power, will determine the level of aggregation of producers.

In saving and credit groups, if the purpose were to provide common servises to the SHGs for a fee and to make the model self supporting, much will depend on the available human resourses, the geographical terrin and the local infrastructure, determines the number of SHGs that a service provider can cover in a day.

8.6.2Producer Company:

Objectives of Producer Company:

The objects of producer companies shall include one or more of the eleven items specified in the Act, the more important of these being:

(i) Production, harvesting, procurement, grading, pooling, handling, marketing, selling, export of primary produce of members or import of goods or services for their benefit;

(ii) Processing including preserving, drying, distilling, brewing, venting, canning and packaging of produce of its members; and

(iii) Manufacture, sale or supply of machinery, equipment or consumables mainly to its members.

The other objects include rendering technical or consultancy services, insurance, generation, transmission and distribution of power and revitalisation of land and water resources; promoting techniques of mutuality and mutual assistance; welfare measures and providing education on mutual assistance principles. Important Terms and Concepts are discussed in Box-2.

Steps to be followed to form a Producer Company

BOX 1: Steps to be followed for the incorporation of a Producer Company	
Step 1	Meeting with the villagers and introduce the concept
Step 2	Exposure visit to a Producer Company
Step 3	Motivating Eligible members to become shareholders
Step 4	Meeting the shareholders and discuss objectives/ possible business ideas
Step 5	Drafting of Memorandum and articles of association
Step 6	First informal meeting of the shareholders to approve: • Approval of Memorandum and articles of association • Selection/election of promoter (effort to be made by initiator to avoid election in this stage as it can lead to drift among some members) • Authorised Capital and Cost of each share

Box-2: Important Terms and Concepts for Understanding Producer Company:

A. PRIMARY PRODUCE

Produce of farmers from agriculture and allied activities or produce of persons engaged in handloom, handicraft and other cottage industries, including any by-product and product resulting from ancillary activities thereof. Also, any activity intended to increase the production or quality of aforementioned products or activities.

B. PRODUCER

Any person engaged in any activity connected with or relatable to any primary produce.

C. PRODUCER INSTITUTION

Producer Company or Institution having only producer(s) or Producer Company (ies) as its members (may or may not be incorporated) having specified objects and agreeing to make use of the services of the Producer Company (ies).

D. PRODUCER COMPANY

A body corporate registered under the Companies Act, 1956; and having specified objects and activities (refer box). Ownership and membership of such companies is held only by 'Primary Producers' or 'Producer Institution', and member equity shall not be publicly traded. However it may be transferred, only with the approval of the board of directors of the Producer Company.

E. WHO CAN FORM PRODUCER COMPANY?

Any one of the following can get a producer company incorporated under the Act:

- Any ten or more persons engaged in any activity connected with primary produce, or
- Any two or more producer institutions or companies, or
- A combination of ten or more individuals and producer institutions.

F. CHARACTERISTICS OF PRODUCER COMPANY

The registered producer company should be treated as a private limited company with the significant difference that a minimum of two persons cannot get them registered.

- These companies are with limited liabilities and limited only by share capital.
- The liability of the members is limited to the unpaid amount of the shares held by them
- As per the new circular, minimum paid-up authorized capital is of Rs. 5 lakh.
- The maximum number of members can exceed 50.
- It shall never become a public (or deemed public) limited company.
- Members' equity cannot be publicly traded but be only transferred.

As such, "producer companies would not be vulnerable to takeover by other companies or by Multi-national Companies (MNCs).''

G. WHY PRODUCER COMPANY?

- To offer a statutory and regulatory framework that creates the potential for producer-owned enterprises to compete with other enterprises on a competitive footing.
- To provide for the method of formation and registration of "Producer Companies" which, *inter alia* carries the principles of "mutual assistance" and "Co-operation" within the more liberal regulatory framework afforded by the company law with suitable adaptation.
- To provide an opportunity (on a purely voluntary basis), to the existing large multi-state cooperative institutions and societies, to voluntarily convert themselves into the new form of producer companies.

8.6.2 Farmers Organisation:

Farmer organizations can be grouped into two types: one is the community-based and resource-orientated organization; the other is the commodity-based and market-orientated organization.

Community-Based, Resource-Orientated Farmer Organizations type could be a village-level cooperative or association dealing with inputs needed by the members, the resource owners, to enhance the productivity of their businesses based on land, water,

or animals. These organizations are generally small, have well-defined geographical areas, and are predominantly concerned about inputs. However, the client group is highly diversified in terms of crops and commodities where as commodity-Based, Market-Orientated Farmer Organizations specialize in a single commodity and opt for value-added products which have expanded markets. They are designated as output-dominated organizations.

FO can be used to increase the income of small producers. In the following steps, the term VEW will be used to refer to the person or group of people selected to establish the FO. Detail regarding the Farmers organisation is given in the Annex 8.2.

Box-2: Steps to be followed to form Farmers Organisations	
Step 1.	Understanding the Village Community
Step 2.	Identifying Potential Leaders in the Community
Step 3.	Talking to the Identified Leaders and Seeking Cooperation from Other Agencies
Step 4.	Helping Local Leaders to Call Community Meetings
Step 5.	Nominating Core Group Leaders to Develop or Establish the FO
Step 6.	Developing an Organizational Structure for the FO
Step 7.	Developing the FO's Management through Education and Action Learning
Step 8.	Gearing up for Action
Step 10.	Monitoring and Evaluating the FO's Progress

The below table shows the name of Institutions need to form for the proper management with respect to time.

Table: Formation of institutions with respect to time

Sr. No.	**Procedures/ Stages**	**Name of Institutions Need to be Form for the Proper Management wrt Time**				
		FO / UGs*	**SHGs**	**Corporative**	**Federation**	**Company**
1	Production (Farmer)	Yes	Yes	No	No	No
2	Collection at Village Level	Yes	Yes	No	No	No
3	Collection at Block Level	No	Yes	Yes	No	No
4	Collection at District Level	No	No	Yes	Yes	No
5	Wholesaling and Processing	No	Yes	Yes	Yes	Yes
6	District Level Wholesale Unit	No	No	Yes	Yes	Yes

*(*FO: Farmer Organization & UG: User Group)*

8.7 Basic Design

Basic design of Institution will enable us to understand some of the essential elements in the institutions that influence the livelihood outcomes of the poor. The design including the different sorts of laws, rules and regulations that are in place, as well as the processes by which these are established and enforced, plays a key role in establishing how events and processes in the institutions run effectively. A brief discussion of a design given below:

1. The service rules or working rules are the rules that determine the roles of different actors and agencies, the way in which they work together and the quality of their relationships (such as clear rules that ensure the rewards and the performances of the service holders);
2. By laws or the collective choices rules that establish what processes or conditions are required in order to set, or modify, the working rules; this includes those mechanisms that permit different actors with different functions to generate feedback within a particular action arena so that changes can be considered (such as rules that ensure the transparency in the institutions)
3. The transactions rules or the constitutional rules determine the procedures that can be used to set, or modify, the collective choice rules.

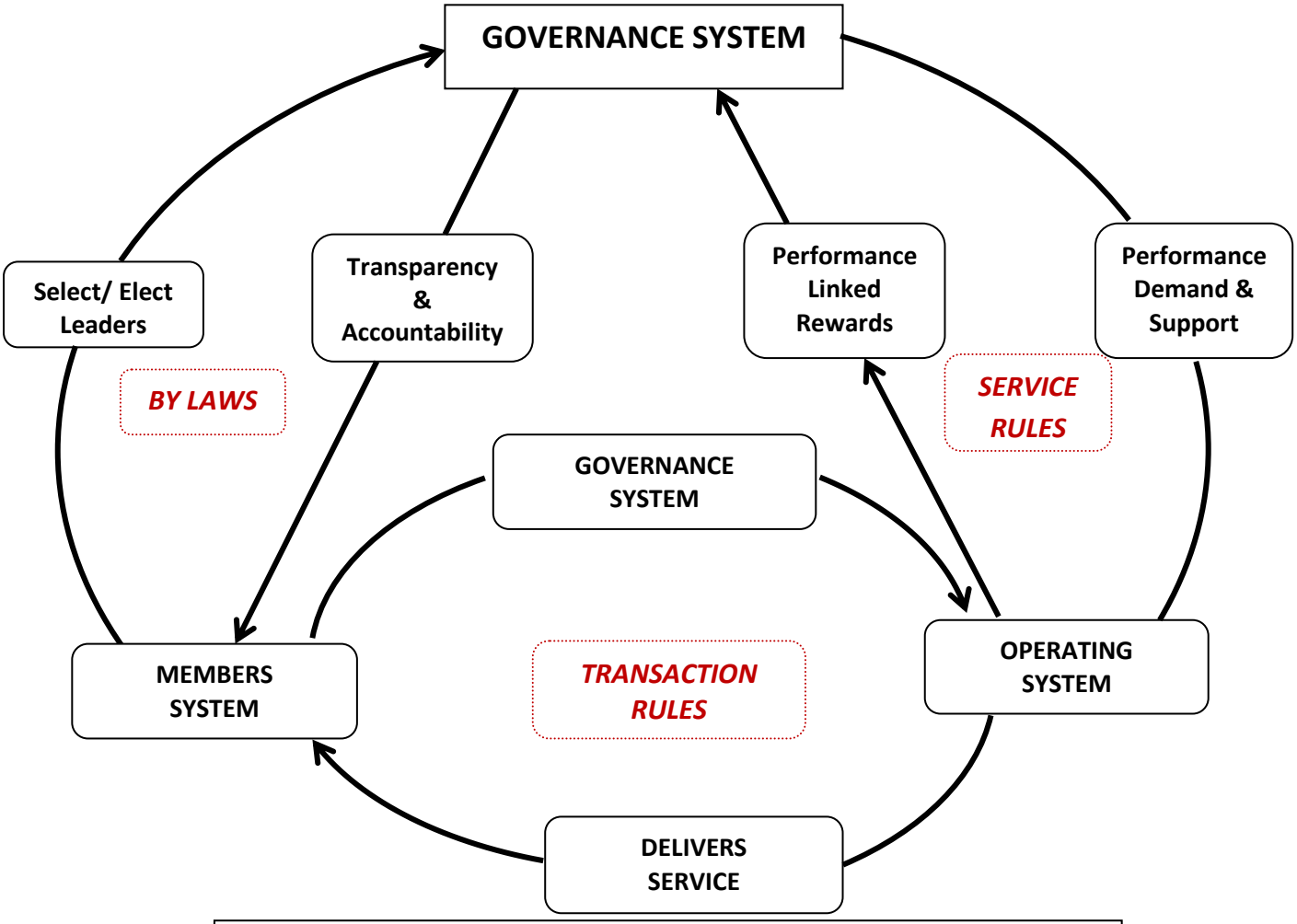


Diagram: Institutional Frame Work

8.8 Developing strategies for institutional change for the sustainability of the Institutions

Developing effective strategies for initiating and sustaining processes of pro-poor institutional change requires:

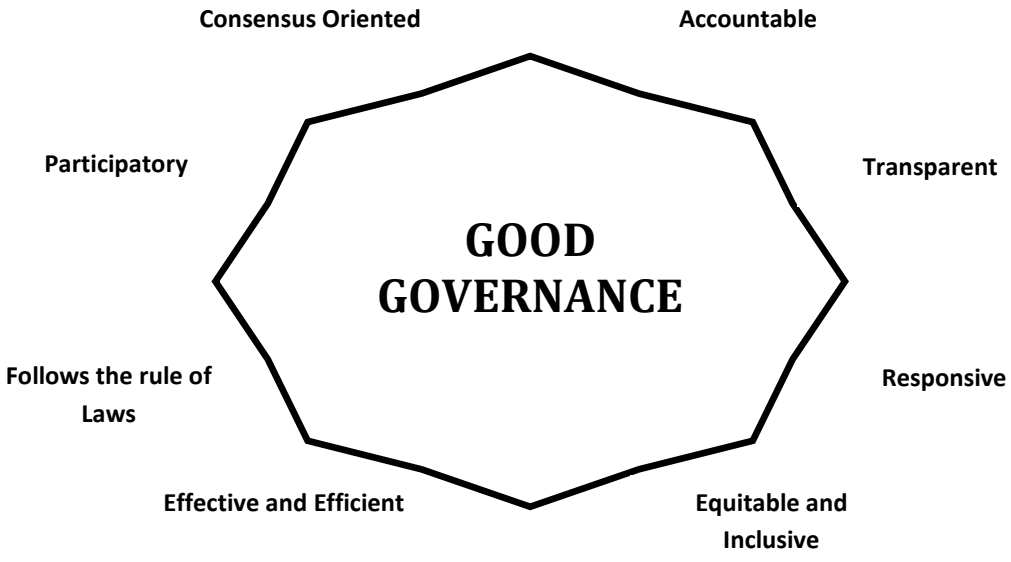
- staying focused on the desired end result; positive change in the livelihood outcomes of the poor;
- using knowledge about institutions to define, as accurately as possible, the changes needed at different institutional levels to achieve positive change;
- making strategic choices about what can and cannot be achieved;
- systematically defining what needs to be done to achieve changes at different levels, and the actions required to sustain those changes;
- a careful assessment of the capabilities of different institutional actors to lead and participate in the process of pro-poor institutional change.

To make the institution sustainable two main points must be take care that are briefly discuss below:

- Good Governance system
- Proper Conflict Resolution System

8.8.1 Good Governance System

Participatory/ Decentralization planning will bring government closer to rural communities and is a positive factor for better services and for the use of local capacity. Enhancing participation and effective involvement of civil society and other relevant stakeholders at all levels in consultations, planning, decision-making, the operation and management of sustainable sanitation services, in research and in other related activities, as well as promoting transparency and broad public participation is of paramount importance.



Good governance can be achieved through:

- Engaging civil society organizations/ institutions in policy development, research and advocacy, and assisting with planning, implementation and management of programmes and projects at community level;
- Supporting the development of capacity in civil society organizations;
- Encouraging civil society organizations to help monitor sector performance at all levels;
- Engaging civil society organizations in creating a link between government and local communities;
- Engaging capacitated community-based organizations to manage water services projects at the local level, where appropriate
- Making the unbiased rules and regulation that should be accountable and transparent
- Efficient and effective uses of available recourses
- Following the rules and regulation of laws at every stage such as in registration, at the time of running. (registration details are discussed in the is detailed in the annex)

8.8.2 Conflict Resolution Management

Resource, extraction and uses have seen episodes of conflict and social unrest in the social, economic or environmental spheres. Conflict may arise due to following reasons:

- The rules may not sustain the institution
- Biased decision by the president
- Different opinion among the group members
- At the time of deciding new policies
- Presence of free riders in the institutions

Conflict is usually handled by governments but it is perceived as biased towards big business. There is the need for a neutral, objective and credible body to help solve conflicts with objectivity and lasting effects. Following points helps to minimize the conflict in institutions:

- The Polices will be designed by the active participation of the members from all communities
- Incorporating unbiased governance system
- Transparency and regular accountability
- Punishment policies for the free riders
- Establishing proper operational rules

8.9 Legal and Adminstrative Impleications of Institutional Choice:

Institutions for collective enterprise must have a legal principles and must have registered under a suitable act or law. Choices for the institutional form are determined not only by the nature of membership and its goals but also by the differences in the legal and adminstartive contexts of each institutional form of situations.

Institution can be registered by the following registration laws and regulation. Brief discussion of the following registration procedures are described below:

- ✓ **Society Act, 1860**
- ✓ **Public Trust Act, 1950**
- ✓ **Section 25, Company Act, 1956**
- ✓ **Indian Cooperatives Societies Act**
- ✓ **Producer Company (Co-op. Society Act, Company Act (Sec-254) or amendment 2002, Ch IX A, Sec-581)**

Societies, Trusts and Section 25 companies enjoy tax exemption (largely) due to the overtly charitable nature of operations. Cooperatives and private companies have to pay taxes, according to their respective acts. Tax nenefits are the least in private companies.

1. Brief Details of Society, Trust and Company Act

Below table shows a brief difference between Trust, Society and Company Act.

Table: Difference between Trust, Society and Company Act

	Public Trust	Society	Section 25 Company
Statute/Legislation	Public Trust Act like Bombay Public Trust Act, 1950	Societies Registration Act of 1860	Companies Act of 1956
Jurisdiction of the Act	Concerned state where registered	Concerned state where registered	Concerned state where registered
Authority	Charity Commissioner	Registrar of Societies	Registrar of Companies
Registration	As Trust	As Society (and by default also as Trust in Maharashtra and Gujarat)	As Section 25 Company
Main Document	Trust deed	Memorandum of Association and Rules & Regulations	Memorandum and Articles of Association.
Stamp Duty	Trust deed to be executed a non-judicial stamp paper of prescribed	No stamp paper required for Memorandum of Association and	No stamp paper required for Memorandum and Articles of

	value	Rules & Regulations	Association
Number of persons needed to register	Minimum two trustees; no upper limit	Minimum seven, no upper limit	Minimum three, no upper limit
Board of Management	Trustees	Governing body or council/managing or executive committee	Board of Directors/Managing Committee
Mode of succession on board of management	Usually by appointment	Usually election by members of the general body	Usually election by members of the general body

The steps for registration the institutions in the society are as follows:

Steps of Registration the institutions in the Society Act 1860:

Step-1	**Association of at least 7 people (uneven)**
Step-2	Naming the Society (Nomenclature)
Step-3	Setting the Vision, Mission
Step-4	Drafting the MoA (Bye Laws)
Step-5	Then only you can go for registration

2. Indian Cooperative Society's Acts

Cooperative is an autonomous association of persons united voluntarily to meet their common economic and social needs through a jointly owned and democratically controlled enterprise.

Institutions can be resistered under the following acts to form co-operatives.

- Cooperative Credit Societies Act, 1904
- Cooperative Society Act,1912
- Travancore Cooperative Enquiry Committee,1935
- A& N Island Cooperative Society Regulation,1973 U/S 8
- National Cooperative Policy Resolution,1977

Major Cooperative Resolutions in India

- National Cooperative Development Corporation
- National Cooperatives Union of India
- National Agricultural Cooperative Marketing Federation of India Ltd
- Indian Farmers Fertilizers Cooperatives Ltd

- Krishak Bharati Cooperatives Ltd
- Anand Milk Union Ltd.
- National Bank for Agriculture & Rural Development

3. Producer Company:

Para 8.6.2 in this chapter already gives an idea of the producer company. To form a producer company, the institution need to resister in the producer company act. It was seen also some institute prefers to resister in producer co-operatives. Main difference between the co-operative and producer company is elaborated below for the basic understaning of the reader.

Table: Main features between Co-operatives and Producer Company

Some Features and Key Indicators- Cooperative and Producer Company		
Features	Producer Cooperative	Producer Company
Registration	Cooperative Societies Act	Companies Act
Membership	Open only to individuals and cooperatives	Only those who participate in the activity
Relationship with other corporates/ business houses /NGOs	Transaction based	Producers and corporate entity can together float a producer company
Shares	Not tradable	Not tradable but transferable
Voting Rights	One person, one vote, but Government and RCS holds veto powers	One person one vote. Those not having transactions with company can't vote
Reserves	Created if there are profits	Mandatory to create every year
Role of Registering authority	Significant	Minimal
Administrative control	Overbearing	None
Borrowing Power	Restricted	More freedom and alternatives
Dispute Settlement	Through Cooperative mechanism	By Arbitration

The following table gives a detail idea about the legal and administrative implications of institutional choices. It is recommended that if the institutions amining towards profit making, it should be resisterd under either cooperative or producer company act.

Table: Legal and Adminstrative Implications of Institutional Choices

Criteria	Different Acts/ laws					
	Society	**Public trust**	**Cooperative**	**Producer Company**	**Section 25 Company**	**Private Company**
Basic Objective	Charity/ Welfare	Mutual benefit	Patronage/ Welfare	Patronage/ Comercial	Charity/ Welfare	Comercial
Accountable to	Promoters/ Social entrepreneurs	Members	Members	Members	Promoters/ Social entrepreneurs	Stakeholders
Resistration Under	Society Resistration Act, 1860	Public Trust Acts, (Varies state to state)	Coperative Acts under different States	Section 581, Company Act, 1956	Section 25, Company Act, 1956	Company Act, 1956
Registration Authority	Resistrar of Societies	Charity Commissioner	Varies State to State	Resistrar of Companies	Resistrar of Companies	Resistrar of Companies
Minimum Member of promoters	At leat seven	AT least two	At least ten	At least Five	At least two directors	At least two directors
Start up capital	No minimum required	No minimum required	Initial Share Capital varies depending on the typrs of cooperative, At least 1 lakh for credit co-operatives	At least 1 Lakh	None required	At least Rs. 1 Lakh
Scope of disposal of surplus to members	Not Possible	Possible	Expected	Expected	Not possible	Possible
Scope of equity participation by	Not Possible	Possible	Expected	Expected	Not possible	Expected

members						
Scope for external participation in equity	Not Possible	Possible	Not Possible	Not Possible	Dificult	Easy
Ability access commercial loans	Difficult	Difficult	Possible	Possible	Possible	Easy
Dissolutions	Possible, on approval by 3/5 majority of members. Fund/ Property transferred to another society with similar goal	Irrevocable, Charity commissioner may be take steps to revive/ reorient the trusts	Liquidation possible as per the procedure of cooperative law	Liquidation possible as per the procedure of company law	Dissolution possible, funds transferred to another section 25 company with similar goals	Liquidation possible as per the procedure of company law

Chapter-9
Mode of Operation and Fund Management in IWMP

The New Common Guidelines for Watershed Development Programmes, 2008 has made distinction between Livelihood Activities for asset-less and Production Systems & Micro-Enterprises. Accordingly, the project costs have been assigned. The Government of India has come up with guidelines for operation of livelihood activities; the same is re-produced here for convenience of the implementer.

Broad Guidelines for the Livelihood Activities
for the Landless/Assetless Households under IWMP

Introduction:

The Integrated Watershed Management Project (IWMP) is being implemented in accordance with the Common Guidelines for Watershed Development Projects – 2008. One of the key features of the Common Guidelines includes focused priority on livelihood activities for landless/assetless persons. Nine percent of the total project cost has been assigned to support the livelihood activities for landless/assetless households. This component aims to maximize the utilization of potential generated by watershed activities and creation of sustainable livelihoods and enhanced incomes for households within the watershed area. This will facilitate inclusiveness through enhanced livelihood opportunities for the poor through investment into assets, improvements in productivity and income, and access of the poor to common resources and benefits and augment the livelihood strategy at household level.

9.1. Guiding Principles of Livelihood Improvement

9.1.1. Livelihood improvement initiatives should emphasize on natural resource based activities and must conform to principles of equity, gender sensitivity and transparency. It should strive to:-

a. Enhance livelihood opportunities for the poor through investment into asset creation and improvement in productivity and income.
b. Improve access of the marginalized communities, including SC/ST, landless/assetless people, women, etc., to the benefits.
c. Select the beneficiaries in a transparent manner.

9.1.2. Livelihood guidelines for landless/ assetless households should aim at improved household income, participation and division of labour, access to information, knowledge, appropriate technologies and resources.

9.2 Planning and Implementation

The most important aspect in implementation of the guidelines would be the inclusion of 'micro level livelihood planning' as an empowerment tool for the marginalised communities. This planning will help in understanding existing livelihood assets/capitals in a highly participatory manner to augment the existing livelihood platform.

9.2.1 Livelihood Planning

i. The agency selected for implementing the watershed programmes will also be responsible to implement the livelihood component of IWMP.
ii. An awareness drive should be undertaken at Gram Sabha level for communication & sensitisation of the target beneficiaries.
iii. A "**Livelihood Action Plan**" (LAP) will be a prerequisite for availing the funds under the livelihood component.
iv. The LAP should be prepared during the preparatory phase by the Project Implementing Agency (PIA) in consultation with WDT, WC and the members of SHGs, SC/ ST, women, landless/ assetless households. This plan should be an integral part of DPR. PIA may also take assistance of livelihood expert of the team/ agency specializing in livelihood sector who can be engaged on a time bound contract basis, expenditure on which may be incurred from Administrative component of the project. PIA should prepare livelihood action plan for the project area before the release of 2nd instalment.
v. To promote convergence, the PIA should work in close association with other employment generating programmes such as MGNREGS, NRLM, etc.
vi. The livelihood action plan should analyse socio-economic conditions and existing livelihood capitals of the watershed village during the situation analysis by means of PRA and focus group discussion in order to facilitate collection of information to feed into the livelihood action planning process. Livelihood action plan should contain schedule of activities, interventions, no. of SHGs to be assisted and expected outcome.
vii. A copy of the livelihood action plan should also be made available to concerned SHGs and Gram Panchayats.
viii. The plan may be reviewed by the PIA, if need be, and revised in consultation with the stakeholders.

9.2.2 Mode of Operation

i. The livelihood action plan will be implemented through Self Help Groups and/or their federation. However financial support to enterprising individuals could also be considered subject to a maximum of 10% of the funds under the livelihood component.
ii. Livelihood activities can be carried out either through the existing SHGs having good performance or new SHGs formed with a group of 5-20 persons.
iii. SHGs selected for implementing livelihood action plan should be homogeneous in-terms of their existing livelihood capitals, common interest and need.
iv. SHGs can undertake any permissible activity jointly as a group or the group may decide to support individual(s) for the activities under the umbrella of the main SHG. In case of individual support under the SHGs, the individuals will be accountable to the main SHG for finances and performance.
v. The financial support to enterprising individuals who prepare and submit a viable livelihood proposal, may be considered by Watershed Cell cum Data Centre (WCDC) on the recommendation of the Watershed Committee (WC). The plan has to be approved by the WCDC before extending financial support. However, support to individuals should not exceed a maximum of 10 % of funds under the livelihood component.

9.3 Eligibility for availing the funds under the Livelihood Component

i. The beneficiaries should be marginalized communities, including SC/ST, landless/assetless people, women, etc., among which preference will be given to women, specially female headed households, ST & SCs, as identified under the wealth ranking conducted as a part of the PRA exercise.
ii. It may be ensured that the selected SHG does not have more than one member from a household.
iii. Priority may be given to women SHGs.

9.4 Budget, procedure of release and administration:

i. 9% of the total project fund is earmarked as the livelihood component for the benefit of marginalized communities, including SC/ST, landless/assetless people, women, etc.
ii. This earmarked amount shall be taken out of the total project fund as a grant to WC in its bank account, which in turn will be used to provide financial

assistance, (seed money for revolving fund to SHGs and a grant -in -aid for enterprising SHGs/ SHG federations to undertake major livelihood activities).

iii. At least 70% of this livelihood fund will be used to support revolving fund for SHGs, including support to enterprising individuals, and a maximum of 30% for supporting grant–in–aid to enterprising SHGs/ SHG federations.

9.5 Seed Money for Revolving Fund:

a. Seed money for SHGs

i. Each SHG shall make an application for financial assistance to the WC. WC in its regular meeting, will consider these applications and pass resolution regarding its approval of financial assistance to SHGs based on merit of the case. The representatives of applicant SHGs may also be present in such meetings of the WC. The resolution will clearly rank the approved cases, based on the priorities and preferences, so that the support may be extended to all the eligible SHGs in order of ranking.

ii. The initial amount up to Rs. 25,000 may be given as seed money to a SHG as the revolving fund after their proposed activity(s) has been approved by the WC in its meeting and included in the resolution.

iii. The SHGs will return the seed money on monthly basis and that could be reinvested in the same or other SHGs as per the resolution passed in meeting of WC. The amount and number of monthly instalments may be decided by WC based on the type of activity, capacity of the group and their savings. The amount may be returned in a maximum of 18 months.

iv. The payment will be made by cheque after the respective SHG has opened a joint bank account with two signatories from the SHG members.

v. The SHGs may use the amount for a combined activity and/ or shall provide the above amount to the concerned members as individual loan against a specific activity for improving income. In case of individual support under the SHGs, the individual will be accountable to the main SHGs for finances and performance.

b. Seed money for Enterprising Individuals

i. The enterprising individual shall apply for financial assistance to the WC, along with a viable livelihood proposal. WC in its regular meeting, will consider such applications and recommend to WCDC, through PIA, the

amount to be provided as seed money to such individual(s) as the revolving fund after their proposed activity(s) has been approved by the WC in its meeting and included in the resolution based on the merits of the case.

ii. The applicants may also be present in such meetings of the WC. The resolution will clearly rank the approved cases, based on the priorities and preferences, so that the support may be extended to all the eligible enterprising individuals in order of ranking.

iii. The WC may release financial assistance to these enterprising individuals after approval by WCDC. Such individuals will return the seed money on monthly basis and that could be reinvested further as per the resolution passed in meeting of WC. The amount and number of monthly instalments may be decided by WC based on the type of activity and capacity of the individual. The amount may be returned in a maximum of 18 months.

iv. The payment will be made by account payee cheque in such individual cases.

9.6 Funding for Major Livelihood activities:

i. The funding for major livelihood activities will enable the enterprising SHGs/ SHG federations (with atleast 5 enterprising SHGs) to avail a composite loan for undertaking major livelihood activities or to expand/upscale activities as recommended by the WC and approved by WCDC in consultation with line departments and bank.

ii. For such activities, a composite loan (grant in aid and bank loan) can be availed depending upon the type of activity. The grant -in-aid will be 50 % of the cost of the activity or Rs. 2.00 lakh whichever is less. However, grant in aid shall not exceed 30 % of the livelihood component (i.e. 9% of the total project cost) of the project.

iii. SLNA may issue detailed modalities for payment of grant-in-aid for funding major livelihood activities.

9.7 Capacity Building for Beneficiaries

i. The capacity building needs of the marginalized communities, including SC/ST, landless/assetless people, women, etc should be included in the livelihood action plan prepared after the livelihood analysis. The capacity building should aim at skill enhancement and not just knowledge and

information. The capacity building component should be planned by the livelihood expert of WDT/Livelihood agency in consultation with WC for making necessary budgetary provision on annual basis.

ii. The expenditure for the training for livelihood component may be met from 5% of the budget component of the project cost earmarked for institution and capacity building.

iii. It shall be mandatory to provide skill based training on the following components apart from the other training needs expressed by SHGs:

   a. Book Keeping (cash book and ledger registers, preparing budget, maintenance of accounts etc).
   b. Minutes of meeting (proceedings) and follow up.
   c. Exposure visits and discussions in the specialized areas of livestock, agriculture/horticulture, agro-forestry, fisheries and other watershed related income generating activities, micro-enterprises, micro-credit, etc.
   d. Knowledge of market and pricing, value addition, alternate institutions including Farmers Production Companies etc.
   e. Other related aspects.

9.8 Once the identification process of Unique Identification Authority of India (UIDAI) is completed, the beneficiaries should be identified uniquely through *Aadhaar* to improve efficiency and transparency in service delivery as well as to ensure the benefits flow to the needy and to avoid duplicity of identity.

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Broad Guidelines for Production System and Microenterprises based Livelihood Activities under IWMP

Introduction:

One of the important components in the Common Guidelines for Watershed Development Projects – 2008 includes support to production/farming system based livelihood activities and enterprises. Ten percent of the total project cost has been assigned to support the production system and microenterprises for land owning households. This component aims to diversify and maximize the production and productivity of agriculture system as a whole and targets the land holders with cascading benefits to landless agriculture labour, leased -in farmers and share -croppers.

The objective is to

a) Promote diversified production/farming systems based livelihood activities/ interventions, and.
b) Encourage farmers to adopt and up-scale successful experiences of proven technologies, integrated farming systems and improved farming practises for livelihood augmentation.

9.9 Planning and Implementation

9.9.1. The most important aspect in implementation would be provision of micro level planning for production/farming system at the planning stage itself.

a. The PIA will be responsible to implement the production system and microenterprises related livelihood component of IWMP.
b. The PIA should analyse the status of natural resources potential to determine the befitting production system and microenterprises based livelihoods conducive to the socio economic situation and existing livelihood capitals of the watershed village(s) in a participatory manner at village level under each micro-watershed during the preparatory phase of the project. The exercise will be undertaken by means of PRA, net planning and focus group discussion in order to facilitate collection of information to feed into DPR which will be a prerequisite for availing the funds under the production system and microenterprises component.
c. PIA should prepare action plan for production system and microenterprises based livelihood activities such as aquaculture, horticulture, agriculture, agro-

forestry, animal husbandry, microenterprise, agro- processing, value addition, marketing etc for the project area before the release of 2nd instalment and it should form integral part of DPR.

d. To ensure convergence with other production system and microenterprises schemes, the PIA should work in close association with other schemes such as MGNREGS, NRLM, NHM, RKVY, NFSM, etc. This should also be duly reflected in convergence plan in the DPR.

e. Production system and microenterprises action plan should contain location/farmer centric schedule of activities and interventions and should be delineated on the map.

f. A copy of the action plan should also be made available to concerned Gram Panchayat.

g. The action plan may be reviewed by the PIA, if need be, and revised in consultation with the stakeholders.

9.10 Mode of Operation and Eligibility for Availing the Production System Funds:

a. Individual land holders/owners can avail the benefits of production system on their private land. The small and marginal farming households, women headed farming households, SC & ST farmers will be given preference based on the wealth ranking exercise conducted during PRA. Those households whose land is in close proximity to the developed natural resources may be preferred to make full use of natural resource potential.

b. Selection of beneficiaries will be done by PIA, in consultation with WC.

c. Beneficiaries having common interest may be organised into User Groups to pool and manage their resources as well as manage aggregating their produce for effective disposal and marketing, besides maintaining their natural resource base. This may also provide a means for deciding resource use arrangements based on equity and sustainability.

d. The funds will be given for cost intensive farming system based livelihood activities/interventions such as aquaculture, agriculture, horticulture, agro-forestry, animal husbandry, agro-processing, value addition, etc.

e. The contribution of farmers will be 20 percent for general category and 10 percent for SC/ST beneficiaries and the project funds will meet the cost of farming/ production system activity to a maximum limit of an amount equal to

double of the unit cost of the project for watershed development (i.e. Rs 12,000/15,000 per ha, as the case may be).

f. Farmers' contribution i.e. 20 percent for general category and 10 percent for SC/ST of this amount (i.e. a maximum of Rs 4800/6000 and Rs 2400/3000 as the case may be, respectively for general category and SC/ST beneficiaries) will go to WDF.

g. Farmers' contribution to WDF in such case would be acceptable in cash at the time of execution of works.

Example:

i. **Assuming the total cost of farming system activity/intervention = Rs 30,000**
Cost of farming system activity to be met from Project fund (@Rs 12,000/ha project unit cost)
(General category) = Rs 24,000
(SC/ST) = Rs 24,000
Farmers' contribution towards WDF
(General category, 20% of 24,000) = Rs 4800
(SC/ST, 10% of 24,000) = Rs 2400

ii. **Assuming the total cost of farming system activity/intervention = Rs 20,000**
Cost of farming system activity to be met from Project fund (@Rs 12,000/ha project unit cost)
(General category) = Rs 20,000
(SC/ST) = Rs 20,000
Farmers' contribution towards WDF
(General category, 20% of 20,000) = Rs 4000
(SC/ST, 10% of 20,000) = Rs 2000

9.11 Budget, procedure of release and administration:

a. It has to be ensured that at least 10% of the total project funds are utilized for the benefit of production system and microenterprise based livelihood activities.

b. The fund amount shall be taken out of the total project fund as a grant to WC in their bank account which in turn will be used to provide financial assistance to identified farmers.

c. Based on the application received for such activities, a team consisting of WC, PIA and nodal officer of the concerned line department and Technical Expert of WCDC will approve the proposal.

d. Once the activity is approved, payments will be made through cheques in their individual accounts.

9.12 Capacity Building:

a. The capacity building needs of the land holder/owner should be included in the action plan prepared during PRA and baseline survey. The capacity building should aim at skill enhancement and not just knowledge and information. The

capacity building component should be decided in consultation with WC for making necessary budgetary provision on annual basis.

b. The expenditure for such trainings may be met from 5% of the budget provided for institution & capacity building in the project.

c. The capacity building aspects will have field visits/ exposure visit to successful farming system models/demonstrations.

Additional Guidelines, Gujarat

- All the asset less families have to be covered under SHGs consisting 5-20 members; not more than one member from the same family can be part of the SHG
- In case of SHGs, Revolving Funds (depending on the strength of the SHG) will be allocated in instalments with a clear cut agenda. The concerned SHG may carry out the activity as a whole unit or may partly engage some of the members in the different activities
- The WC has to sign an MoU with the SHGs regarding the fund allocation and the activities to be carried out by the SHGs, mentioning the roles and responsibilities as well as rules and regulations to adhere to
- The competence/strength of the SHGs shall be assessed as mentioned below and then only grants/ funds can be transferred
- The SHGs will apply to the WC showing the needs of the group. The WC will release Funds to the SHGs on priority/need basis; All households have to be categorized and the most needy families should be identified to be given the funds first, followed by lesser needy ones
- There will be no cash transaction in the same; funds will be transferred directly to the individual / Group's Bank Account
- **Grading of SHGs:**

Sr. No.	Criteria	Verifying source	Very good	Good	Average	Poor
1	Meeting-frequency, place and time	Minutes Book	≥ 9	≥ 7, <9	≥ 5, <7	Less than 5
2	Attendance in meetings	Attendance Register	≥ 9	≥ 7,	≥ 5, <7	Less than 5

				<9		
3	Participation of members in decision making	Minutes Book and Focus Group Discussion	≥ 9	≥ 7, <9	≥ 5, <7	Less than 5
4	Rules and regulations	Rule Book; Minutes of meeting when rule was framed; Documents regarding imposing fines, etc	≥ 9	≥ 7, <9	≥ 5, <7	Less than 5
5	Savings	Pass Books; Savings ledger	≥ 9	≥ 7, <9	≥ 5, <7	Less than 5
6	Internal Lending	Minutes Book; Loan ledgers	≥ 9	≥ 7, <9	≥ 5, <7	Less than 5
7	Repayment rate	Cash Book; General ledger; Minutes Book; Pass Books	≥ 9	≥ 7, <9	≥ 5, <7	Less than 5
8	Book keeping and documentation	All registers / Books of Accounts	≥ 9	≥ 7, <9	≥ 5, <7	Less than 5
9	Audits	Minutes Book; Audit Reports	≥ 9	≥ 7, <9	≥ 5, <7	Less than 5
10	Training programmes	Training register; Discussion with members	≥ 9	≥ 7, <9	≥ 5, <7	Less than 5
	Total		**≥ 90**	**≥ 70, <90**	**≥ 50, <70**	**Less than 50**

Chapter – 10
Convergence

There is no universal definition of convergence, although generally it is understood to mean the ability of different schemes to carry similar kinds of services.

10.1 Livelihood Activities under IWMP

- **Agricultural Development:** such as Land Leveling, Farm Bund, Farm Outlet, Tree Plantation on Farm Bund, Floriculture & Vegetation, Gram Vatika, Grass on Bund (Farm & Waste Land), Improved seed, Drip Irrigation, Sprinkler, Demonstration Plot, Horticulture Plantation, Vegetable Kitchen Garden, Nursery etc.

- **Animal Husbandry:** Animal husbandry includes Poultry Farm, Dairy work , Grassland Development, Improved beeding animals.

- **Agro Processing:** Agri Processing cover all the agriculture related processing such as Processing of Maize, Pickel making from Mango, Rice preparation from Paddy, Vermi Compost preparation.

- **Minor Activities:** Minor activity includes Bamboo or Wooden Work, Mandap, Soap making, Embroidery work, Craft Work, Grih Udhyog etc.

10.2 Means of Convergences

- **Government Schemes:** Convergence can be done with Government schemes. Such as MGNREGA, Mission Manglam, Agriculture Department, Horticulture Department, Animal Husbandry Department, BRGF etc.

- **PPP (Public Private Partnership):** Public–private partnership (PPP) describes a government service or private business venture which is funded and operated through a partnership of government and one or more sector companies. These schemes are sometimes referred to as PPP, P3 or P^3. PPP involves a contract between a public sector authority and a private party, in which the private party provides a public service or project and assumes substantial financial, technical and operational risk in the project. Government contributions to a PPP may also be in kind (notably the transfer of existing assets). In projects that are aimed at creating public goods like in the infrastructure sector, the government may provide a capital subsidy in the form of a one-time grant, so as to make it more attractive to the private investors. In some other cases, the government may support the project by providing revenue subsidies, including tax breaks or by providing guaranteed annual revenues for a fixed period.

- **CSR (Corporate Social Responsibility):** Some companies have their CSR (Corporate Social responsibility). They have also the work of rural development in certain Villages.

- **NGO Grants:** NGO have their specified area for their work. We can get help in those areas for effective work.

10.3 Modes of Convergence: Modes of Convergence may be-

- Training: Watershed participants can get relevant training programme by other department. Such as Farmers agriculture training programme by KVK, Craft training programme by Gujarat mati kalakar Board.
- Raw Material: Participant may be availed raw material facility from other department. Such as Hybrid seed by Agriculture department.
- Subsidy: Participant may be availed Subsidy facility from other department. Such as Subsidy on Drip irrigation.
- Credit Linkage: SHG can be linked by this means.

10.4 Convergence Decision Level:

- **State Level / Head Office:** Convergence Decision can be taken at State level. Such as SLNA can do it with other schemes.
- **District Level / Regional office:** Convergence Decision can be taken at District level too. Such as District Watershed Development Unit can do it with other schemes.
- **Block Level/ Local Level:** Convergence Decision can be taken at Block or Local level too.
- **Agriculture: For Agriculture related work** Convergence can be done with Department Of Agriculture, Dept. Of Horticulture, Forest Dept, KvK / Agricultural University, GGRC. APMC, NABARD. Other Organizations
- **Animal Husbandry: Under Animal Husbandry Convergence can be done with** Dept of Animal Husbandry, NDDB/ Amul/ Milk Co operatives, BIAF Development Research Foundation, J K Trust.

10.5 Convergence Summery

10.5.1 Convergence by Different Schemes (Watershed Work)

Sr No	Activities	Name of the Scheme	
		Forest Area	**Non Forest Area**
1	Contour Bund	Dept. of Forest, MGNREGA	MGNREGA
2	Tarish Talawdi	Dept. of Forest, MGNREGA	MGNREGA
3	Tree Cover, Grass & Bamboo	Dept. of Forest, MGNREGA	MGNREGA, TASP
4	Nala Bund	Dept. of Forest, MGNREGA	GLDC, GSRDC
5	Gabion	Dept. of Forest, MGNREGA	GLDC, GSRDC
6	Nala Plug	Dept. of Forest, MGNREGA	MGNREGA
7	Check Wall	Dept. of Forest, MGNREGA	MGNREGA
8	Check dam	Dept. of Forest, MGNREGA	MGNREGA, TASP, Minor Irrigation
9	Pond	MGNREGA	MGNREGA, TASP, Minor Irrigation

10.5.2 Convergence by Different Schemes (Livelihood Activities)

Sr No	Activities	Name of the Scheme
1	Land Leveling, Farm Bund, Farm Outlet	MGNREGA, GLDC
2	Tree Plantation on Farm Bund	Horticulture Department
3	Grass on Bund (Farm & Waste Land	Social Forestry, GSRDC
4	Well	MGNREGA, TASP, Minor Irrigation
5	Oil Engine	BRGF, Vikashshil Taluka
6	Electrification	BRGF, Vikashshil Taluka
7	Pipeline	BRGF, Vikashshil Taluka
8	Improved seed	TASP, Agri. Dept
9	Milching Animal	Animal Husbandry Dept, Vikashshil Taluka, BRGF, MP-MLA Fund
10	Drip Irrigation	BRGF, TASP, Vikashshil Taluka, MP Fund
11	Sprinkler	BRGF, TASP, Vikashshil Taluka, MP Fund
12	Demonstration Plot	MGNREGA, BRGF, Vikashshil Taluka,

		MP Fund
Agri. Based Economic Activities		
13	Horticulture Plantation	MGNREGA, BRGF, Vikashshil Taluka, MP Fund
14	Vegetable Kitchen Garden	MGNREGA, BRGF, Vikashshil Taluka, MP Fund
15	Nursery	Social Forestry, Horticulture Department, MGNREGA, BRGF
SHG Activity		
16	Training	Mission Mangalam, Gujarat Pottery Board, Handicraft Handloom Board, Gurjari
17	Activity	Mission Mangalam, Gujarat Pottery Board, Handicraft Handloom Board, Gurjari
Non Conventional Energy Resources		
18	Solar Light	Wind Board, Gujarat Energy Development
19	Wind Energy	Wind Board, Gujarat Energy Development
20	Gobar Gas	GEDA, Khadi Board
21	Vermi Compost	BRGF, MGNREGA, Department of Forest

10.6 Types of Benefit Under Different Department

10.6.1 Type of benefit under Animal Husbandry Department

Sr No	Name of scheme	Beneficiaries	Type of benefit
1	Fodder development	SF,MF,BPL,SC,ST	Fodder seed of Rs 160
2	Round weal chaff cutter	SF,MF,BPL,SC,ST	50 % with maximum limit of Rs 1000
3	Cattle shed	For ST Having Minimum 2 cattle	50 % with maximum limit of Rs 10000
4	sylopit	Every one	50 % with maximum limit of Rs 8000
5	Weaker section scheme (Rabbit 3+1)	BPL	50 % with maximum limit of Rs 5180
6	Poultry Farm	BPL,SC	50 % with maximum limit of Rs 15580
7	Increase Milk Production	SC	Medicines of Rs 500
8	Increase Milk Production	ST	Medicines of Rs 1000

9	Dairying	SF, MF, Agri Labour	100 % on Interest up to 4 cattle & 75 % on Interest up to 10 cattle

10.6.2 Activity Wise Type of benefit under Agri Department

Sr No	Activity	Beneficiaries	Type of benefit
1	FYM	All Farmers	50% of Expenditure per Ha for Green Manuring with maximum limit of Rs 1000 up to 2 Ha
2	Varmi Compost		50 % with maximum limit of Rs 1600
3	IPM		50% of Expenditure per Ha for IPM with maximum limit of Rs 1500 up to 2 Ha
4	For Pulses, Maize Oil Crops		Certified seeds of Pulses, Maize Oil Crops with Maximum limit 600 Rs
5			50 % of Cost of hand operated Sprayer up to Rs 800
6			50 % of Cost of Power operated Sprayer up to Rs 2000
7			50 % of Cost of Pesticides up to Rs 500
8			50 % of Cost of herbicides up to Rs 500
9			Bio-fortiliser Rihzobium Culture 50 Rs per Ha
10			Micro nutrient up to Rs 500
11			Gypusm-50 % per Ha or 500 Rs per Ha for maximum 5 Ha / Farmer
12			Farm Implement-
13			Bullock Operated 50 % of cost up to Rs 2000
14			Power Operated 50 % of cost up to Rs 10000

10.6.3 Activity Wise Type of benefit under Horticulture Department

S. N	Item	Estimated Cost	Pattern of Assistance #
1	**Fruits**		
(a)	Cost intensive crops (For a maximum area of 4 ha per beneficiary)		
i)	Perennial Fruits-Grape, Strawberry, Kiwi, Passion fruit etc.	Rs.1,00,000 /ha	
ii)	Non Perennial Fruits-Banana (sucker) and Pineapple	Rs.70,000/ ha	Maximum of Rs. 50,000/- per ha. (50% of cost for meeting the expenditure on planting material and cost of material for INM/IPM, in 3 installments of 60:20:20 subject to survival rate of 75% in 2nd year and 90% in 3rd year). Cost of individual crop to be claimed based on the unit cost as indicated at Annexure.
iii)	Banana (TC) and Pineapple	Rs.1,00,000 /ha	Maximum of Rs. 50,000/- per ha. (50 % of cost for meeting the expenditure on planting material and cost of material for INM/IPM etc., in 2 installments of 75:25). Cost of individual crop to be claimed based on the unit cost as indicated below.
(b)	High density planting (mango, guava, litchi, ber, etc).	Rs. 80,000 /ha	Maximum of Rs. 40,000/- per ha. (50% of cost for meeting the expenditure on planting material and cost of material for INM/IPM etc., in 3 installments of 60:20:20 subject to survival rate of 75% in 2nd year and 90% in 3rd year).
(c)	Fruit crops other than cost intensive crops using normal spacing.	Rs. 40,000/ ha	Maximum of Rs.30,000/- per ha. (75% of cost for meeting the expenditure on planting material and cost of INM/IPM etc) in 3 installments of 60:20:20 subject to survival rate of 75% in 2nd year & 90% in 3rd year for perennial crop and non-perennial crops in two installments of 75% and 25%.Cost of individual crop to be claimed based on the unit cost as indicated at Annexure-IV.

2	**Mushrooms**		
(a)	Integrated mushroom unit for spawn, compost production and training	Rs.50.00 lakh	100% of the cost to public sector and 50% of cost for private sector, for meeting the expenditure on infrastructure, as credit linked back ended subsidy.
(b)	Spawn making unit	Rs. 15 lakh/ unit	100% of the cost to public sector and in case of private sector, 50% of cost, as credit linked back ended subsidy.
(c)	Compost making unit	Rs. 20.00 lakh/ unit	100% of the cost to public sector and in case of private sector, 50% of cost, as credit linked back ended subsidy.
3	**Flowers (For a maximum of 2 ha per beneficiary)**		
(a)	Cut flowers	Rs.70,000/ ha	50 % of the cost to Small and Marginal farmers and 33% to other category farmers, subject to a maximum of Rs.35,000/- per ha for S&M farmers, 23,100/- per ha for other category farmers.
(b)	Bulbulous flowers	Rs. 90,000/ ha	50 % of the cost to Small and Marginal farmers and 33% to other category farmers, subject to a maximum of Rs.45,000/- per ha for S&M farmers 29,700/- per ha for other category farmers.
(c)	Loose Flowers	Rs. 24,000/ ha	50 % of the cost to Small and Marginal farmers and 33% to other category farmers, subject to a maximum of Rs.12,000/- per ha for S&M farmer. Beneficiary & Rs.7,920/- per ha for other category farmers.
4	**Spices (For a maximum area of 4 ha per beneficiary)**		
(a)	Seed spices and Rhizomatic Spices.	Rs. 25,000 / ha	Maximum of Rs. 12,500/- per ha. (50% of cost for meeting the expenditure on planting material and cost of material for INM/IPM etc).
(b)	Perennial spices (black pepper, cinnamon, clove and nutmeg)	Rs. 40,000ha	Maximum of Rs. 20,000/- per ha (@50% of cost for meeting the expenditure on planting material and cost of material for INM/IPM etc).

V	**Aromatic Plants (For a maximum area of 4 ha per beneficiary)**		
(a)	Cost intensive aromatic plants (patchouli, geranium, rosemary, etc)	Rs. 75,000/ ha	50% of cost, subject to a maximum of Rs.37,500/- per ha, for meeting the expenditure on planting material and cost of material for INM/IPM etc
(b)	Other aromatic plants	Rs. 25,000/ ha	50% of cost, subject to a maximum of Rs.12,500/- per ha, for meeting the expenditure on planting material and cost of material for INM/IPM etc.
VI	**Plantation crops (For a maximum area of 4 ha per beneficiary)**		
(a)	Cashew and Cocoa including replanting	Rs. 40,000ha	Maximum of Rs. 20,000/- per ha (50% of cost for meeting the expenditure on planting material and cost of material for INM/IPM etc) in 3 installments of 60:20:20 subject to survival rate of 75% in second year and 90% in third year for a maximum area of 4 ha per beneficiary.
3	**Rejuvenation/ replacement of senile plantation including Canopy management.**		
	Rejuvenation/ replacement of senile plantation including Canopy management.	Rs.30,000/ ha (average)	50% of the total cost subject to a maximum of Rs. 15,000/ha to a limited of 2 ha per beneficiary. Actual cost to be claimed based on the nature and requirement of the crop to be rejuvenated.
4	**Creation of Water resources**		

(a)	Community tanks/on farm ponds/on farm water reservoirs with use of plastic/RCC lining.	Rs. 15.00 lakh /unit in plain areas, Rs.17.25 lakh in hilly areas.	100% of cost for 10 ha of command area, with pond size of 100m x 100m x 3 m or any other size depending upon pro rata basis, owned & managed by a community/farmer group. Cost for non-lined ponds/tanks only in black cotton soils will be 33% less. Assistance under NHM will be restricted to the cost of plastic / RCC lining. However, for non NREGS beneficiaries, assistance on entire cost including construction of pond/tank as well as lining can be availed under NHM.
(b)	Water harvesting system for individuals- for storage of water in 20mx20mx3m ponds /wells @ Rs.100/- cum	Rs. 1.20 lakh /unit in plain areas, Rs.1.38 lakh in hilly areas.	50% of cost. Maintenance to be ensured by the beneficiary.
5	**Protected cultivation**		
1.	**Green House structure**		
(a)	Fan & Pad system	Rs. 1465/ Sq.m	50% of the cost limited to 1000 Sq.m per beneficiary.
(b)	Naturally ventilated system		
(i)	Tubular structur	Rs. 935/ Sq.m	50% of the cost limited to 1000 Sq.m per beneficiary.
(ii)	Wooden structure	Rs. 515/ Sq.m	50% of the cost limited to 2 units (each unit not to exceed 500 Sq.m per beneficiary.
(iii)	Bamboo structure	Rs. 375/ Sq.m	50% of the cost limited to 5 units (each unit not to exceed 200 Sq.m) per beneficiary.
2.	**Plastic Mulching**	Rs. 20,000/ ha	50% of the total cost limited to 2 ha per beneficiary.
3.	**Shade Net House**		
(i)	Tubular structure	Rs. 600/ Sq.m	50% of cost limited to 1000 Sq.m per beneficiary.
(ii)	Wooden structure	Rs. 410/- Sq.m	50% of cost limited to 5 units (each unit not to exceed 200 Sq.m) per beneficiary.
(iii)	Bamboo structure	Rs. 300/ Sq.m	50% of cost limited to 5 units (each unit not to exceed 200 sqmt) per beneficiary.

4.	**Plastic Tunnels**	Rs.30/ Sq.m	50% of cost limited 1000 sqmt per beneficiary.
5.	**Anti Bird/Anti Hail Nets**	Rs.20/- per Sq.m	50% of cost limited to 5000 Sq.m per beneficiary.
1.	Green House structure		
(a)	Fan & Pad system	Rs. 1465/ Sq.m	50% of the cost limited to 1000 Sq.m per beneficiary.
(b)	Naturally ventilated system		
(i)	Tubular structur	Rs. 935/ Sq.m	50% of the cost limited to 1000 Sq.m per beneficiary.
(ii)	Wooden structure	Rs. 515/ Sq.m	50% of the cost limited to 2 units (each unit not to exceed 500 Sq.m per beneficiary.
(iii)	Bamboo structure	Rs. 375/ Sq.m	50% of the cost limited to 5 units (each unit not to exceed 200 Sq.m) per beneficiary.
2.	**Plastic Mulching**	Rs. 20,000/ ha	50% of the total cost limited to 2 ha per beneficiary.
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(ii)	Wooden structure	Rs. 410/- Sq.m	50% of cost limited to 5 units (each unit not to exceed 200 Sq.m) per beneficiary.
(iii)	Bamboo structure	Rs. 300/ Sq.m	50% of cost limited to 5 units (each unit not to exceed 200 sqmt) per beneficiary.
4.	**Plastic Tunnels**	Rs.30/ Sq.m	50% of cost limited 1000 sqmt per beneficiary.
5.	**Anti Bird/Anti Hail Nets**	Rs.20/- per Sq.m	50% of cost limited to 5000 Sq.m per beneficiary.
6.	**Cost of planting material of high value vegetables grown in poly house**	Rs.105/ Sq.m	50% of cost limited to 500 Sq.m per beneficiary.
7.	**Cost of planting material of flowers for poly house**	Rs.500/ Sq.m	50% of cost limited to 500 Sq.m per beneficiary
8	**Precision Frming development and extension through Precision Farming Development Centres (PFDCs)**	Project based	100% of cost to PFDCs

9	**Promotion of Integrated Nutrient Management (INM) / Integrated Pest Management (IPM)**		
(i)	Sanitary and Phytosanitary infrastructure (Public Sector)	Rs.100.00 lakh	100% of cost
(ii)	Promotion of IPM/INM	Rs. 2000/ha	50% of cost subject to a maximum of Rs 1000/ha limited to 4.00 ha/ beneficiary.
(iii)	Disease forecasting unit (Public Sector)	Rs. 4 lakh/ unit	Maximum up to Rs. 4 lakh/unit
(iv)	Bio control lab	Rs.80 lakhs/ unit	Maximum up to Rs. 80 lakh/unit for Public Sector and Rs.40.00 lakh as credit linked back ended subsidy to Private Sector
(v)	Plant Health Clinic	Rs. 20 lakhs/ unit	Maximum up to Rs. 20 lakh/unit for Public Sector and Rs.10.00 lakh as credit linked back ended subsidy to Private Sector.
(vi)	Leaf /Tissue analysis lab	Rs. 20 lakh/ unit	Maximum up to Rs. 20 lakh/unit for Public Sector and Rs.10.00 lakh as credit linked back ended subsidy to Private Sector.
8	**Organic Farming**		
(i)	Adoption of Organic Farming.	Rs. 20,000/ ha	50% of cost limited to Rs.10000/ha for a maximum area of 4 ha. per beneficiary, spread over a period of 3 years involving an assistance of Rs.4000/- in first year and Rs.3000/- each in second & third year. The programme to be linked with certification
(ii)	Organic Certification	Project based	Rs. 5 lakh for a cluster of 50 ha which will include Rs.1.50 lakh in first year, Rs. 1.50 lakh in second year and Rs. 2.00 lakh in third year.
iii)	Vermi compost Units /organic input production unit	Rs. 60,000/ unit for permanent structure and Rs. 10,000 /unit for HDPE Vermibed	50% of cost conforming to the size of the unit of 30'x8'x2.5' dimension to be administered on pro-rata basis. For HDPE Vermibed, 50% of cost conforming to the size of 96 cft (12'x4'x2') to be administered

			on pro-rata basis.
9	**Certification for Good Agricultural Practices (GAP), Including infrastructure**	Rs. 10,000/ ha	50% of the cost.
10	**Pollination support through beekeeping**		
(a)	Production of nucleus stock (Public sector)	Rs. 10.00 lakh	100% of the cost.
(b)	Production of bee colonies by bee breeder	Rs.6.00 lakh	50% of cost for producing min. of 2000 colonies / year
(c)	Honey bee colony	Rs. 1400/ colony of 4 frames	50% of cost limited to 50 colonies / beneficiary.
(d)	Hives	Rs. 1600/ hive	50% of cost limited to 50 colonies / beneficiary
(e)	Equipment including honey extractor (4 frame), food gradecontainer (30 kg), net, etc.	Rs. 14,000/ set	50% of the cost limited to one set per beneficiary.
11	**Horticulture Mechanization**		
(a)	Power operated machines/tools including Power Saw and Plant Protection equipments etc.	Rs.35,000/- per set	50% of cost limited to one set per beneficiary
(b)	Power Machines (upto 20 BHP) with rotavator / equipment	Rs.1,20,000/- per set	50% of cost limited to one set per beneficiary
(c)	Power machines (20 HP & above including accessories /equipments	Rs. 3,00,000/-	50% of cost limited to one set per beneficiary
(d)	Import of new machines & tools for horticulture for demonstration purpose (Public sector)	Rs. 50.00 lakh	100% of the total cost.
12	**Technology Dissemination through demonstration/ Front Line Demonstration (FLD)**	Rs. 25.00 lakh	75 % of cost in farmers field and 100% of cost in farms belonging to Public Sector, SAUs etc.

10.6.4Type of benefit under GGRC

- Any farmer can get subsidy of Rs.60,000 per hectare or 50 % of the MIS cost (derived based on crop spacing) whichever is less for any area & any crop. Tribal Farmer of tribal area can get additional 25 % subsidy from Tribal Department of GOG.
- Government of Gujarat placed the subsidy at the disposal of GGRC. Subsidy is released by GGRC after scrutinizing the applications directly where as in other States subsidy is released through government.
- GGRC arranges bank finance to farmers, who needs loan. MIS supplier has to render agronomic and technical support after implementation (after sales service). In other schemes, farmers have to rely on themselves.
- Insurance coverage equivalent to cost of MIS, to farmer for five years for MIS components and the farmer (as well) except natural death.
- Maintenance and repairs of MIS support by the supplier for five years.
- Supply of other agro inputs through GSFC depots and continuous farmer services.
- Farmer can choose cropping pattern of his choice with a flexibility of MIS.
- District-wise NGO's provide socio-economic feedback report on the project.
- 200 depots of GSFC/GNFC are coordinating between farmers and MIS agencies.
- Agricultural Finance Corporation will evaluate the impact of MIS on the farm economics periodically.

10.6.5 Subsidy Scheme under Backward Region Grant Fund (BRGF)

Information regarding Special Component Plan Schemes

Sr. No.	Name of Schemes	Eligible candidate / Institute	Scheme information	Contact office for detailed information
1	Milk Enhancement Program for Milch Animals	Scheduled Caste People	Free health package supply consisting – F.M.D. Vaccine, De-worming, Mineral mixer Total value Rs. 500/-	First Aid Veterinary Centre, Veterinary Dispensary, Veterinary Policlinic
2	Assistance for Round wheel Chaff-cutter	Scheduled Caste People	Round wheel chaff-cutter Rs 1000/- Portable Manger Rs.1000/- Cattle Shed Rs. 10000/- to each beneficiary	First Aid Veterinary centre, Veterinary Dispensary
3	Assistance on	Scheduled	75% subsidy in a	Intensive Poultry

	establishment of 25 RIR birds' Unit	Caste People	form of asset 25 RIR birds is given. Total unit cost -4000/- & subsidy value Rs. 3000/-	Development Project Office, District Poultry Extension Centre
4	Assistance for establishment of 100 Broiler birds' Unit	Scheduled Caste People	75% subsidy in the form of amount. Total unit cost -24000/- & subsidy value Rs. 18000/-	Intensive Poultry Development Project Office, District Poultry Extension Centre
5	Scheme to give stipend on completion of six days' poultry management training	Scheduled Caste People	Considering Rs. 75/- per day, Rs. 450/- for 6 days as Daily allowance and Rs. 60/- as to & fro transport fare with the maximum total stipend Rs. 510/-	Intensive Poultry Development Project Office, District Poultry Extension Centre
6	Assistance for establishment of Goat Unit (10 Female + 1 Male)	Scheduled Caste People	Assistance of Rs. 20000/- (50%) is given against the Unit cost of Rs.40000/-	Veterinary Dispensary, District Panchayat Office (Pashupalan Branch)

Chapter 11
OUTCOMES

Livelihood outcomes are the achievements of livelihood strategies, such as more income (e.g. cash); increased well-being (e.g. non-material goods, like self-esteem, health status, access to services, sense of inclusion); reduced vulnerability (e.g. better resilience through increase in asset status); improved food security (e.g. increase in financial capital in order to buy food); and a more sustainable use of natural resources (e.g. appropriate property rights). Outcomes help us to understand the 'output' of the current configuration of factors within the livelihood framework. They demonstrate what motivates stakeholders to act as they do and what their priorities are. They might give us an idea of how people are likely to respond to new opportunities and which performance indicators should be used to assess support activity. Livelihood outcomes directly influence the assets and change dynamically their level – the form of the pentagon – offering a new starting point for other strategies and outcomes. The mean income increase of the project beneficiaries in various activities has been: agriculture 66 per cent, dairy 16 per cent, Non-farm 45 per cent increase in income.

11.1 LIVELIHOOD INDICATORS

Some indicators, this can help to measure livelihood intervention outcome in quantitative forms. These are given below:

11.1. Changes in household income

Sr no	Pre project				Post project				Remarks
	Livelihood activity	No of household involve (APL/BPL)	Income in Rs (yearly)	Change in income Rs (yearly)	Livelihood activity	No of household involve (APL/BPL)	Income in Rs (yearly)	Change in income Rs (yearly)	
1									
2									

Expected outcome can be:

Households involved in activities viz. cultivation, horticulture, Animal husbandry and other activities indicate that income from those sources have increased. This increase is visible across both APL and BPL households.

Almost 50 percent of households have reported increase in income from new production system or new agriculture practices and 20 percent of households have reported increase in income from Micro enterprise.

Further analysis of the individual activities was taken-up to ascertain statistical significance of the findings. This was done for activities where the reported change is significant. For cultivation, local labour and migration, the change is highly significant as well as statistically significant.

11.1.2 Change in Agriculture

Sr. No.	Name of crops	Pre-project			Expected Post-project			New intervention adopted	Remarks
		Area (ha)	Production in Qtl	Average Yield (Qtl) per ha.	Area (ha)	Production in Qtl	Average Yield per ha (qtl)		
1	Kharif								
2	Rabi								
3	Zaid								

Expected outcome can be:

Indicate change in cropping pattern because of new production system interventions for ex. incidence of soybean cultivation is found to be more in project. Similar is the case of households cultivating water intensive crops and vegetables, Adopted micro irrigation system etc.

The findings reflect that the project has positively impacted on the level of access of services related to agriculture in comparison with pre-project situation. Improved access is significant especially for availability of improved seeds, fertilizers, credit, trainings etc. The increase is maximum (6 times) for agricultural related information followed by seeds (more than 4 times) and fertilizers (3 times).

Incident to the project interventions, approximately 20-30 percent of households in project villages have reported that in the last two years they have visualized increase in production of agricultural crops. The increased production is for Cash crop, grain crop, oil seed, pulses, cereals, vegetables crops and fruit. The enhanced level of production is incident to the project interventions.

11.1.3 Livestock

Sr no	Type of Animal	Pre-Project			Expected Post-project			Remarks
		No.	Yield	Income	No.	Yield	Income	
1	Milch-animals							
2	Draught Purpose animals							
3	Animals for other purpose							

Note: for fluids please mention in litres, for solids please mention in kgs and income in Rs

Expected outcome can be:

Approximately one-fourth of the households in the project villages have reported that the interventions especially exposures to camps have led to reduced mortality rate and better cattle health. Reduced incidences of diseases have been reported by 71 percent of the project households.

Approximately one-fourth of the households in the project villages have reported that the interventions especially breed improvement has lead to increase milk production 2 to3 times in the project area.

11.1.4 Traditional skills based activities

Sr. No.	Name of activity	Forward/Backward linkage	Market linkage with	Outcome (Av. Annual Income in Rs)

Expected outcome can be:

One of the project output is to engender transition from "wage labour to micro enterprise or self employed service provider" the same being achieved through household members upgrading their skills or starting an enterprise.

The findings of traditional skills based activities reflect that almost 10 percent of the households in the project villages have members who have started on their own or up scaled existing traditional enterprise in the project duration. Of these 80% of the households were earlier involved in wage labour activities.

11.1.5 Migration

Sr no	No. of persons migrating		No. of days per year of migration		Remarks
	Pre-project	Expected post project	Pre-project	Expected post project	
1					

Expected outcome can be:

The level of migration in the project villages has reduced notably in the project area. This has come down due to new livelihood option available at village level.

11.1.6 Common land resources

S. No.	CPR particulars	Activity proposed	Target			Remarks
			Target area under the activity (ha)	Estimated expenditure (Rs.)	Expected no. of beneficiaries	
1						

Expected outcome can be:

More than 60 percent of these households access the community land resources present in their village. Grazing land, Common wasteland and forest are primarily used for fodder, cow dung and fuel wood.

The usage pattern of these land resources does not show variation across APL and BPL households and availability of fodder is found to be better in project village.

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Annexures

Annexure:I

Annual Action Plan of Livelihood Activities

Data capture Level : Project wise/Village wise **IWMP Projects:- ……..**

Village Name: **IWMP Project Name:……..**

Taluka Name: **Project Sanction Year……..**

Periodicity : Annual					1st year		2nd year		3rd year		4th year	
Sr. No	Name of Activity	Name of Sub-activity	Unit (ha/nos)	Total Amount	Target	Target (Rs. In lacs)	Target	Target (Rs. In lacs)	Target	Target (Rs. In lacs)	Target	Target (Rs. In lacs)
A	**Agricultural Development**	**Crop Demonstration**										
		Maize, Red Gram, Wheat										
		Turmeric, Ginger, Garlic										
		Horticulture Nursery With Green House (S.H.G.)										
		Nursery Raising for Forestry Plantation (SHG)										
		Rose & Sitafal Nursery (SHG)										
		Other Agri-Develoment										
		Agro-Horti-Forestry (Wadi)										
		Vegetable Growing										
		Floriculture										
		Kitchen Garden with Bucket Kit										
		Better Quality (Improved variety) Seed & Cattle Feed Store to SHG										
		Poultry										
		Fishary										
		Other activities										
B	**Organic farming**	Vermi-compost to individual										
		Vermi-compost to Group										
C	**NTFP Activities**	Collection of Leaves										
		Collection of Medicinal herbs										

		Others										
D	**Agro-processing Unit**	Mango processing Unit (SHG)										
		Mahuda Extraction Oil Center										
		Ground-nut Processing unit										
		Other Different Processing Unit										
E	**Dairy Development**	**Improvement of livestock**										
		Cattle Camp										
		Artificial Insemmination										
		Training on good rearing										
		Others										
		Milk Production										
		Milk Collection Center (BMC) & Dairy Product Processing Unit (SHG)										
		Others										
F	**Activities for Assetless**	Paper Dish Making Unit (SHG)										
		Lether Works										
		Artisan works										
G	**Other Minor Activities**	Minor activities Proposed by the team										

Annexure-II

Micro Irrigation Model

Micro-Irrigation System

Iirrigation may be defined as the science of artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and re-vegetation of disturbed soils in dry areas and during periods of inadequate rainfall. Major Kharif Crops are Cotton, Groundnut, Sesamum, Castor, Paddy, Bajra, Maize, Tur, Green Gram, Sugarcane and major Rabi / summer Crops are Wheat, Rice, Maize, Mustard, Gram, Groundnut, Bajra.

Objective

The main objectives are enhancing agricultural productivity through various types of irrigation system have the following sub objectives:

i. Providing uniform water over the land surface or plants
ii. Maintenance of landscapes and vegetation
iii. Improving quality of crops & fruits
iv. Providing pesticides and fertilizers
v. Efficient utilization of water

Indicative values of the Irrigation Efficiency

Irrigation methods	Field irrigation efficiency
Surface irrigation (border, furrow, basin)	60%
Sprinkler irrigation	75%
Drip irrigation	90%

vi.

Drip Irrigation System

It is method of application of water to the plant in a controlled way through water dispersing device at a designed rate just at zero discharge pressure, directly above the root zone under the canopy of plant. Drip irrigation, also known as **trickle irrigation**, functions as its name suggests. In this system water falls drop by drop just at or near the root zone of plants. This method is the most water-efficient method of irrigation

Advantages of Drip Irrigation System

(i) Crop grows consistently, healthier and matures fast.
(ii) Early maturity results in higher and faster returns on investment.
(iii) Fertilizer use efficiency increases by 30%.
(iv) Cost of fertilizers, inter-culturing and labour use gets reduced.
(v) Fertilizer and chemical treatment can be given through micro-irrigation system itself.
(vi) Considerable saving in water.
(vii) Considerable saving labour
(viii) Undulating terrains, saline, sandy & hilly lands can also be brought under productive cultivation.

Various Crops Can be covered under Micro Irrigation System are:

Sr. No	Type of Crop	Name of Crops
1	Fruit crops	Almond, Apple, Arecanut, Indian Gooseberry, Ber (Zizyphus), Banana, Cashew, Custard Apple, Cherry, Durian, Fig, Guava, Grape, Litchi, Lemon, Sweet Lime, Mango, Orange, Olive, Papaya, Pomegranate, Pear, Peach, Pistachio, Pineapple, Sapota, Strawberry, Star Fruit, Jack Fruit, Tamarind, Water Melon, Musk Melon.
2	Vegetable crops	Brinjal, Cucumber, Lettuce, Pepper, Potato, Pea, Tomato.
3	Field & other Crops	Corn, Cotton, Sugarcane, Tobacco, Betel vine, Mulberry.
4	Oil Seeds	Groundnut, Sunflower, Jojoba, Castor.
5	Forage crops	Lucerne, Pastures, Turfs, Fodder.
6	Plantation crops	Cardamom, Coffee, Tea, Rubber, Spices, Oil Palm, Coconut.
7	Ornamentals	Floricultural Plants; Rose, Gerbera, Carnation, Gladioli, Poinsettias, Chrysanthemum.
8	Forest Trees	Eucalyptus, Casuarinas, Teak, Acacia, Bamboo, Neem, Dalbergia.

Types of Irrigation Systems

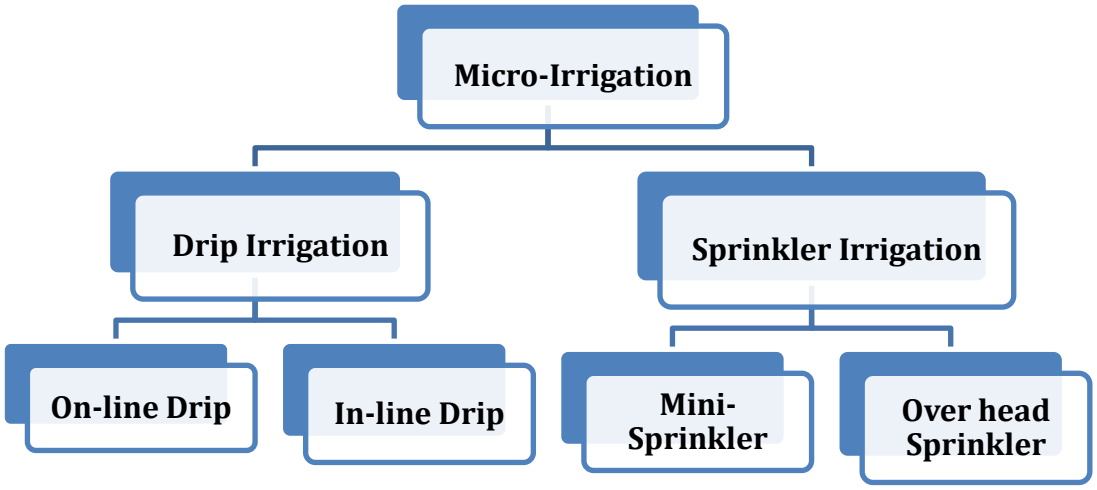

Fig: Various types of irrigation system

Water Requirement of Crops/Plants

Water requirement of crops (WR) is a function of surface area covered by plants, evaporation rate and infiltration capacity of soil. At first, the irrigation water requirement has to be calculated for each plant and thereafter for the whole plot based on plant population for the different seasons. The maximum discharge required during any one of the three seasons is adopted for design purposes.

The daily water requirement for fully grown plants can be calculated by equation WR = A X B X C X D X E; Where : WR = Water requirement (lpd/plant); A = Open Pan evaporation (mm/day); B = Pan factor (0.7); C = Spacing of crops/plant (m2); D = Crop factor (factor depends on plant growth for fully grown plants = 1); E = Wetted Area (0.3 for widely spaced crops and 0.7 for closely. spaced crops). The total water requirement of the farm plot would be **WR x No.of Plants**. The daily water requirement pf various crops per plant for different pan evaporation readings are given in Table below.

Table: Water requirement of Crops/Plants on the Basis of Pan Evaporation Data

Crops	Spacing (m)	Pan Evaporation (mm/day)				
		2	4	6	8	10
		Water Requirement(lpd /plant)				
Grapes	3.0x3.0	3.7	7.6	11.3	15.1	18.9
Mango/Sapota	10.0x10.0	42	84.0	126.0	168.0	210.0
Oranges	'5.0x5.0	10.5	21.0	31.5	42.0	52.5
Coconut	6.0x6.0	15.1	30.2	45.4	60.5	75.6
Banana	7.5x7.5	24.2	48.5	72.8	97.0	121.3
Cotton	1.5x1.5	1.7	4.4	6.6	8.8	11.0
Tomato/Brinjal/Chillies	1.3x1.3	0.5	3.3	5.0	6.6	8.3
Sugarcane	1.0x0.3	0.3	1.0	2.5	2.0	2.5
Litchi	6.0x8.0	35	42	65	69	

Recommended spacing of various crops for Drip Irrigation System

Sr.No	Crop	Spacing (m)	Plant Population (Nos/ha)
1	Grapes	3.0x3.0	1,100
2	Mango	10.0x10.0	100
3	Oranges	5.0x5.0	400
4	Lime	6.0x6.0	270
5	Coconut	7.5x7.5	175
6	Banana	1.5x1.5	4,400
7	Cotton	1.3x1.3	5,900
8	Tomato/Brinjal	1.0x0.5	20,000
9	Sugarcane	1.0x0.3	33,000
10	Litchi	6.0x8.0	208

The average unit costs of drip irrigation system for different crops

Sr.No.	Crop	Spacing (m)	Cost (Rs/ha)
1	Coconut	8x8	23790/-
2	Sapota/Mango	10x10	17030/-
3	Oranges/Guava	6x6	28010/-
4	Pomegranate	4.5x2.7	32010/-
5	Grapes	2.7x1.8	54370/-

6	Banana/ Papaya	1.8x1.5	73010/-
7	Sugar Cane	[(0.75m+1.25m) x 0.15m] lateral spacing-2.25m	60440/-
8	Vegetables	0.6x0.45	103020/-
9	Mango	5x5	32060/-
10	Litchi	6x8	42000/-

Model Design of Drip Irrigation System

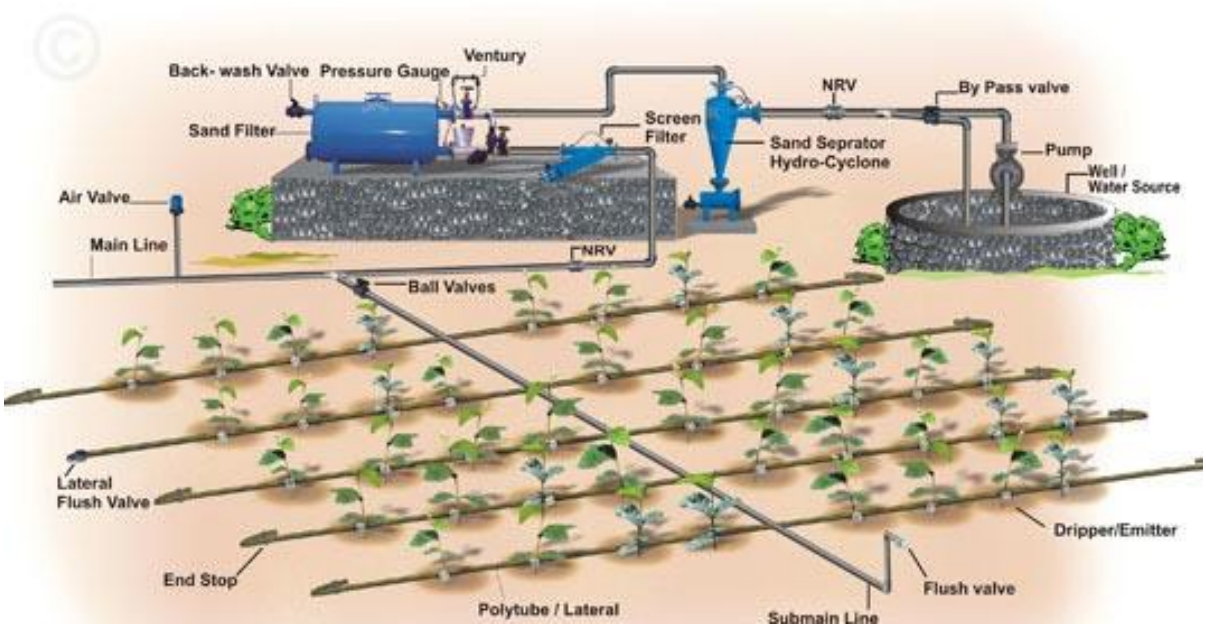

Fig: Drip Irrigation Model design

Fig: Drip inline irrigation system in a banana field (Source: Jain Irrigation System Ltd., Jalgaon, Maharashtra)

Fig: Drip inline irrigation system in a banana field (Source: Jain Irrigation System Ltd., Jalgaon, Maharashtra)

Sprinkler Irrigation System

Water is sprayed into the on the ground surface somewhat resembling rainfall to supply adequate moisture for plant growth, application of pesticides and fertilisers. The spray is developed by flow of water under pressure through small orifices or nozzles. Sprinkler systems are currently being used for a wide variety of crops such as fruit trees, vines and vegetables, broad acre crops and pasture, and on a wide range of soil types and topography. It is the most popular in the areas having sufficient water quantity, Sandy soil type and cropping pattern of close spacing field crops like Potato, Ground nut, Fodder grass etc.

Advantages of sprinkler irrigation

- Elimination of the channels for conveyance, therefore no conveyance loss
- Suitable to all types of soil except heavy clay
- Suitable for irrigating crops where the plant population per unit area is very high. It is most suitable for oil seeds and other cereal and vegetable crops
- Water saving
- Closer control of water application convenient for giving light and frequent irrigation and higher water application efficiency
- Increase in yield
- Mobility of system
- May also be used for undulating area
- Saves land as no bunds etc. are required
- Influences greater conducive micro-climate
- Areas located at a higher elevation than the source can be irrigated
- Possibility of using soluble fertilizers and chemicals
- Less problem of clogging of sprinkler nozzles due to sediment laden water

Mini-Sprinklers

Mini-Sprinklers cover a wide range of products that are designed and manufactured for the special requirement of lawns. Spay heads for installation in lawns are pop-up types; these heads are installed flush with the turf. A nozzle pops-up to deliver the spray during operation and recedes within the body when inoperative.

Spray Pop-ups Recommended for landscape, turf and home gardens.	
Floppy Sprinkler Ideally suitable for irrigation of closely spaced crops like sugarcane, vegetables, oil seeds, onions, potato, fodder, cereals, etc.	

Over Head Sprinklers

Overhead Sprinklers are designed for a wide range of general field uses portable, semi-portable and solid set systems, to meet the demanding needs of modern, economic irrigation systems. Featuring a sophisticated field tested construction and the use of highly corrosion resistant materials; they ensure fall safe operation and long life requiring a minimum maintenance. Wide range of overhead sprinkler starting from small nozzle size with low flow rates to large nozzle size with high flow rates.

Over head Sprinklers (High-Level) Range includes:	
Jain Impact Sprinkler - Full Circle Suitable for field crops like pulses, oil seeds, vegetables, sugarcane, cotton, cereals, tea, coffee and fodder crops.	
Jain Impact Sprinkler - Part Circle Can be efficiently used where field layout is uneven or at the sides and corners of the field.	
233B - AF - Anti Frost Metal Impact Sprinkler Overhead irrigation and frost protection in vineyards, orchards and vegetables.	
Impact Pop-Up 805 Large fields and plantations (tea gardens and coffee).	
Medium Volume Rain Gun Model 162 & 163 Recommended for field crops like sugarcane, pulses, oil seeds, cereals, tea, coffee, and vegetables.	
Big Volume Rain Gun Model Twin 95 Plus Recommended for field crops like sugarcane, pulses, oil seeds, cereals, tea, coffee & vegetables, etc.	
Big Volume Rain Gun Model Twin 140 Plus Recommended for field crops like Sugarcane, Pulses, Oil Seeds, Cereals, Tea, Coffee & Vegetables etc.	

General Futures of Gujarat Green Revolution Company

- Any farmer can get subsidy of Rs.60, 000 per hectare or 50 % of the MIS cost (derived based on crop spacing) whichever is less for any area & any crop. Tribal Farmer of tribal area can get additional 25 % subsidy from Tribal Department of GOG.
- Government of Gujarat placed the subsidy at the disposal of GGRC. Subsidy is released by GGRC after scrutinizing the applications directly where as in other States subsidy is released through government.
- GGRC arranges bank finance to farmers, who needs loan. MIS supplier has to render agronomic and technical support after implementation (after sales service). In other schemes, farmers have to rely on themselves.
- Insurance coverage equivalent to cost of MIS, to farmer for five years for MIS components and the farmer (as well) except natural death.
- Maintenance and repairs of MIS support by the supplier for five years.
- Supply of other agro inputs through GSFC depots and continuous farmer services.
- Farmer can choose cropping pattern of his choice with a flexibility of MIS.
- District-wise NGO's provide socio-economic feedback report on the project.
- 200 depots of GSFC/GNFC are coordinating between farmers and MIS agencies.
- Agricultural Finance Corporation will evaluate the impact of MIS on the farm economics periodically.

Annexure: III: Agro-Forestry Combination

Trees(Fuel/Fodder)	Grasses	Crops
1. Hill Region		
Grewia optiva (Bhimal)	Crysopogon Fulvus(Gorda)	Wheat
Bauhinia Variegata (Kachnar)	Eulaliopsis binata (Bhabhar)	Maize
Celtis australis(Khiriks)	Dichanthium annulatum	Pepper
Albizia Chinesis(Ohi)	Hybrid napier	Potato
Morus Serrata(Kimar)	Panicumj maximum	Peas
Ficus roxburghii(Timla)	Cenchrus ciliaris	Tomato
Toonu ciliata(Toon)	Digitaria decumbense	Cauliflower
Pistacia Integerrima(Kekkar)	IIteregopogon contortus	Beans, Mustard
Ficus Palmata (Angiri)		Sesamum
Mella Azadarach(Derek)		Taramira
Bombax Ceiba (Simul)		
Prunus Puddum (Pazzar)		
Morus Alba(Shehjatoot)		
II. Alluvial Plain Region		
Azadirachta indica	Diplachne Fusca	Seasmum
Dulbergia sissoo	Dichanthium annulatum	Wheat
Acacia nilotica	Chenchrus Cillaris	Taramira
Shorea robusta	Mentha arvensis	Pearlmillet
Eucalyptus hybrid		Mustard
Populus deltoides		Paddy
Seshania spp.		Potato
Tectona grandis		
Prosopis Juliflora		
Cusurina equisetifolia		
Terminalia Arjuna		
III. Arid and Semi-arid Region		
Prosopis cineraria	Chenchrus ciliaris	Sorghum
Acacia nilotica	Dichanthium annulatum	Pigeonpea
Cacia tortilis	Panicum antidotale	Blackgram
Albizia Lebbeck	Chenchrus Setigerus	Taramira
Proposis Juliflora	Brachiaria ramosa	Safflower
Holoptelea integrifolia	Digitaria adscendens	Pearlmitter
Accacia albida	Dactylocterium Scindicum	Castor
Acadia senegal		Cluster Bean
Acadia senegal		Tobacco
Acacia tortillis		Cowpea
Eucalyptus tereticornis		
Hardwiokia binata		

IV Tropical Region		
Azadirachta indica	Hybrid napier	Sorthum
Cassia siamea	Chloris burnii	Safflower
Morus alba	Cenchrus Ciliaris	Bengalgram
Pongamia Pinnata	Dichanthium annualatum	Maize
Tamarindus Indica	Stylosanthus hamata	Cowpea
Eucalyptus globulus	Cenchrus Setigerus	Pearlimillet
Albizia lebbeck	Setaria grass	Pigeonpea
Acacia senegal	Guinea grass	Castor
Acacia albida		Cluster Bean
Hardwickia binata		Horsegram
albizia procera		
Prosopis juliflora		
Dalbergia sissoo		
V. Humid & Sub-Humid Region		
Eucalyptus tereticornis	Cenchrus Cilliaris	Maize
Acacia nilotica	Hybrid Napier	Mustard
Accacia lecophloea	Gautemala grass	Pigeonpea
Accasia Planiforns	Guinea grass	Safflower
Ailanthus triphsa	Setaria grass	Cassava
Casuotina equisetifolia	Stylosanthes quyanensis	Elephant Foot Yarm
Sesbania grandiflora		Turmeric
Prerocarpus marsupium		Phascolus
Acacia auriculiformis		Blackgram
Albitia Falcataria		Hosegram
Artocurpus heterophyllus		Cowpea
Sesbania aegyptica		Niger
Bauhinia purpurea		Groundnut
Gmelina Arborea		
Trema Amboinensis		
Tamarinds india		
Mussuendra Macrophylla		
Gliricidium sepium		

Annexure-IV

HORTICULTURE SCENARIO OF GUJARAT STATE

Sub Region	District	Rainfall	Soils	Major horticultural crops
Southern Hills	Dang, Valsad, Navsari	1500 and above	Deep black with patches of coastal alkali lateritic and medium black soil,	Mango, Chikoo (Sapota), Banana and Coconut, Brinjal, Tomato, Chillies,Turmeric etc.
South Gujarat	Surat, Bharuch, Narmada	1000 to 1500	Deep black clayey soils	Mango, Chikoo (Sapota), Banana, Coconut, Tomato, Okra and Beans
Middle Gujarat	Panchmahal, Dahod, Vadodara, Kheda, Anand	800 to 1000	Deep black to loamy sand (Goradu)	Mango, Banana, Chikoo (Sapota), and Kagzi Lime, Papaya, Potato, Brinjal, Cabbage, Cauliflower, Tomato, Okra and Cluster bean, Ginger, Coriander, Chillies, Fenugreek, Fennel
North Gujarat	Ahmedabad, Gandhinagar, Sabarkantha, Banaskantha, Patan, Mehsana,	625 to 875	Sandy loam to sandy soils	Kagzi Lime, Guava, Ber, Pomegranate, Brinjal, Cabbage, Okra, Tomato, Cauliflower, Cluster bean, Cumin, Chillies, Ginger, Coriander, Fenugreek, Fennel
North Arid Zone	Kutch	250 to 500	Sandy and Saline soils	Mango, Banana, Chikoo (Sapota), Papaya, Ber, Coconut, Date palm and other vegetables, Cumin etc.
North Saurastra	Bhavnagar, Jamanagar, Surendranagar, Amreli, Rajkot,	400 to 700	Shallow medium black soils	Mango, Chikoo (Sapota), Banana, Kagzi Lime, Pomegranate, Papaya, Guava, Coconut, Potato, Onion, Brinjal, Okra, Cumin, Garlic Chillies, Coriander etc.
South Saurastra	Junagadh and Porbandar	645 to 700	Shallow medium black & calcareous soils	Mango, Chikoo,Banana, Pomegranate, Papaya, Coconut, Onion, Brinjal, Okra, Cumin
Bhal & Coastal	Khambhat, Bhal Coastal area of Surat	625 to 1000	Medium black poorly	Chillies, Ber, Aonla, Tamarind etc.

Area	& Bhrauch Olpad, Vagra, Hansot, Alater, Khabhat, Dholka, Dhandhuka Vallbhipur, Bhavnagar & Limbdi Talukas		drained and saline soil	

Annexure-VI

List of district wise field representatives

Important crops grown in each district (Seasonwise)

Sr.	District weather	Kharif crops	Rabi crops	Hot- crops
1	Ahmedabad	Paddy,Bairi,G'nutJowar, Hy. Castor Cotton, deshi & Hy.Sesamum.	Wheat,(Dry),Wheat(Irri.) Gram,Mustard, Cumin,Sunflower,Rabi Jowar.	Bajri
2	Banaskantha	Bajri,Jowar,Pulses, Guwar,Castor, Cotton, Maize,/Fennel	Wheat,Mustard,Cumin, Isabgul,Gram,Potato,	Bajri, Mug,G'nut
3	Baroda	Cotton,Paddy,Jowar, Pulse, Vegetables, Pegionpea(Tur) Soyabean.	Rabi,Jowar,Wheat, Vegetables	Bajri (Erract) Bajri,Tobacco, G'nut, Gram, Maize, Mustard,Mug
4	Narmada	Cotton,Paddy, Jowar,Tur,Bajri	Wheat,Jowar,Gram, Sugarcane,Vegetable,	Maize, Vegetable, Pulses,Mug
5	Bharuch	Cotton,Paddy,Jowar, Pegion Pea,(Tur) Bajri Soyabean	Wheat,(dry),Wheat(Irri) Jowar,Gram,Sunflower, Vegetables/Pulses	-
6	Bulsar	Paddy,Sugarcane Jowar, Kharsani.	Sugarcane,Wheat, Vegetables, JowarPegion pea (Tur)	Sugarcane, Cowpea, Mug
7	Navsari	Paddy,Sugarcane,Jowar	Sugarcane,Wheat, Jowar, Tur,Vegetables	Sugacane, Paddy, Mug,Cowpea
8	Dangs	Paddy,Nagli,Wari	Gram,Wheat	-
9	Gandhinagar	Bajri,Paddy,Castor, Pulses, Vegetables,Cotton,Jowar,	Wheat,Musard,Vegetables, Lucern	Bajri,Pulse, Vegetable Jowar(fodder)
10	Anand	Paddy,Bajri,Tobacco, MaizeTur,Vegetable	Wheat,Mustard,Tobacco, Vegetable,Sufflower	Vegetable, Paddy, Grass
11	Kheda	Paddy, Bajri, Tobacco, Cotton,Maize,Pegion,Pea(Tur) Fennel,Vegetables	Wheat,Mustard,Potato, Tobacco,Vegetables, Safflower,Grass.	Vegetables, Grass,Hy.Bajri, Paddy
12	Mehsana	Hy.Bajri,Hy.Castor,Cotton, Jowar,Pulses,Sesamum, Vegetable, Chilly/Fennel.	Wheat,Cumin,Mustard, Isabgul,F.grick,Tobacco, Lucern,Cow-pea.	Hy.Bajri,G'nut. Pulses

Annexure: VI: District Wise Data for NTFP

Sr. No	Name of District	Name of Item	2007-08 Collection of Quantity In Qui.	2008-09 Collection of Quantity In Qui.	2009-10 Collection of Quantity In Qui.
1	**Panchmahal**	Mahuda Flower	3155.92	10	256.85
		Mahuda Fuitseed	50.75	103.27	47.73
		Amla Pulp	186037	0	95.5
		Wild Bor	13.5	0	100
		Bamboo	10	0	0
		Neam Seed	12.6	0	105.9
		Casia Augusti Folia	0.5	0	0
		Khakhra Seed	10	0	0
		Brahmi	4.45	0	0
		Amla Seed	0.2	0.675	0.1
		Ber Cotyledons	0.25	0	1
		Moringa Leaves	0	3.91	0
		Stylo Grass	0	14.5	0
		Sankhpushpi	0	0	5
		Kasra Augusti Folia Seed	0	0	0.4
		Jetropha	0	0	23.4
		Datura	0	0	0.7
2	**Kheda**	Kusum Lac	0	0	2.6
		Babul Gum	39.67	16.98	21.01
		Mahuda Seed	0	6.69	4.27
		Green Amla	0	0	11.77
3	**Panchmahal**	MahudaFlower	199.86	0	50
		Mahuda Seed	0	8	4.5
		Tetropla	0	0	20
		Amlapulp	0	0	25.2
		Gokhru	0	0	30.4
		Kachkabij	0	0	4.9
4	**Dahod**	Mahuda Flower	5550.7	0	500.29
		Mahuda Seed	108.72	0	77.56
		Casia Tora	68	0	-
		Blackberry Seed	0	0	53.11
		Ashwagandha	0	0	20
		Bheda Bank	0	0	26
		Ithieer Plot	0	0	2.31
5	**Vadodara**	Mahuda Flower	4307.21	0	310.88
		Mahuda Seed	100.45	167051	65.4
		Casia Tora	25.94	25.94	0
		Kusum Lakh	4.04	0.1	15.77
		Khakhar Lakh	7.82	0	0
		Jambu Seed	0	10.6	100.93
		Gado	0	7.18	22.25
		Charoli Seed	0	0	0.5
6	**Narmada**	Timru Pan	7761.4	6143.8	6872.6
		Mahuda Flower	73	69.25	75.44
		Mahuda Seed	19.71	3.8	5.56
		AmlaPulp	12.76	27.65	57.85

		Gado	11.92	44.9	3.89
		Casiatora	876	0	241
7	**Bharuch**	Timru Pan	4684.8	3783.5	3324.7
		Mahuda Flower	15.25	0	15
		Mahuda Seed	5.2	7	3
8	**Surat**	Timru Pan	5329.6	5801.4	5475.5
		Mahuda Flower	30.55	0	20
		Mahuda Seed	15.1	35	17.2
		Jetropha	18.1	2.8	30
		Casia Tora	330.7	0	118.24
9	**Tapi**	Timru Pan	6736.2	6328.7	0
		Mahuda Flower	70	0	29.24
		Casia Tora	373	0	253
10	**Kutch**	Honey Bee	257.695	1939.63	894.23
		Wax	4.182	21.676	16.537
		Ganda Babul	14.58	37.84	62.91
11	**Patan**	Ganda Babul	0	4.3	3.5
		Charcoal	0	18018.18	34690.42
12	**Junagadh**	Timru Pan	591	495.145	747.62
		Ganda Babul	20	0	29.36
13	**Jamnagar**	Gugal	0	61.65	35.681
		Gokharu	0	0	1.6
14	**Navsari**	Mahuda Flower	127.45	0	87.81
		Mahuda Seed	10.95	21.2	21.69
		Jetropha	0	0	10.5
15	**Dang**	Jetropha	1198	0	752.64
16	**Valsad**	Mahuda Flower	127.2	0	78
		Mahuda Seed	9.3	13.81	30.07
		Karanj Seed	5	0	0.89
		Casue nut Seed	0.75	0.3	2.95
17	**Sabarkantha**	Timrupan	61582.6	66183.9	35234.6
		Mahuda Flower	888.57	0	218.59
		Mahuda Seed	135.04	249.04	108.28
		Casia Tora	139	0	0
		Salai Gum	46.01	96.22	243.82
		Ganda Babul Gum	22.5	0	5.82
18	**BanasKantha**	Timrupan	1007	329	334.6
		Salai Gum	14.75	6.01	23.47
		Ganda Babul Gum	91.48	1.21	28.33
		Casia Tora	258.8	140	0
		Honey Bee	42.74	47.34	0

Annexure-VII: Farmer organizations

Farmer organizations can be grouped into two types: one is the community-based and resource-orientated organization; the other is the commodity-based and market-orientated organization.

Community-Based, Resource-Orientated Farmer Organizations. This type could be a village-level cooperative or association dealing with inputs needed by the members, the resource owners, to enhance the productivity of their businesses based on land, water, or animals. These organizations are generally small, have well-defined geographical areas, and are predominantly concerned about inputs. However, the client group is highly diversified in terms of crops and commodities.

There are many primary-level agricultural cooperatives in the developing world, but the majority of them have been financially vulnerable and ineffective. Strategies have been developed to strengthen these organizations (see the section on how to strengthen existing farmer organizations). This group of organizations can generate income from the sale of inputs and outputs. The income can then be put back into the organization by spending it on extension, data generation, business planning, and administration. It is essential to have professional and honest management with constant monitoring and periodic rounds of evaluation (Gupta, 1989). *Commodity-Based, Market-Orientated Farmer Organizations.* These organizations specialize in a single commodity and opt for value-added products which have expanded markets. They are designated as output-dominated organizations. Not specific to any single community, they can obtain members from among the regional growers of that commodity who are interested in investing some share capital to acquire the most recent processing technology and professional manpower. These FOs are generally not small and have to operate in a competitive environment. Research, input supply, extension, credit, collection of produce, processing, and marketing are all integrated to maximize the returns on the investments of the members who invested in the collective enterprise. Several successful cases are found in India, such as Anand Milk and other dairy FOs.

The rate of success of these organizations is determined by their capacity to arrange for major investments and a continuous flow of raw materials. This requires the competent and convincing management of both enterprise-related and member-related aspects. The profits generated are used to provide supplementary and supportive services at reduced cost to encourage members to use them. To do this requires a high calibre of

representative and enlightened leadership from among the grower members. It is a challenging and demanding task to conceive, design, build, and nurture this type of FO.

VEWs can consult and work with other governmental agencies and nongovernmental organizations. However, each farmer organization will need to define its own BASE (basic activity sustaining the enterprise). In India, or for that matter in many developing countries, there is tremendous potential for expansion of commodity-based FOs. One rule of thumb suggests that any commodity which accounts for more than 50 percent of the costs of the raw material can be considered for value-added processing by a farmer organization (V. R. Gaikwad, personal communication, 1994).

Issues Influencing Participation in FOs

The following issues will influence the extent of participation:

- The degree of the farmer's dependence on the outputs of the organized activity.
- The degree of certainty of the availability of the outputs.
- The extent to which the outputs will be available only as a result of collective action.
- The extent to which the rewards associated with the collective action will be distributed equitably.
- The extent of availability of rewards within a reasonable time frame.
- The extent to which the rewards are commensurate with the costs associated with continued participation (Shingi & Bluhm, 1987).

The Role of Extension in Farmer Organizations

The role of extension will vary with the role of the organization, the sectors in which the organization operates, the services offered, and the organizational form used. In community-based organizations, extension is used as a supplementary or supportive activity to realize the objectives of the BASE function of the organization. In commodity-based organizations, extension is integrated with all the other aspects of the organization to maximize the returns on the investment of the collective enterprise. Extension is taken seriously by both the organization and its members because both derive direct and measurable benefits from it.

The following issues need to be considered when developing the extension role, especially for farmer organizations which are set up to specialize in the extension function:

- Is there an identifiable need for extension in specific commodities in the area covered by the FO?

- Would the FO be able to generate enough revenue from the extension activity alone (with farmers willing to pay for these services) to meet the FOs expenses and to provide satisfactory rewards to its members for their monetary and nonmonetary contributions? It will be important to anticipate the high potential for unresolved conflict over the issues of equity and charges for extension services.
- How sustainable will the extension activity be over time, and therefore how sustainable will the organization be? It is possible for advice to be converted to freely transmittable knowledge which can be transferred to anyone without payment. The cost of the extension advice limits access to this knowledge. Therefore, the revenue earned from the extension activity could decline, especially with a client group which has a low resource base and is primarily concerned with a subsistence economy.
- Can the advice given be actually put into practice and produce tangible benefits to the FO members? The FO would need to control or arrange for the supply of necessary inputs to ensure this; otherwise, the extension organization will fail, as has happened in the past in many developing countries. This means that the extension function needs to be integrated backwards with research recommendations and forward with the supply of inputs.
- The organization will need to provide specific information in addition to the general information available from research centres. To do this and to survive, the organization will need a research linkage with government and university research institutions. It is beneficial if the FO can employ qualified and committed scientists who have active contacts in research organizations or who can act as consultants to groups of members. This would increase the cost of extension advice to members if the FO is supposed to be financially self-supporting.
- It is necessary to appreciate that "extension markets" are governed by factors such as agroclimatic variations, infrastructure development, and the strength of market forces. FOs operating in desert regions, single-crop rainfed areas, and predominantly irrigated areas will have different occupational and extension needs; therefore, variable response patterns to extension have to be anticipated (Gupta, 1981, 1985). Similarly, FOs operating in food-deficit and food-surplus stages will have different roles, expectations, and returns.

Steps in establishing farmer organizations

Some of the principles and steps for social action models, community organizations, and management are used in designing the simplified step-wise approach in establishing FOs (Chamala, 1990). Care needs to be taken in selecting a person or a group of people who will take the lead in establishing community-based or commodity-based farmer organizations. This person - from another FO or government or other organization, such as a village extension worker - needs to be acquainted with and convinced of how the FO can be used to increase the income of small producers. In the following steps, the term VEW will be used to refer to the person or group of people selected to establish the FO.

Step 1. Understanding the Village Community

VEWs should enter the community with an open mind and understand the community structure. They must understand the community power structure, problems, and opportunities for development. Walking around and talking to key people can help ease their entry into the community. VEWs should also develop an under-standing of the entire community, including the poor and marginal farmers and women.

Some of the techniques that can help to understand the community are using key informant techniques, participating in the community meeting and tea stalls, and walking around. Understanding the ownership of community resources and people's attitude, knowledge, and skills in the development of agricultural production will help the VEW learn about the community. The VEW can also understand the situation in more depth by collecting both qualitative and quantitative information on the levels of income and productivity, costs of cultivation, post-harvest losses, output utilization, and the likelihood of making striking improvements to each of these factors.

Step 1 is crucial and cannot be done in a hurry. VEWs must spend some time (up to a month or so) to get the feel of the village community structure, politics, groups, and past experience in FOs.

Step 2. Identifying Potential Leaders in the Community

The usual tendency is for the VEWs to talk to formal leaders and commercial sections of the community. By using the sociometry method (see Box 1 for details on the methodology), they can identify potential leaders. However, it is also important to be sensitive to the leadership structures operating in that culture and to the knowledge and skills needed to be a successful leader of a farmer organization.

In some cultures, it is wise to search for and contact middle-aged leaders of the area who are not too young or too old. Preferably, they should come from better-off families, have social status and respect, and be from farming households. Case studies of leaders who have established farmer organizations show that these leaders initially made considerable sacrifices, experienced financial losses, and had to be supported by their families. These leaders also had to struggle and negotiate with bankers, bureaucrats, politicians, critics, and others including their own farmer members (Seetharaman & Shingi, 1992). This family background and grooming helps these leaders to deal with situations which they will have to face with confidence and without being cowed. Leadership of an FO is not a job for a sincere but ordinary farmer.

Step 3. Talking to the Identified Leaders and Seeking Cooperation from Other Agencies

VEWs might talk to these leaders on general agricultural development and get ideas and information on FOs in the village. They might also seek cooperation from government agencies and especially from NGOs (if there are any in the area) to help establish FOs and support them in achieving success.

Does the community have a farmer organization? If not, is there a need for such an organization? If the community has an FO, what is its structure and history of performance. How could the FO play a role in village or community development? VEWs can canvass for ideas from the community and add their own ideas on the need for and the role of FOs in the entire process of broad-based agricultural development. They can explain how FOs in other communities helped them in development. It is important to provide facts and figures to convince potential leaders of the possibilities and approaches for increasing the income of a sizeable number of farmers and for contributing to the economic development of the region. Good FO leaders might also receive political advantages through satisfied farmers and people living in the region. The leaders' support should be secured and key people encouraged to consult among themselves about the pros and cons of forming FOs in the community.

Step 4. Helping Local Leaders to Call Community Meetings.

VEWs can help enthusiastic local leaders to call for community meetings. Sometimes more than one meeting may be needed to discuss the need for and the role of FOs in agricultural development. FO leaders from neighbouring villages can be invited to speak at these meetings. Farmer-to-farmer information exchange helps them. Sometimes smaller meetings can be held for low-resource (small and marginal) farmers and

minority groups. They may prefer having a separate FO to serve their specific needs. There is no harm in having more than one FO in a village.

It is important that producers from all sectors in the village participate in these meetings because the success of an enterprise-based FO depends on the volume of raw material procured from member producers. Every small or big producer contributes to this volume. The volume itself is more important than the socioeconomic status of the supplier.

Prospective members need to be convinced that everyone benefits in proportion to his or her contributions, not just the big farmers, as is widely perceived.

Step 5. Nominating Core Group Leaders to Develop or Establish the FO

From the community meetings, core group leaders are elected or nominated to design the FO with further community consultation. In some cultures, however, this approach may lead to the appointment of leaders who are unable to cope with the complexities of a farmer organization, as mentioned in step 2. If leaders are elected or nominated, VEWs should consider the issues raised in step 2 when assessing each candidate for election or nomination.

In situations where it is more appropriate to appoint a leader, the search for a suitable person is critical and requires time and patience. It is also critical that the selected leader be involved in the search for a potential agro-based enterprise to act as a BASE (basic activity sustaining the enterprise) for economic development. This process requires time, patience, and interactive and intellectual inputs. The VEW can help the appointed FO leader in this process.

Step 6. Developing an Organizational Structure for the FO

The VEW can help the core group of leaders in developing an organizational structure for their farmer organization. In the past, the "blueprint" approach was taken without understanding the function that the FOs structure plays in its performance. Group discussions help to highlight the need for careful planning. See Box 2 for details.

The structure should serve the organization's functions and goals. Understanding various types of FOs is useful. Should they be commodity-based organizations, cooperatives, partnerships, groups, or syndicates? Should they be multipurpose? Should there be one FO for the entire village or several to cater to the needs of special-interest groups (low-resource farmers, women, craftsmen, small businesses, and the like)? Should they have subgroups and an advisory committee? It is the farmers' organization, so they must go through the process explained in Box 2 and design it carefully by

describing roles, responsibilities, rewards, and punishments for the people who perform tasks in the FO. At this stage, the VEW should, as far as possible, play a passive role because the leaders are the ones who are building the FO. NGOs also may share their experience and help leaders to develop an organizational structure.

Several less exacting chores also need to be taken care of at this stage. These include locating premises and negotiating for land, money, technology, personnel, construction, and infrastructure services such as power lines and telephones (if available).

Step 7. Developing the FO's Management through Education and Action Learning

An essential part of community empowerment is to help educate the leaders and members in management principles covering planning, implementing, and monitoring their projects and programmes. The following empowerment methods may be useful:

- *Educating.* Organize formal and informal learning activities.
- *Leading.* Help the leaders to lead and to learn from their actions by reflection as a team.
- *Mentoring and supporting.* Help the members initially by mentoring or supporting them in their planning and implementation stages.
- *Providing.* Obtain the services of other stake holders, FOs, and VEWs in providing various services to nurture the FO in the early stages of development.
- *Structuring.* Help the FO to structure its meetings and various participative planning activities and to learn from their experience through reflection.
- *Actualizing.* Help them to reflect on the process of managing their FO. Learning by doing can help them in self-actualization.(For more details on empowerment, see Vogt and Murrell (1990).

Step 8. Gearing up for Action

In this step, FOs examine their action plans, and task groups are set up to mobilize human and financial resources. Understanding the participative action management (PAM) planning process is useful (for details see Chamala, 1995a). A detailed six-stage PAM planning cycle (Figure 1) can help FO leaders in designing an inclusive and participative planning process. This is the stage to start considering the timing, scale, and content of the extension and research input of the FO.

Step 9. Implementing Selected Projects

In this step, the village extension worker can help the FO leaders implement the projects they have chosen.

The following process may be useful:

- Start implementing the selected project(s).
- Secure resources and allocate tasks.
- Develop a calendar of activities to achieve the goal.
- Develop monitoring processes for reflecting on events and activities regularly, either formally or informally.
- Ask committee members to meet to discuss actions periodically and report to general members regularly to keep them informed and involved.

Step 10. Monitoring and Evaluating the FO's Progress

Usually evaluation is done annually to meet formal requirements. But VEWs can encourage FOs to reflect on their activities more frequently so that they learn and improve their management skills. They need to watch for people who want to take over the FOs for their self-interest. It is important to take action against any negative influences. These monitoring or reflection processes help strengthen FOs and avoid self-defeating problems. Learning organizations are created through collective reflection and openness on financial and the other managerial matters (Senge, 1990).

The success of the farmer organization can be evaluated by measuring the increase in the members' productivity, the increase in their net income, and the net reduction in the cost of cultivation due to bulk purchases of inputs by the organization. It is essential to conduct monitoring and periodic evaluations.

How to strengthen existing FOs

Many farmer organizations that go through a high activity phase become inactive or defunct over a period of time. This is a normal process for many groups or FOs. VEWs can help the community to understand the reasons and causes for decline.

By reviewing the literature on groups and management, Chamala (1995b) identified twenty-six factors that factors, (2) service agency factors, (3) community factors, and (4) other external factors.

VEWs need to understand the factors that influence group or organization effectiveness or success (see details in Box 3). Many FOs have failed because of corruption, mismanagement, conflict, and lack of clear goals. It is important that VEWs understand these forces that influence their functioning. Several steps are suggested below to revive or revitalize existing FOs.

Policy issues in establishing and strengthening farmer organizations

Several macro-level policy issues influence the establishment of farmer organizations. Some were discussed earlier, but two issues need clarification and discussion (see also Korten, 1989; Esman & Uphoff, 1984; Burkey, 1993; Garforth, 1993).

Increased Demand for Services

Will strong farmer organizations create more demand for services, and if so, how can this issue be resolved? Some policy makers believe that strong farmer organizations could create more demand on research and extension. This is partly true, but if the overall policy framework emphasizes empowerment, self-help, or user-pay systems, then more local resources could be mobilized and help increase the correct way of using current natural resources on a sustainable basis. Several low-resource farmer groups working with other stakeholders like banks, agribusiness, NGOs, private consultants, and religious and philanthropic agencies will bring more resources to the development process. Retired professional teachers, nurses, and agricultural scientists could be encouraged to work as volunteers with FOs. In many developed countries, volunteers are a major force in providing services to the community.

Competition for Services

Will organized low-resource farmers compete for extension services with the existing commercial farm sector, and if so, how can this issue be resolved? In principle, farmer organizations with full empowerment reduce the pressure on "routine extension" activities, which take up a lot of the VEW's time. For example, "Landcare" groups in Australia and some successful FOs in Malaysia, the Philippine, Thailand, India, and Africa are helping other farmer groups or farmer organizations to be effective not for egalitarian or welfare reasons, but because they see that the commercial sector is dependent on low-resource farmers or upland farmers in solving their salting, erosion, water quality, and pest and weed management problems. Ecologically, the commercial sector is dependent on resource-poor or other minority tribes and groups for their survival. Just as in farmer-to-farmer extension methods, VEWs should help link the commercial sector with the low-resource farm sector so that win-win projects can be developed.

Similarly, the commercial sector needs peace and prosperity to avoid social unrest and to stop thefts and other problems. VEWs can play a positive role in developing a common or shared vision for sustainable development. Again, several techniques like future research, problem census, and SWOT analysis will help develop a

shared vision for the commercial sector as well as the low-resource farming sector or minority groups. Collective action is crucial for survival and sustainable development. Community organization is essential for rural development. One should not take a blueprint approach, but rather a learning-process approach within an action-learning framework (Korten, 198).

Source: Shankariah Chamala and P. M. Shingi , - Establishing and strengthening farmer organizations, Chapter 21, http://www.fao.org/docrep/W5830E/w5830e0n.htm (accessed on 24th October, 2011)