

# **Livelihood Food and Self Employment Enhancement**

## **Introduction**

The definition of Livelihood – Livelihood is defined as adequate stock and flows of food and cash to meet basic needs. Security refers to secure ownership of, or access to, resources and income-earning activities, including reserves and assets to offset risk, ease shocks and meet contingencies. Sustainable refers to the maintenance or enhancement of resource productivity on a long-term basis. A household may be enabled to gain sustainable livelihood security in many ways – through ownership of land, livestock or trees; rights to grazing, fishing, gathering; through stable employment with adequate remuneration; or through varied repertoires of activities.

The livelihood is a way of looking at the complexity of people's livelihoods, especially the livelihood of the rural poor. It seems to understand the various dimensions of a person's livelihood; the strategies and objectives pursued, and associated opportunities and constraints.

The livelihood strategies and activities of poor people are often complex and diverse. For rural people, agriculture and other natural resource based activities may play an important role, but rural households also diversify into other activities, some of which are linked to agriculture and the natural resources sector, others which are not. Strategies may include subsistence production or production for the market, participation in labour markets or labouring in the home. Poor people often also depend upon multiple diverse livelihood activities involving different employment (labouring) and self employment activities.

The outcomes of livelihood strategies are divided between the effects on livelihood security and the effects on environmental sustainability. Income level is obviously important to people, but to poor people income stability and risk avoidance may be as important, if not more so. Also bear in mind that income in the livelihood security box does not just refer to monetary income but also to incomes in kind, such as the food produced by smallholder farmers for home consumption.

Seasonality refers to the fact that many rural livelihood strategies (especially in agriculture) results in seasonal fluctuations in income. This affects livelihood security, and people usually try to reduce seasonal income fluctuations or their vulnerability to them.

## **Objectives of Livelihood Improvement**

### **A) Objective of Livelihood for the Landless / Asset less (7%) of LAP**

- i) 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 / asset less people, women, etc., to the benefits.
  - c. Select the beneficiaries in a transparent manner and priority should be given to the landless
- ii) Livelihood guidelines for women, landless and assetless households should aim at improved household income, participation and division of labour, access to information, knowledge, appropriate technologies and resources.**

### **B) Livelihood action plan for Production System and Microenterprises (8%) of LAP**

- 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 practices for livelihood augmentation.

## **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.

## **Mode of Operation for Livelihood Activities**

- i. The livelihood action plan to be implemented through Self Help Groups, Landless, Women, Farmers and/or their federations / registered organisations.
- ii. Livelihood activities can be carried out either through the existing SHGs / Federation having good performance or new SHGs formed with a group of 5-20 persons.
- iii. 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) after studying the feasibility. The plan has to be approved by the WCDC before extending financial support.
- iv. Seed Money for Revolving Fund for Women SHGs, landless, enterprising individuals

It is proposed that Nandgaon as it is the most convenient location, has the facilities and is situated on Mumbai – Goa Highway and the villages Aynal and Bharani which is touching to main road can be the most convenient place for coordinating, training & capacity building, setting up of various large & small scale enterprise development for mangoes, cashew nuts, coconuts, kokum, turmeric and other agriculture & horticulture various products which will help in central storage, sales, value addition and marketing from Nandgaon Sales Centres, which could be located on the highway itself for the direct benefit to the surrounding villages of this Watershed Cluster.

## **Recommended Livelihood Activities for Landless / Asset less / Women / SHGs / Farmers / Federation**

Following the objectives of livelihood improvement for landless, asset less, women, farmers, SHGs, local organisations, for enhancing their livelihood opportunities through investments into assets creation, improving in productivity and income sources. Encouraging landless, women, farmers, SHGs to adopt and up-scale successful experiences of proven technologies, integrated farming systems and improved farming practices for livelihood augmentation.

Available local agriculture, horticulture, natural resources produce and local available skills, give us an opportunity to up-scale, enhance, diversified and promote improved technologies, integrated & improved farming systems for production systems and micro enterprise enhancement for livelihood activities. Following are the recommended livelihood activities:

### **1 Mango Processing**

#### 1. Products from ripe Mango

- |                                 |                 |                        |
|---------------------------------|-----------------|------------------------|
| a) Canned Mango slices in syrup | b) Mango pulp   | c) Mango Jam           |
| d) Mango Squash                 | e) Mango Juice  | g) Mango Cereal Flakes |
| h) Mango Custards Powders       | i) Mango toffee | k) Mango Juice Powder  |
| l) Mango Freeze dried product   | m) Mango Syrup  |                        |

#### 2. Unripe Mango Products

- Mango Pickle
- Mango Chutney

- Dried green mango slices and powder (Amchur)
- Various other products such as candy, preserve, squash and jam can be prepared

### 3. Other Value added products

Mango processing industry produce almost 25-30% of fruits waste in the form of peels, stones, kernels and trimmings which can be profitably utilized for the production of value added products.

Mangoes are widely used in cuisine. Sour, unripe mangoes are used in chutneys, *athanu*, pickles, or side dishes, or may be eaten raw with salt, chili, or soy sauce. A cooling summer drink called *panna* or *panha* comes from mangoes. Mango pulp made into jelly or cooked with red gram *dhal* and green chillies may be served with cooked rice. Mango lassi, a popular drink made throughout South Asia, is created by mixing ripe mangoes or mango pulp with buttermilk and sugar. Ripe mangoes are also used to make curries. *Aamras* is a popular pulp/thick juice made of mangoes with sugar or milk, and is consumed with bread, rice or *pooris*. The pulp from ripe mangoes is also used to make jam called *mangada*.

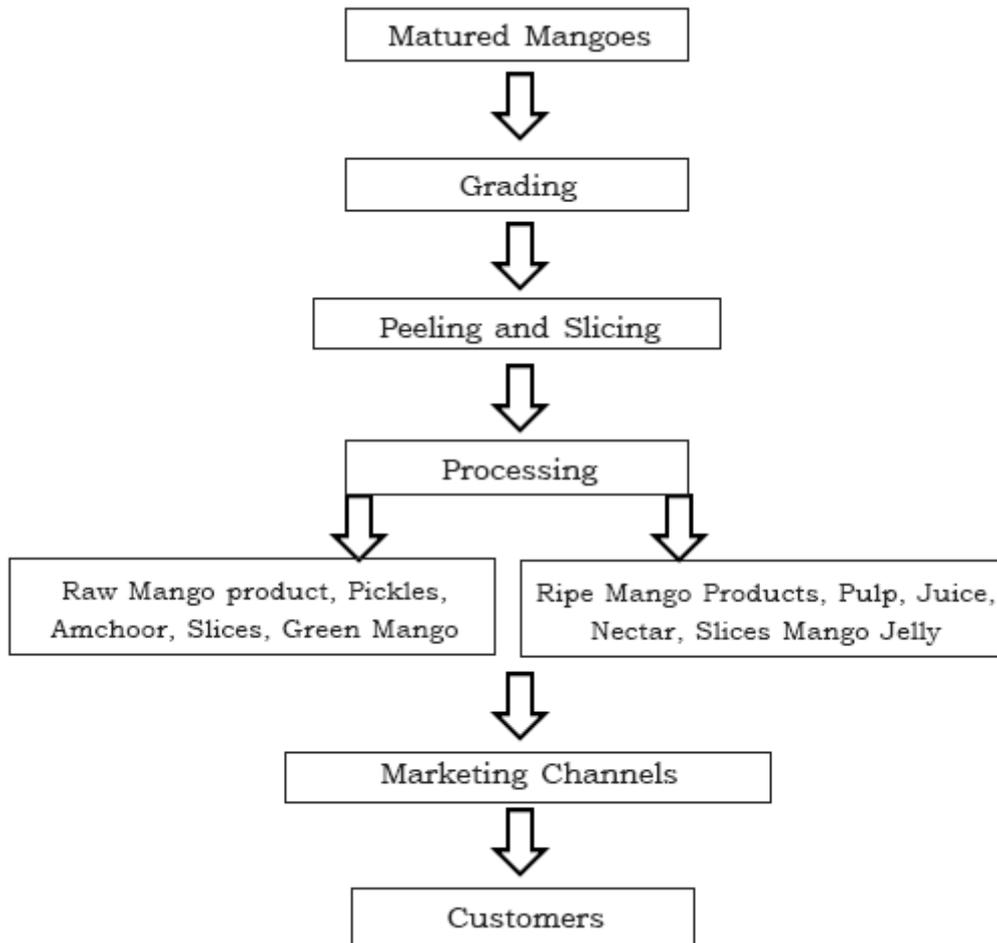
Mangoes are used in preserves such as *moramba*, *amchur* (dried and powdered unripe mango) and pickles, including a spicy mustard-oil pickle and alcohol. Ripe mangoes are often cut into thin layers, desiccated, folded, and then cut. These bars are similar to dried guava fruit bars available.

Dried strips of sweet, ripe mango (sometimes combined with seedless tamarind to form *mangorind*) are also popular. Mangoes may be used to make juices, mango nectar, and as a flavoring and major ingredient in ice cream and *sorbetes*. Pieces of mango can be mashed and used as a topping on ice cream or blended with milk and ice as milkshakes.

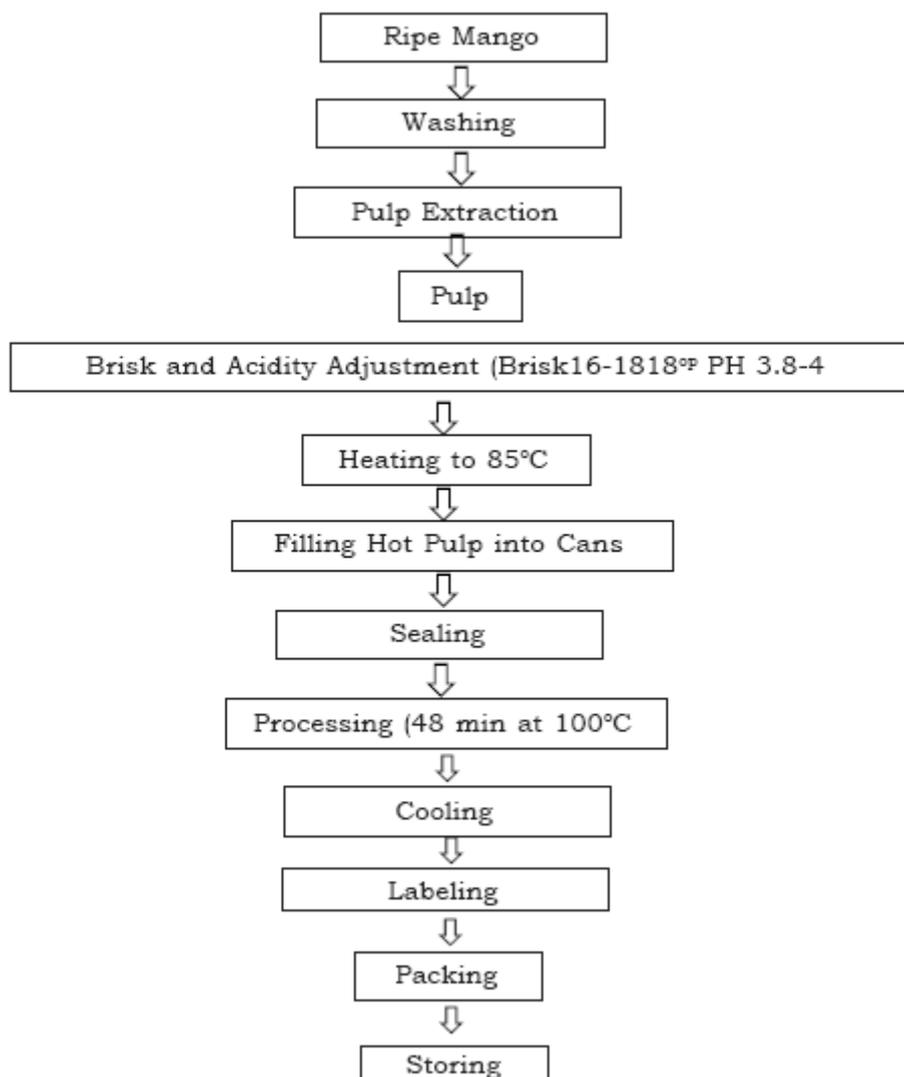
Mangoes are processed into various types of products as explained below:

#### • **Raw Mango Products: Pickle, Amchoor, Mango slice and Green Mango Beverage**

For pickles, the fruits are peeled, sliced into small pieces and mixed with 20 per cent salt, 7.5 per cent chilly powder, and 1 per cent asafetida on weight basis. Spices are then mixed in it and the slices dipped in boiled cool oil. The whole mixture is then kept for few days with frequent stirring and then filled in clean glass jars. Mango slices from peeled mangoes are dipped in solution of potassium metabisulphate (1.5%) for 5 minutes and dried in sun or solar dehydrator. Amchoor is obtained by grinding the dried slices. Raw mango slices are dipped in 1.5 per cent potassium meta-bisulphate solution for 5 minutes, drained, mixed with equal amount of powder salt and stored in polythene pouches. These slices could be used later for the required food/ product preparation. Whole raw mangoes are boiled with equal amount of water and pulp is extracted to one kg of extract, 1.6 kg sugar, 1.6 liter water, 80 gram salt, 20 gram mint, 10 gram cumin, 4 gram black pepper and 20 gram citric acid are mixed. The mixture is heated and filled in clean glass bottle. It may be used as raw mango squash, a modified version of 'Panna'.



- **Waste Utilization**—During mango processing, peel and stones are generated as waste, which is about 40 -50 per cent of fruit weight. They are rich in various nutrients and many value added products could be obtained from them. Good quality jelly grade pectin and edible fibre could be extracted from ripe mango peel. Mango peel, has lignocelluloses composition and hence its complete breakdown is difficult. Its decomposition depends on cow dung in 3: 1 ratio, which results in its successful biodegradation. Mango kernel contains high amount of fat and starch. The oil extracted from kernel is of good quality and could be used in cosmetic and shop industries. About 10 per cent alcohol could be obtained from mango kernel by co-culture fermentation.
- **Manufacturing Process of Mango Pulp**  
A flow chart of process involved in preparation of mango pulp -



Once mango season starts, matured mangoes are brought from the market and are ripened in the ripening shed. Usually, fruits are ripened in about 7-8 days under tropical conditions. The usual practice is to place the fruits in single layers on paddy straw in closed but well ventilated rooms. The fruits become ripe uniformly in the temperature ranging from 19.4° to 21.1° C. The ripened fruits are then washed with water in tubs to remove the adhering impurities and dirt. The prepared mangoes are passed through pulper fitted with 30 mesh sieve to obtain the pulp. The pH of the pulp is adjusted to 3.8-4 by adding citric acid. It may also be sweetened so that a brix value of 16-18° is attained, as per the requirement. Ascorbic acid if added to the pulp is helpful for retention of colour, flavor and carotene. The pulp is then heated to 85°C and sterilized cans are filled with pulp. Thereafter, the cans are sealed, processed at 100° C for 45 minutes and cooled. Then the cans are moved to a store room where the cans are labeled and packed in card board cartons until they are lifted by the export houses/agents.

**Manufacturing of Mango Jelly:** Jelly is a semi solid product prepared by boiling a clear strained solution of pectin containing fruit extract free from pulp after the addition of sugar and acid. Pectin is the most important constituent of jelly. Usually, 0.5-1.0 per cent of pectin of good quality in the extract is sufficient to produce jelly. Pectin, sugar, acid, and water must be present approximately in the required proportion pectin 1, sugar 65-70 %, citric acid 1% and water 33.38%). The ripe mango fruits are cut into 6-8 slices by manual peeling. The bulky juice is sent for sieving. The sugar is sprinkled into fruit extract while it is boiling to ensure complete dissolution. Well prepared mango pulp is spread on clean bamboo mats to form a sheet of 2 mm thickness. The size of the mat generally used is 1.35 m x 1.35 m. On its drying another layer is spread over this and allowed to dry. About 7-9 layers of pulp are applied for natural drying. The dried slab is cut into required size and packed for marketing.

## **2. Cashew Nut**

The first introduction of Cashew in India was made in Goa from where it spread to other parts of the country. In the beginning it was mainly considered as a crop for Afforestation and soil binding to check erosions. The nuts, apple and other by products of this crop are of commercial importance.

### **Cashew Nut Processing**

#### **The Process**

The procured cashew is processed through a series of distinct steps that do not require sophisticated machinery. The major steps involved in cashew processing are as follows:

**Boilers - Steaming/Roasting:** Roasting is done to facilitate the removal of kernel from the shell. The steam boiling method (called the Mangalore method) provides the advantage of allowing a recovery of the cashew nut shell liquid (CNSL), which is not possible using other methods of roasting, such as the drum roasting. The raw nuts are fed into boilers, which work on the principle of pressure cookers. At present the SSI units use wood and cashew shells as fuel for the boilers. This process provides uniformity in drying, cooling is faster and the product appearance is cleaner.

For the micro units, that were created under the Scheme of Department of Agriculture (since 2000-2001) there is a need of setting up quality standards for their small scale machinery. The boilers used give poor colour to the end product. Each boiler requires a unique protocol and many micro enterprises do not know the optimum process for boiling. Most of them have learnt the process by trail and error after following short training programmes. Further, many machines do not work properly and processing is a still concern of most of the micro enterprises.

**Cutting:** The heat applied to the nut makes the shell brittle, and allows the shells to be cut by means of both, hand and leg operated cutters.

Cutters should wear plastic bags around their hands, cover their fingers with cotton or apply oil and ash to their hands to avoid any direct contact with CNSL. Nonetheless, one can easily identify the cashew cutters by looking at their hands.

**Drying:** To facilitate the removal of the outer skin attached to the kernel, drying is done in an electric conventional oven, called "drier". The wholes and splits are kept there for 8 hours to remove the moisture from the kernels. The capacity of drier varies from 400-500 Kg in case of SSI units, to 9-15 kg in case of MEs. Small enterprises face the problem of voltage fluctuations and as a result the nuts are not properly dried. Further, since local masons do not properly construct conventional dryers, non-uniform temperature diffusion across the trays affect the quality of cashew kernels as well.

**Peeling:** The peeling of the outer skin is a skilled operation, done manually by women (with a small blade). The quantity of skin obtained is 100 grams per kg of cashew kernel.

It is the slowest operation and since it is contracted out, it is beyond the entrepreneurs' control. If production is to be enhanced, the factories will have to face labour constraints, since there is a shortfall of labour.

**Grading:** Cashew can be classified in 26-32 types depending upon colour, scratch, size, wholeness, etc. Different grades of cashew kernel and average yields of cashew kernels of different grades per quintal of cashew nuts.

It is very difficult for MEs to grade the kernels as SSI units do it, since it is a time-consuming task, which requires high volumes of nuts and skills/techniques that, in spite of training given by NGOs.

**Packaging:** Graded cashews are packed by SSIs in tins of 10 Kg that are filled with Carbon dioxide to avoid that moulds develops during storage periods. To cater to the retail markets, simple polypropylene bags can be used. Sealing machines operated by electricity or sometimes seal with candle flame close the bags.

**The Boiler, Cutter, Pulveriser, Dal Processing Machine and other machineries are manufacture by –**  
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### 3. **Kokum:**

Kokum (*Garcinia indica* Choisy) is one of the native underexploited tree spices and it is mostly found in Konkan region of Maharashtra. In spite of its incredible medicinal and nutritive properties, kokum is generally not cultivated systematically on orchard scale like that of mango, cashew nut etc. It is mostly found as a kitchen garden plant or mixed crop in plantations of coconut, areca nut, as roadside plants or in forest. The common names for Kokum are Goa butter tree, Kokum butter tree, mangosteenoil tree.

### **Kokum Processing:**

#### **Processing:**

The kokam fruit has an agreeable flavour and sweetish acid taste. The normal shelf-life of the fresh fruit is about five days. Hence sun drying is practiced for preservation. For sun drying the fresh fruits are cut into halves and the fleshy portion containing the seed is removed. The rind, which constitutes 50–55% of the whole fruit, is repeatedly soaked in the juice of the pulp during sun drying. About 6–8 days are required for complete drying. The product so dried constitutes the unsalted kokam of commerce. A salted variety wherein common salt is used during soaking and drying of the rind is also marketed. Lonaval kokam, Pakali kokam, Khanee kokam and Khoba kokam are a few of the trade varieties. The seed contains about 32–35% fat and is extracted by one of several methods – boiling, cold extraction/churning of the powdered seeds by water or simple extraction:

**Boiling process:** The seed is cracked and the shell removed. The white kernel is then pounded in a large specially-made stone mortar and pestle. The pulp is put into an earthen or iron pan with some water and boiled. After some time it is poured into another vessel and allowed to cool. The oil which rises to the surface on cooling becomes gradually solid, and is strongly moulded by hand into egg-shaped balls or concavo-convex cakes.

**Cold extraction/churning process:** The kernel is pounded as above and the pulp with some water is kept in a large vessel and allowed to settle for the night. During the night the oil rises to the surface and forms a white layer, which is removed in the morning. The mixture is then churned, and the oil which, like butter, rises to the surface in a solid form, is removed by hand. This process gives the best product and is most favourably performed in the cold season.

**Simple extraction:** In this process, the kernels are pressed in an ordinary oil mill, like other oil seeds, and the oil is extracted. Extraction is mostly on a cottage industry basis by crushing the kernels, boiling the

pulp in water and skimming off the fat from the top; or by churning the crushed pulp with water. Nowadays it is obtained by solvent extraction also. After extraction the crude kokam butter is sold as egg-shaped lumps, having a characteristic yellowish colour and greasy in nature. It also has a faint but not disagreeable odour. Refined and deodorized fat is white in colour and compares favourably with high-class hydrogenated fat. It is readily soluble in ether and slightly in rectified spirits, more in hot than in cold.

## **Crop Establishment**

**Soil and Climate:** It can be grown in a variety of soil and in different agro-climatic conditions.

**Nursery Raising and Planting:** It can be cultivated by soft wood grafting and planted in the month of July-August.

**Thinning and Weeding:** Weeding and thinning of the plants may be done as and when required usually after 15-20 days.

**Manures, Fertilisers and Pesticides:** The medicinal plants have to be grown without chemical fertilizers and use of pesticides. Organic manures like, Farm Yard Manure (FYM), Vermi-Compost, Green Manure etc. may be used as per requirement of the species. To prevent diseases, bio-pesticides could be prepared (either single or mixture) from Neem (kernel, seeds & leaves), Chitrakmool, Dhatura, Cow's urine etc.

**Irrigation:** Normally grown as rainfed crop. Hence regular irrigations is not in vogue for grown up orchards.

**Harvesting / Post Harvesting Operation:** Harvesting is done in March-April. Fruits and Bark are removed and dried in shade.

**Yield:** Ripe fruit 8.5 ton per hectare

### **Economics**

**Expenditure per ha. Rs.13,000/-**

**Return per ha. Rs.47,300/-**

**Net income Rs.34,300/- (YEAR-2001)**

***NOTE: Market for medicinal plants is volatile and the economics may vary.***

## **Kokum Syrup:**

### **1.0 Introduction**

Peculiar climate of the Konkan region of Maharashtra provides many opportunities in food processing segment. Kokum fruits (also known as Ratamba) are natural source for making syrup which has some medicinal properties as well. Apart from juice or syrup, they are also used for extraction of oil and in curry preparations. Kokam plants are grown in large areas of Konkan and provide an opportunity to make syrup. Kokum syrup is very popular in Maharashtra and Goa and is gradually making in-roads in nearby states like Karnataka, Gujarat and Madhya Pradesh.

### **2.0 Products**

Kokam fruits have certain medicinal properties. Juice extracted from this fruit is sweet and sour and thus liked by many. A glass of cold kokam syrup is refreshing and it also improves the digestive system. The product is popular in the state since long and now it is sold in nearby states as well. Since it is a natural fruit extract, it is preferred by many people.

## 2.1 Compliance with PFA Act and FPO is necessary.

### 3.0 Market Potential

#### 3.1 Demand and Supply

Plantation of kokam or ratamba trees is a typical horticulture activity confined primarily to the Konkan region of Maharashtra. Many useful products are made from its fruit and seeds since long. Few years back, some processors undertook aggressive promotion campaign and gradually these products started being accepted by the consumers.

#### 3.2 Marketing Strategy

Brands like Yojak, Ajaramar or Marco have made kokam syrup very popular not only in Maharashtra but also in other states like Karnataka, Gujarat and Madhya Pradesh. Hence, a new entrant would find it easier to capture growing market. Konkan railway also provides good opportunities as the product can reach even the southern states. Kokam syrup is extracted from fruits and thus has distinct advantages over other synthetic preparations. It also improves digestive system and thus many people drink it regularly. With proper sales network, the product can be sold easily. With addition of preservatives, its shelf life goes up to almost 4 months which is yet another advantage.

### 4.0 Manufacturing Process

The process of manufacture is simple and standardised. Fresh and ripe kokam fruits are cleaned and cut into 2 pieces and seeds are removed. Then these pieces along with sugar are kept in transparent glass jars and jars are kept under sunlight for around 8-10 days. With melting of sugar, juice is naturally extracted from fruits and over a period of time syrup is formed. This syrup is filtered and some preservatives are added into it before packing it in 1 ltr. capacity plastic jars. Seeds and shells of fruit are sold to oil extractors and other processors who make products for curry making. From 100 kgs. of kokam fruits, around 35 ltrs. of syrup is made whereas by-products like shell and seeds account for 15 kgs. Rest of the ingredients are waste or process loss.

### Kokum Butter Profile

Botanical Name	:	<i>Garcinia indica</i>
Origin	:	India
Extraction	:	Expeller pressed/Refined
Shelf life	:	1 year optimal

**Notes-** To prolong shelf life and prevent melting you should store it in a cool location. Kokum is a relatively hard butter and does not apply well as a "stand alone" application. It is best used within cosmetic formulations along with other ingredients to make it more pliable when you are developing exotic body care products. PLEASE NOTE: Kokum butter is a dry and flaky butter which is best used for further manufacturing purposes and because of its dry nature many will think that the butter has gone bad. This is normal and all raw Kokum butter will have a dry and cracked appearance.

### Specifications

Color	:	White
Odor	:	None
Free Fatty Acids	:	0.52%
Peroxide Value	:	1.20
Non-Saponifiables	:	0.706%
Saponification Value	:	188
Iodine Value	:	37.40
Total Saturated	:	52-68
Total Monounsaturated	:	30-42
Total Polyunsaturated	:	0-2
Melting Point	:	97-99 degrees

### Fatty Acids

Oleic :	40-50%
Palmitic:	5-8%
Linoleic :	2-4%
Stearic :	40-45%

### Introduction

Kokum Butter is often used as a substitute for Cocoa Butter due to its uniform triglyceride composition. It melts when it comes into contact with the skin. Kokum Butter is composed of beneficial compounds that help to regenerate skin cells. It's commonly used in skin healing lotions, creams and body butters, as well as soaps, cosmetics and toiletries.

### Benefits

Kokum Butter is rich in essential fatty acids, which aid in cell oxygenation and make nutrients more readily available for use by skin tissues. Kokum Butter also contains antioxidant vitamin E. Kokum Butter is a non-comedogenic (non pore-clogging) material that aids quick absorption and adds a premium texture to your cream emulsions. Kokum Butter helps regenerate tired and worn skin cells and supports skin elasticity and general flexibility of the skin wall. It has been used traditionally in India to soften skin and restore elasticity and as a balm for dry, cracked, rough and calloused skin. It is also beneficial for the treatment of many different conditions, such as:

- Helps prevent dry skin and wrinkles
- Helps regenerate skin cells

### Using Kokum Butter

With its relatively higher melt point, it melts slightly at skin temperatures making it ideal for lipsticks and balms; it's also a great addition to bar soaps and skin lotions and may be easily incorporated into Lotions, Creams, and Body Butters. It is also wonderful to use in the summer as a moisturizer before and after sun exposure to reduce possibility of the skin peeling or becoming dried out. Use as an addition to:

- Creams, lotions, balms
- Cosmetic foundations
- Lipsticks
- Conditioners
- Moisturizers

### Precautions

Those with serious or persistent skin problems, such as eczema, should consult a physician before using Kokum Butter. Not recommended by those with nut allergies.

## 4. Jackfruit

The **jackfruit** (*Artocarpus heterophyllus*), is a species of tree in the *Artocarpus* genus of the mulberry family (*Moraceae*). It is native to parts of South and Southeast Asia, and is believed to have originated in the southwestern rain forests of India, in present-day Kerala, coastal Karnataka and Maharashtra. This tree is widely cultivated in tropical regions of India. The jackfruit has played a significant role in Indian agriculture for centuries. The jackfruit tree is a multipurpose species. It provides food, fuel, timber and medicinal extracts, and is a potential source of income for both the rural and urban people of the tropics and subtropics. It assumes the role of a secondary staple in certain areas that are particularly prone to variable climatic conditions which lead to food shortage.

### Jackfruit processing

- The fruit is rich in vitamins A, B and C, potassium, calcium, iron, proteins and carbohydrates
- Processing reduces post-harvest losses
- Processing increasing the shelf-life of the fruit
- Processing adds value and increase income

### Dried Jackfruit

#### Procedure

- Wash jackfruit with clean tap water.
- Soak in 200 ppm chlorinated water\* for 10 minutes to reduce microbial load.
- Cut into halves. Separate edible yellow pulp from the white pulp.
- Remove the seeds. Weigh the yellow pulp.

- Prepare 60% syrup\* in a container. Mix sugar and water to dissolve. Bring to boil.
- Blanch the pulp in syrup until translucent. Cool.
- Add 0.1% sodium metabisulfite\* in syrup. Dissolve thoroughly.
- Soak overnight. Drain the syrup.
- Rinse with clean tap water. Lay in trays.
- Dry in a cabinet dryer at 60-C for 8 to 12 hours or until the pulp sticks to the cheese cloth.
- Remove from trays and loosely pack dried jackfruit in ordinary plastic bags.
- Allow to sweat overnight for moisture equilibration.
- Coat in confectioner's sugar.
- Pack in OPP or PP plastic bags of 0.003" to 0.004" thickness.
- Seal, label and store in a cool and dry place.

\*60% syrup – Basis: 1 kilo of edible pulp = 600 grams sugar + 400 mL water

50% syrup – Basis: 1 kilo of edible pulp = 500 grams sugar + 500 mL water

0.1% sodium metabisulfite (antioxidant)

0.1% convert to 0.001 = 0.001 x 1 kilo = 0.001 kg or 1 gram

### Jackfruit Flakes

#### Procedure

- Weigh previously washed and sanitized jackfruit. Cut and slice.
- Separate edible yellow pulp from the white pulp.
- Remove seeds. Weigh yellow pulp.
- Steam-blanch yellow pulp for 3 minutes. Weigh.
- Add 5% maltodextrin\*. Blend.
- Dry in a drum dryer.
- Cut/Roll into shapes while hot.
- Allow to cool at room temperature.
- Pack in appropriate packaging material and seal.
- Label and store in a cool and dry place.

\* 5% maltodextrin (bulking agent and for color protection)

Basis: 1 kilo edible pulp, convert 5% to 0.05 -> 0.05 x 1 kilo =0.05 kilo or 50 grams

### Jackfruit Syrup

#### Procedure

- Weigh previously washed and sanitized jackfruit. Cut/slice.
- Separate yellow pulp from white pulp. Remove seeds.
- Weigh yellow pulp.
- Pack in previously sterilized jars.
- Prepare 50% syrup\*, added with 0.1% citric acid\*.
- Add hot syrup into jars containing the fruit.
- Remove bubbles formed by exhausting at 80-C for 10 minutes. Seal.
- Process jackfruit in jars in boiling water for 30 minutes.
- Cool at room temperature. Label and store.

\* 60% syrup – Basis: 1 kilo of edible pulp = 600 grams sugar + 400 mL water

50% syrup – Basis: 1 kilo of edible pulp = 500 grams sugar + 500 mL water

0.1% citric acid

0.1% convert to 0.001 = 0.001 x 1 kilo = 0.001 kg or 1 gram

### Jackfruit Pastillas

#### Materials Needed

- mashed ripe jackfruit, 1 kilo (5 cups)
- sugar, 300 g (2 ¼ cups)
- butter or margarine, 200 g
- full cream powdered milk, 1 cup

Utensils Needed rolling pin, frying pan, chopping or kneading board, spatula, kitchen knife, wax paper

#### Procedure

- Blend or mash ripe jackfruit. Add sugar and milk.

- Cook over slow fire. Stir constantly until a smooth mixture is obtained. The mixture should not stick to the sides of the frying pan.
- Transfer the cooked mixture over a kneading board covered with wax paper.
- Cool.
- Spread butter and small amount of sugar over the mixture.
- Sprinkle small amounts of sugar over the wax paper. Spread the mixture using a rolling pin until it is 1-inch thick.
- Make slices of about 4 x 1 cm. Wrap individually.

## 5. Coconut

The major coconut cultivation and equally the same per cent of production of coconut are from the coastal region of Maharashtra. The marketable value added coconut products includes packed tender coconut water, coconut milk and milk based products, coconut chips, coconut based dairy products, desiccated coconut, coconut water based products, snowball-tender-coconut, vinegar, coir based products, coconut shell and coconut wood based products. Other products, which are being subjected to research and development, are organic food, oleo chemical, bio-diesel, bio-lubricant and cosmetics.

Some of these products viz. coconut milk, coconut cream, spray dried coconut milk powder, vinegar, packed tender coconut water, snowball-tender- coconut and virgin-coconut-oil have been produced on commercial scale. Besides, coconut biscuits, coconut chips, coconut based sweets and coconut chutney like traditional convenience products, using indigenous technology were already in the market.

### Uses of Coconut Tree from its parts

- Coconut Roots can be use for beverage, dye stuff, and medicine purposes.
- Coconut Trunk uses for buildings parts. Out of the Coconut Trunk, handy and durable wood is obtained to make various pieces of furniture and novelty items. Paper pulp can also be extracted from the trunk.
- Coconut Shell, a part of Coconut Fruit produce items such as handicrafts items, charcoal for cooking, and many more.
- Coconut Husk also a part of Coconut Fruit is also used to obtain Coir. An elastic fiber used for rope, matting, and coarse cloth.
- Coconut Leaves for thatch and Puso.
- Coconut Leaves produce good quality of paper pulp, midrib brooms, hats and mats, fruit trays, fans, midrib decors, lamp shades, bag, and utility roof materials. In a provincial City of Cebu, Coconut Leaves are used to wrap white rice called Puso.
- Coconut Spathe and Gunit can produce helmets, caps, "bakya" straps, and handbags.
- Coconut Inflorescence is also used to produce Coconut Juice, Coconut Toddy or Tuba. The fermented juice is the common alcoholic drink in the coconut region. Other products out of the Coconut Tree's inflorescence are gin and vinegar.

### Coconuts Products

Sl. No.	Principal Edible Products	Products by Products and Value Added Products
1.	2.	3.
1.	Products from Inflorescence SAP.	<b>Derivatives</b> i) Sugar / Jaggery. ii) Beverage (Boiled sap) iii) Toddy (Fermeuted sap) iv) Coconut wine v) Neera (Fresh sap) vi) Vinegar vii) Confectionary Jelly
2.	Products from Coconut Kernel (Meat)	<b>Immatured Coconut Kernel in Syrup</b> i) Coconut Jam ii) Puddings / Ice cream <b>Matured Coconut</b>

		i) Desiccated Coconut ii) Partially De-fated Coconut Powder iii) Roused Coconut Paste iv) Coconut Chips (Sweetened Chips) (Sliced Coconut) v) Ball Copra vi) Cup Copra (Coconut flour) vii) Coconut Yoghurt / Ice cream viii) Fresh Coconut gratings ix) Dehydrated edible coconut meat x) Coconut oil / Virgin Coconut oil
3.	<b>Products from Coconut Milk</b>	i) Milk Powder (Dehydrated Milk) ii) Coconut Milk / Syrup iii) Coconut Spread / Cheese iv) Coconut honey / candy v) Coconut Skim Milk Beverage vi) Sweetened coconut skim milk blend vii) Coconut protein viii) Low / high fat coconut jam ix) Virgin Coconut oil
4.	<b>Production from Coconut Water</b>	<b>Tender Coconut</b>
		i) Fresh Tender Coconut Water ii) Tender nut Coconut water & Coconut Meat shake iii) Canned or Pouched tender coconut water
		<b>Matured Coconut</b>
		i) Coconut water concentrate (Syrup) as flavoured beverage on dilution ii) Carbonated / non carbonated coconut water iii) Nata-de-coco iv) Vinegar v) Toddy
5.	<b>Coconut oil</b>	i) Edible oil ii) Bio diesel / biofuel iii) Industrial oil iv) Cosmetics
6.	<b>Virgin Coconut oil</b>	i) Dietary oil ii) Body oil/ Baby oil (skin can) iii) Body cream/ Lotion/ Shampoo iv) Soap v) Pharmaceuticals vi) Nutraceutical Products
	<b>Non Edible Products</b>	
1.	<b>Coconut Husk</b>	i) Coir, Coir foam, Rubberized foam ii) Coir Carpets/ Mattresses iii) Coir geotextiles iv) Coir Composite v) Coir pith briquette vi) High Value coir products safety belts vii) Coir boards, Coir asbestos
2.	<b>Coconut shell</b>	i) Charcoal ii) Activated charcoal iii) Shell powder iv) Shell handicrafts v) Ice-cream & beer cups vi) Shell gasified for alternate heat energy
3.	<b>Coconut palm wood</b>	i) Furniture ii) Doors iii) Panels (Wall & Floor) iv) Handicrafts
4.	<b>Coir pith</b>	i) Organic Manure ii) Ornament plant growing pot iii) Coir pith briquettes iv) Coir chullah

## 6. Nursery Techniques and Seed Bank

The major part of the budget is marked for horticulture activities in the proposed watershed area. SHGs can take up these horticulture activities hence this demands for good quality planting materials..

### a) Establishment of Nursery:

Nursery is developed gradually. The mother plants planted for vegetative and seed propagation and seed propagated plants are raised. Important factors considered for establishing a nursery are agro-climatic conditions, soil types, soil pH, location, area, irrigation facilities, communication, market demand, availability of germplasm or mother plants, skilled persons, etc.

**Selection of site:** The site selected for raising a nursery should preferably be located near marketing centres for the convenience of transportation of the products with minimum or no damage. The site should

be convenient enough for transportation of input materials also. It is important to have or develop a perennial source of water inside the nursery. If need arises, wind breaks of tall plants like aonla, seedling mango, etc. may be planted to provide necessary shade and protection.

**Methods of propagation:** Plants may be raised from seeds or by vegetative propagation. Some important aspects of propagation are summarized below:

1. **Raising from seeds:** Germination from seeds may not be 100% even if the seeds are sown in perfect conditions. The factors that control the germination are age, stage of maturity and viability of seeds, water, free supply of oxygen and the heat or temperature. Some seeds do not germinate easily for variety of reasons such as the dormancy, rest period and presence of hard seed coat. Seeds with hard coats require some kind of external treatment for germination. Cracking of the coats by mechanical means, abrasion, soaking in water or acid and stratification are some methods commonly applied.
2. **Vegetative Propagation:** Safe methods of vegetative propagation such as cutting, layering, division, separation, budding and grafting are adopted for multiplication of plants.
  - **Cutting:** Plant parts that are normally used for this purpose are stems, roots, leaves and modified stems such as tubers, corms and rhizomes, runners and bulbs. This method is very popular, particularly because it is the cheapest and most convenient one.
  - **Layering:** The method of inducing roots in a stem which is still attached to the plant and then detaching it after the root is formed for transplanting is called a layering or layerage. Mostly creepers and trees are raised by this method. Eg.: Guava, pomegranate, lemon, etc.
  - **Grafting:** Grafting, except budding (which is also a form of grafting) is not widely used in horticulture except in a few cases. The types of grafting which are used in plants are limited to inarching, side grafting, splice grafting, saddle grafting, flat grafting and cleft grafting. Eg.: Amla, mango, sapota, jack, etc.

## 2) **Management of Nursery**

**Seedbed and nursery beds:** For raising seedlings, some permanent or temporary structures for seed bed may be prepared. These beds will be minimum 0.5 to 0.75 m high from ground level. The beds may be 0.75m to 1.00m in breadth and length may be as per the availability of land. The nursery beds will be prepared for storing of perennial plants or the plants that should be kept for sale.

**Collection and planting of mother plants:** The plantation of mother plants is an important work for developing a nursery. The mother plants must be true to the type and true to the variety. The plants should be properly labelled. Collection of exotic type of mother plants is a continuous process or job. The mother plants may be maintained properly for their vigorous growth; otherwise number of propagated plants will get reduced.

**Storage of dried, cleaned soil and compost manure:** For raising seedlings during rainy or early winter season, the soil and compost would be stored during hot or summer months. In rainy season, collection of dried soil and manure is very difficult. Without these, the seedlings cannot be raised during rainy season.

**Production of seeds:** Production of seeds is highly specialized job. The seeds should be produced carefully. If the quality of seed is good, the percentage of seed germination, seedlings vigour, vegetative and reproductive growth of the crops will be good. After harvesting of quality seeds, germination percentage of seeds and seedling vigour should be checked before marketing of seeds.

**Storage of propagated plants in nursery beds:** The propagated plants are planted in nursery beds for better growth or hardening the plants. In general, this type of nursery bed is prepared under partial shade.

**Manuring:** Manuring is to be done very carefully. Vigorous growth of plant is always attractive to the buyer. Again, heavy manuring is not beneficial for storage of plants.

**Watering:** Like manuring, watering is also important. Watering will be done according to need of the plant. The nursery should have a water source of its own.

**Drainage:** For sufficient vegetative and reproductive growth of plants, good drainage system must be developed in between the beds and around the nursery. Adequately gentle slope in the bed surface is also desirable. It is extremely important to ensure that water logging does not occur in and around the beds.

**Plant protection:** Keen observation on attack of different pests and diseases is required. If the mother plants are infected, the propagated plants will be infected also. Necessary control measures should be taken immediately on observation.

### **Packing and handling**

Seeds are cleaned and stored in close bottles or tins. Before packing, they are dried first in shade for 2-3 days and finally in the sun for a couple of days. In husked seeds, the husks are removed before packing.

It is important to see while packing the plants that the container is neither over-packed nor loose enough allowing the contents to move about. All space should be filled up by some packing materials like straw, dried grass, etc.

### **Storage**

Seeds are stored in a cool, dry place or kept in desiccator. Living plants should be kept in shade. Bulbs, corms and tubers are stored in single layer over dry sand, flat wooden trays or racks in a well-aerated store room with low temperature and low humidity. Before storing, they may be treated with fungicides and insecticides such as 0.1% benlate or 0.1-0.2%, captan 5% , DDT , BHC, etc.

### **Marketing & Selling**

Marketing & selling of plants and planting materials is the most crucial and important part of the nursery business. The production of high quality true to the type and attractive planting materials is absolutely necessary. They must be free from pests and diseases, vigorously growing and bright and colourful. The plants can be supplied to other nurseries, locals and the Watershed Development Implementing Agencies.

The training for Nursery Raising Techniques can be organised to the SHG members at Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli.

## **7. Value addition to agriculture produce**

Both cereals and pulses are nutritionally important since they usually provide the bulk of the diet. They are also a relatively cheap source of energy, protein, and important vitamins and minerals. Some businesses are set up to clean and package wholegrains and pulses. These businesses can be successful as there is very little need for equipment and consequently the required capital investment is relatively low. Wholegrains are normally processed before being used as an ingredient to produce a range of products. Processing techniques include puffing, flaking and milling.

Grain processing is the biggest component of the food sector, sharing over 40% of the total value. The primary processing sector shares 96% of the total value while the secondary and tertiary sector shares 4% of the total value addition. The grain processing industry covers a range of food products. These include the basic primary food, such as rice products, pulses and the processes for converting them into edible form and processed food like biscuits, bakery products, breakfast food, etc.

Cereal products and pulses can be broadly classified into the following groups:

- Whole cereals/pulses where only the husk of the grain is removed, e.g. rice, wheat, gram, lentils, etc.
- Split pulses like tur dal, gram dal, etc.
- Milled grain products are made by removing the bran and usually the germ of the seed and then crushing the kernel into various sized pieces. These include wheat flour, maida, semolina (rawa), besan etc.
- Processed cereals and pulses like weaning food, breakfast cereals, etc.
- Ready mixes like cake mix, idli mix, vada mix etc.

### **1. Value added products from Pulses**

#### **a. Roasting of Pulses or Puffed Legumes**

##### **Puffed Chickpea and Peas**

Puffed chickpea and peas are widely used in India as a snack.

### Procedure

1. Soaking chickpea or peas in water for a 15-20 minutes and draining of water
2. Keeping the wet grains in a closed vessel for the moisture to equilibrate in the grain
3. Puffing the wet grains in a hot iron vessel containing sand at 190-200°C for 60-80 sec.
4. The grains puff and the husk is split off

For efficient puffing, the temperature just before explosion must be sufficient to create a high enough water vapour pressure without burning the pericarp and the temperature increase must be fast enough to build up the required pressure before the water evaporates. Moisture content of the kernel has a pronounced effect on popping behaviour. The kernels, which are too dry, often pop up feebly.

### Parching of pulses

Legumes such as Bengal gram and peas are parched to give highly acceptable products. Bengal gram is tied in a moist cloth and kept overnight before it is parched. Peas are soaked in water for 5 minutes dried partially in the sun for 15 minutes and then parched. Salt and turmeric powder are sometimes added to the steeping water or the grains smeared with the paste of the same before they are parched. Parching is done in a hot iron vessel containing sand at 190-200°C for 60-80 seconds. Parching Bengal gram has been used in the treatment of protein calorie malnutrition in children

### B. Preparation of Papad

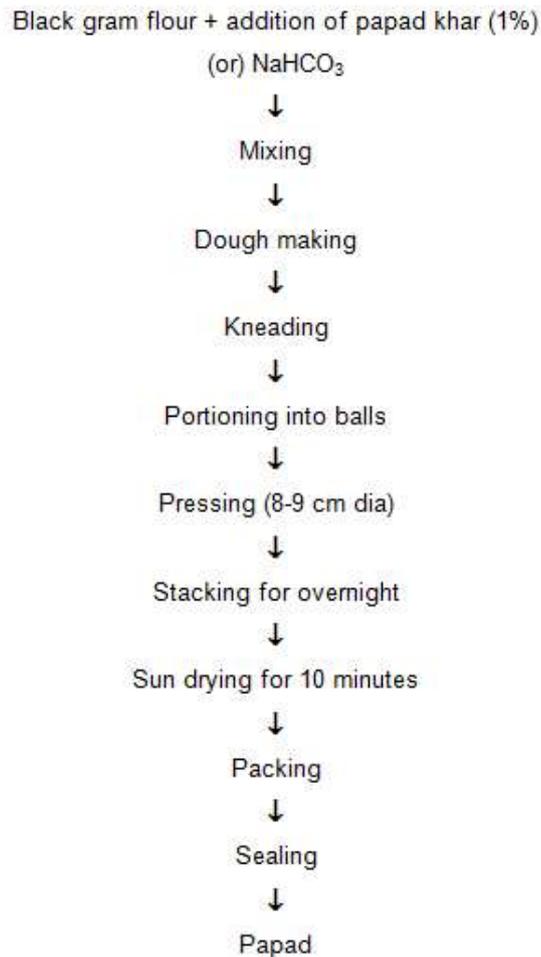
Papad also known as appalam or papadam in South India, is essentially a thin wafer like product, usually circular in shape rolled from a dough made out of pulse, cereals, edible vegetable oil, alkaline and mucilaginous additives. It is normally consumed in toasted or fried form. In India, papad has been associated and deeply entwined with social customs/ rituals and has been developed into culinary art.

### Materials needed

Black gram flour	100g
Water	50 ml
Salt	7 g
Sodium bicarbonate (or) sodium carbonate	1 g
Asafoetida	0.2 g
Refined oil	2-3 g

### Method

All the ingredients except water were mixed well. The dough was prepared after adding water. The prepared dough was kneaded well and divided into balls of 15 gm each and pressed to 0.8 cm thickness with 8-9 cm diameter papad. The papad was soaked overnight, conditioned and dried under the sun for 10 minutes to reduce the moisture content to  $\pm$  14.0 per cent. It was packed in polyethylene pouches. The steps involved in the processing of papad are given below:



### **Packing**

The grains and pulses are low moisture commodities due to which they are less susceptible to spoilage and have greater shelf-life. The spoilage mainly occurs due to moisture absorption during storage leading to fungal growth at high temperature and humidity. Before bulk packaging and storage, the whole grains are fumigated to reduce microbial load and increase storage period. The requirement for bulk packaging are therefore, most important for these commodities. The packing materials used for packing of cereals and pulses are as follows –

- Jute Bags
- Woven sacks made out of high density polyethylene or polypropylene
- Multiwall paper Sacks. The multiwall paper sacks are not commonly used in India owing to its high cost and lack of proper availability.

### **Jute Bags**

Traditionally, jute has been the packaging material used for bulk packaging of food grains and pulses. With the increasing growth of these commodities, there has been a quest to look at alternate packaging materials due to the stagnant jute production.

#### **Disadvantages of jute bags include:**

- Availability: Food grade jute bags are not easily available.
- Mineral Oil Contamination: Mineral oil is used as a lubricant in processing of jute fibres. Mineral oil adds hydrocarbon odour to the fabric and some free radicals are also found in mineral oil which affects normal metabolism of human bodies. Alternatively, lubricants based on vegetable oil have been developed by Indian Jute Industries Research Association (IJIRA) for manufacture of odourless and hydrocarbon free jute fabric for food contact application. However, bags made out of odour free fabric are expensive.
- Poor resistance to UV radiation.
- Susceptibility of the material to insect infestation and rotting.
- Poor resistance to corrosive chemicals.

- **Insect Breeding:** It is a regular practice in the grain trade to reuse bags. The structure of jute fabric being porous, the insects like stored grains and pests find it easier to lay their eggs on its fibres. The eggs of stored grain pests are microscopic in nature and one can know about the presence of infestation only when it gets developed into the larva stage. Such bags can therefore serve as a potential source of infestation. Many a times the used bags are contaminated with food items or with chemicals, and in such cases they serve as a potential source of contamination.

The nature of jute packaging is such that, lot of food packed therein gets exposed to deteriorating factors and germs. Air borne germs and the ones present in the storage godowns may seek way through the pores of the fabric and may contaminate the food. Such food, when consumed may cause illness like food poisoning.

### **High Density Polyethylene (HDPE)/Polypropylene (PP) Woven Sacks**

HDPE and PP woven sacks have replaced jute bags in number of applications. Several plants manufacturing these sacks have come up in different parts of the country making the availability of these products possible at low price.

#### **Advantages of HDPE and PP woven sacks include:**

- Elongation at break of HDPE tapes is about 15-20% in comparison to jute bags, which is about 30%. Owing to this property HDPE woven sacks have better resistance to dropping.
- HDPE/PP woven sacks do not impart any odour to the food product packed in them
- HDPE/PP woven sacks are not attacked by insects
- HDPE and PP woven sacks of strength equivalent to that of jute bags can be made using almost 70 times lower weight of the resin and hence are almost 60-65% cheaper than the jute bags.
- HDPE and PP woven sacks are the most hygienic material for packing of cereals and pulses and one need not reuse the same owing to their low cost.
- Fabric allows diffusion of air/gases easily through the gaps between the filament thus facilitates ventilation of grains during earlier stages of harvest and penetration of fumigants.
- Although HDPE/PP undergo degradation under UV light, it is possible to arrest the same by using appropriate UV stabilizers.
- It is possible to laminate HDPE woven sacks with LDPE. The laminated bags protect the product packed in the bag from moisture and also prevent the loss of products like flours due to spillage, which usually occur through plain jute bags, which are commonly used for packing of flour.

Lamination of PP woven sacks with polypropylene is also possible, as the grade of PP suitable for lamination is now available in the market.

### **MINI-DAL MILL DEVELOPED BY Central Food Technological Research Institute (CFTRI) Mysore,**

A unique mini-dal mill developed by the Central Food Technological Research Institute (CFTRI) Mysore, is all set to revolutionise processing of pulses. Priced at Rs.70,000/- approximately. The mini-dal mill can process major pulses Tur, Harbhara, Soyabean, Masur, Udi, Mung into dal at a lower processing cost. The capacity of the mill is 100 kg per hour and it requires only 1.5hp.

The uniqueness of the dal mill is that the unprocessed pulses get dehulled and split simultaneously in the dehusing section which consists of an emery coated cone rotating inside a wire mesh cage.

The husk is aspirated by a section mechanism and clean dal is separated from broken and whole grains in the separation section. The quality of the dal processed in the mini-dal mill is as good as that processed in large dal mills. One of the main features of the mini-dal mill is that it is easy to operate, maintain and repair in the villages.



It can be adopted at farm level in the rural sector and can give self employment to the rural men or women. A team of two/three workers can operate the mini-dal mill (self employed) and there is scope for engaging another two persons for allied works like pre-milling treatment of pulses.

#### **Beneficial Unit**

The mini-dal mill is an efficient replacement to traditional pulse milling units like chakkies and plate mills. The mill gives a dal yield of 78 percent with almost 99 percent removal of husk and minimum breakage (2 to 3 percent).

The mill can provide better facilities for milling of pulses at the rural level and also value addition to the byproducts (husk, broken and powder) through separation and utilization of edible material from the byproducts.

As the cost of processing the pulses is cheap, it would enable them to provide toor dal and Bengal gram at a cheaper rate to the village residents.

- **The capacity of the mill is 100kg per hour and it requires only 1.5hp**
- **Installation of the mill can help rural men and women become self-employed**

## PKV Mini Dal Mill

Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola



Mini Dal Mill

The production of pulses and their per capita requirements for consumption are not in harmony. On an average 10-15% losses are observed in the milling process through broken and powder. Villagers use floor mills for dehulling of pulses after prolonged treatment where dal recovery seldom exceeds 58 percent. In commercial mills higher recovery is obtained but total investment is beyond the capacity of an average person to mitigate this problem. A mini dal mill can be used where the investment is low with higher dal recovery as compared to commercial and rural levels.

Farmers produce pulses and sell it at low prices to the middlemen. They do not have processing facilities at the rural level to process the farm produce. Moreover, transportation of raw material to commercial mills and back to the consumers staying in villages adds extra burden on the producer. If pulses are processed at the rural level, the villagers may get the finished product at comparatively low prices. Similarly, it can save the transportation and handling losses. Such processing is possible through the use of a Mini Dal Mill.

PKV Mini Dal Mill

It consists of a taper roller, elevator, aspirator, blower, cyclone separator, replaceable three-screen sieve unit, oil and water tank, screw conveyor etc.

### Feature

- Easy to install and requires less space.
- Capable to make fatka dal, sawwa number of pigeon pea.
- Capable to make mogar of green gram and black gram, capable to make chana dal.
- Length 1500mm
- Width 1600
- Height 1800mm
- Capacity (8hr/Day): Toor 8 to 10 Qu., Mung & Udi -10 to 12 Qu.
- Operating speed – 1440 RPM
- Motor – 3hp
- Power – 2.2 Q.Watt
- Place for drying – 20X8 Sq.m.
- Machine Shade area – 5X3 sq.m.
- Approximately price : Rs.70,000/-

### Dal Processing Machine and other machineries are manufactured by –

Shri. Prashant M. Kulkarni

Womens Development Education & Public Welfare Foundation

1182/70, 'E' Ward, Mali Colony, Takala

Kolhapur – 416 008, Maharashtra, India

Tel 0231 – 2650665

Mobile: 09822026856

Email: [womensdev@rediffmail.com](mailto:womensdev@rediffmail.com)

## **5. Fodder Bank**

### **Introduction**

“The fodder bank technology is a farming practice whereby leguminous shrubs and grass species are grown on a farm to provide fodder for livestock sector.” It provides a wide range of animal products that are rich in high quality proteins and have the potential as good and sustainable sources of income in many areas. However, lack of fodder in terms of quality and quantity, is one of the major constraints towards the low productivity of cattle in Watershed project. The fodder bank ensures fodder availability which in turn reduces the distressed migration of the people resulting in sustainable livelihood opportunities and enhances natural resource security in the project area.

### **Objective of a fodder bank:**

1. Build a local fodder bank and organize the distribution of fodder during drought and scarce situation.
2. Establish and maintain village fodder farm in the community grazing area, and allocate the community land for fodder production, in association with dairy co-operatives.
3. Control regulates and charge in the community grazing and pastures lands.
4. Undertake the distribution of fodder seeds in the village.

### **Feasibility of Fodder Bank:**

The fodder bank should be sustainable and towards that, the sale price of fodder should cover operating costs and losses in storage. All these decisions should have to take jointly with the member of operating fodder bank.

### **Production of Fodder:**

Fodder from community land of Village/Gram Panchayat and for remaining requirement by two ways first one buy the fodder at the time of harvesting and second we can take land on lease agreement from some other government as well as private agency.

### **Technical Support/Assistance:**

To ensure proper technical support for fodder bank and smooth functioning of activities the required technical assistance may be taken from Krishi Vigyan Kendra (KVS), Dept. of Agriculture, Dept. of Vety & AH.

### **Advantages:**

The importance of a fodder bank can be well understood. The fodder banks will provide much needed relief and self-reliance to poor in the village especially in drought condition. Specifically, the advantages are:-

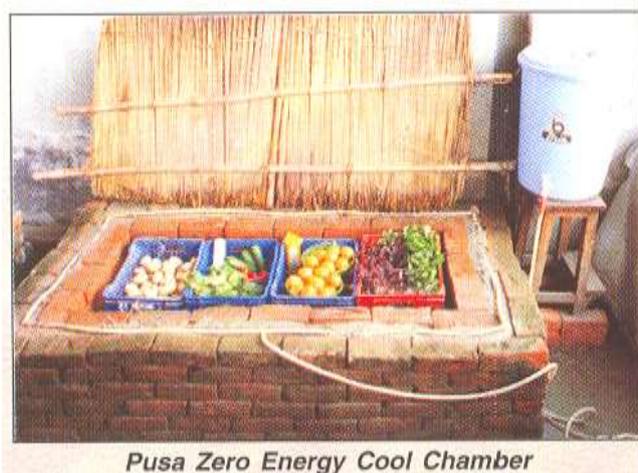
- It will reduce migration during drought condition.
- Farmers can purchase and sale of fodder at village level, thus doing away with costs incurred by them to carry out these transactions at the city market.
- It can reduce in overall market prices of fodder during the lean season.
- Ensure availability of fodder during the lean season at affordable and reasonable prices.
- Reduced distress sale of cattle due to non –availability and / or non-affordability of fodder.
- Higher incomes for the poor as cattle will have enough fodder even during the lean season.
- Increase employment opportunities at the village level associated with the sale, purchase and storage of fodder

## **6. Low Cost Storage Technologies for Preservation of Horticultural Produce and Foodgrains**

Owing to improper post-harvest operations, especially storage, over 10% of foodgrains and 30-40% of the fruits and vegetables produced in the country are lost resulting in poor returns to farmers and high cost to

consumers. While dry foodgrains can be stored in bulk without significant damage for relatively longer period of time, storage of fresh horticultural produce, being highly perishable, particularly under the tropical climate in India, is a major challenge needing immediate attention. Both foodgrains and horticultural produce are living entities and carry out all the vital activities such as respiration and / or transpiration, etc., while in storage. The spoilage of these commodities can be controlled to a large extent by maintaining proper storage conditions. The Indian Agricultural Research Institute has been working to provide indigenous low cost storage technologies for the preservation of different horticultural produce and foodgrains. The indigenous low cost methods for storage of horticultural crops and foodgrains are designed to check microbial, enzymatic and oxidative spoilage in the stored / preserved materials. These produces can be stored safely up to a few months without excessive spoilage. Specific storage technology would further cater to domestic and overseas markets.

To retain the freshness and for the storage of fresh fruits and vegetables for short period, an on-farm storage chamber, known as Pusa Zero Energy Cool Chamber, was designed on the principle of evaporative cooling system. For safe storage of food grains, Pusa Bin / Pusa Kothar was constructed. For easy handling and safe storage of pigeonpea at the household level without any loss in quality, an economical container, known as Pusa Domestic Metal Bin, was made.



Pusa Zero Energy Cool Chamber

### 1. Pusa Zero Energy Cool Chamber

Storage of fresh horticultural produce after harvest is one of the most challenging problems of a tropical country like India. Fruits and vegetables because of their high water content are liable to rapid spoilage. The spoilage of fresh fruits and vegetables can be controlled by reducing the storage temperature. Refrigerated cool storage is not only energy intensive and expensive, but also involves large initial capital investment. Therefore, there is a need for low cost technology, which can be adopted widely.

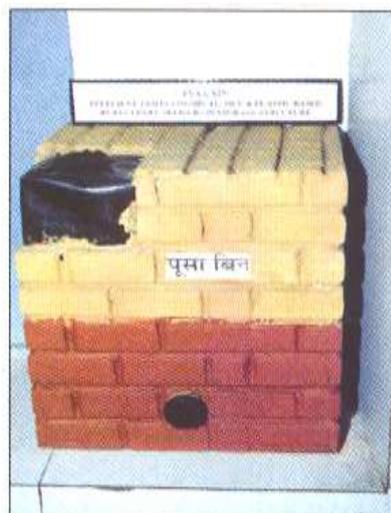
Pusa Zero Energy Cool Chamber (Pusa ZECC) can be constructed easily anywhere with locally available materials like bricks, sand, bamboo, *khaskhas*/straw, gunny bags, etc., with a source

of water. The chamber can keep the temperature 10-15°C cooler than the outside temperature and maintain about 90% relative humidity. Studies at different agro-climatic zones have shown it to be very useful. It is most effective during the dry season.

Small farmers can easily construct Pusa Zero Energy Cool Chambers (ZECC) near their fields and store a few days's harvest before dispatching it to the market. In this way, the farmers can avoid the clutches of the middlemen and are not forced to make any distress sale. Apart from farmer's fields, the cool chambers can be installed profitably wherever fruits and vegetables are temporarily e.g. (i) packing stations, (ii) Village *mandis*, (iii) whole sale markets in metropolitan cities, (iv) railway stations, (v) interstate bus terminals, (vi) retail outlets, (vii) big hotels and institutional catering centres, (viii) defense establishment in remote places where supplies come once in a week or so, and (ix) fruits and vegetables processing factories

#### Some specific advantages of Pusa ZECC

- Can be constructed by an unskilled person
  - No mechanical or electrical energy needed
  - Allows small farmers to store produce for a few days so that they are not forced to sell at low prices
  - Reduces losses and pays for itself in a short time
  - Useful for temporary storage of curd, milk and cooked food
  - Can also be used for mushroom cultivation, sericulture, storage of bio-fertilisers, hardening of tissue-cultured plants, etc



Pusa Bin

### 2. Pusa Bin / Pusa Kothar for safe storage of foodgrains

#### Pusa Bin

Interaction of biotic factors such as insects, fungi, bacteria, mites, and psocids and abiotic factors such as relative humidity / moisture content and temperature leads to various kinds of deterioration of grains during storages. However, the grains are hygroscopic in nature and tend to absorb or loss water from the atmosphere depending upon the prevailing relative humidity. The storage container or structure, thus, plays a vital role in restricting the moisture content to a safe level. With these points in view, a Pusa Bin was developed at IARI during late 1960's and later modified as Pusa Kothar in 1974. The structures have proven record, and are widely acclaimed and adopted by farmers.

#### Characteristic features of Pusa Bin

- Moisture proof
- Air tight
- Thermally insulated
- Rodent proof
- Eco-friendly (use of chemicals avoided)
- Economical and within the reach of poor farmers

#### Material required for construction of a 1000-kg capacity bin

Polythene sheet 1000 gauge	=	6.50 m
Unburnt bricks	=	900
Burnt bricks	=	95
Wood	=	Small quantity to give support to the roof
Exit pipe (outlet)	=	One
Cost	=	Rs.700/- (approximately)

The size of the structure can vary depending on the requirement of the user. The Pusa Bin is constructed over the floor made of burnt bricks. A polythene film extending by 6 cm on all the extremities is placed over the platform and covered with another layer of unburnt bricks thus sandwiching the polythene sheet between the two layers. On the border of the platform, the walls with unburnt bricks are raised to the desired height and a roof is laid using mud slabs. A wooden frame gives support to the roof. The structure has to be dried and then filled with grains dried below 9 per cent moisture content. The structure can be used for a number of years provided due care is taken.

#### Pusa Kothar

The materials required for the construction of Pusa Kothar are the same as in Pusa Bin. Pusa Kothar was developed to avoid the wastage of space all around and to bring about the reduction in cost. It is a modified version of Pusa Bin. The existing 2 or 3 walls of the room are utilized to make the structure. And they serve as outer wall of Pusa Kothar, and then polythene sheet is spread over these existing walls. The farmers have been making these structures on their own with the help of Entomologists.

### 3. Pusa Domestic Metal Bin for Pigeonpea

There is a need of proper storage structure for pigeonpea at domestic level due to considerable post harvest loss. The consumers not only have to pay higher price but are also forced to use chemicals for the control of insects and pests, which are harmful to public health in general and family in particular.



*Pusa Domestic Metal Bins for pigeonpea*

Domestic Metal Bins are given below:

#### Some specific advantages:

- It is easy to handle and simple in construction
- It is moisture-proof, insect-proof and rat-proof

- It does not need any chemical for fumigation to control insects
- It helps in maintaining clean and hygienic environment in the house
- It provides an opportunity to purchase pigeonpea for family consumption for one year at cheaper rate during harvesting season
- It protects stored grain from all sorts of physical, chemical, mechanical and biological factors
- It is economical on unit storage cost basis
- It can store well sorted, washed and dried (up to 7% moisture content) pigeonpea for more than one year without any loss in quantity as well as quality and without the use of any chemical

## 7. Solar Dryers



Solar Air Dryer invention is patented by Indian Patents Office with a patent number 211911. Solar Food Processing is a novel and unique technology developed by Society for Energy, Environment and Development (SEED) for dehydration of fruits, vegetables, forest produce, spices, sea-food to the permissible moisture limits for better preservation, long shelf life and to the international cleanliness standards. This process can be accomplished in the innovative solar dryers which operate with zero energy cost unlike the electrical drying systems. The important nutrient facts are mostly preserved in this process.

- Zero energy cost.
- Cabinet temp : 40 - 65°C
- Temp. diff.  $\Delta T$  : 15 - 30 °C
- Temperature indicator
- Moisture & Humidity control
- Stainless Steel Trays
- Standby Electrical back
- U.V. Reduction filter
- Rain & Dust proof Cover

5 years warranty

Through micro-enterprises in solar food processing, the application of Solar dryers generate income in rural areas and self employment for small farmers. These dryers are multi-purpose, applicable to multi-crops and works for almost 300 days in a year. This will cost Rs.40,000 – Rs.1,50,000 per unit and transportation charge extra (from Hyderabad).

## Solar Food Processing

Food Processing Technology is one of the priority sectors in our country. We introduced this technology in solar dryers at micro level in the villages to help the society. This would be a boon for rural women and youth. This approach finds a solution for not only preservation of food products but also can create a great opportunity for rural employment. The solar dryer technology will process the food products with zero energy cost.

In the past few years intensive Research work has been carried out by SEED in drying more than 60 products of vegetables, forest produce like gumkaraya (edible gum), spices, herbs using solar dryers on a commercial scale.

Processed foods in Solar Dryers has these advantages than drying in a open sun drying. Drying in Solar Drying is

- Safe & hygienic
- Free from insect and bird contamination
- Clean & dust free products

#### **Quality**

- More uniform quality products
- Uniform in colour, texture, appearance of the product
- Evenness in drying
- Moisture control to optimum levels
- Nutrient retention especially beta carotene
- Yields high quality, Export products
- Products qualify for quality & sensory tests
- Long shelf life to the products

#### **Some of the food products processed in SEED solar dryers are:**

**Fruits Bars:** Mango,Pineapple,Papaya,Guava, Grapes and Chikku (Sapota).

**Vegetables:** Potatoes,Donda,Carrot, Tomato,Mushrooms, Bittergourd,Onion,Amchur powder and coconut.

**Leafy Vegetables:** Spinach,Fenugreek,Tamarind, Gogu, Mint,Drumstick,Coriander and Curry leaves.

**Spices:** Ginger,Mango Ginger,Garlic,Red Chillies, Green chillies and Pepper.

**Forest Produce:** Karaya Gum,Karakkaya,Sugandapala (Budipalagadda),Alovera,Amla and Honey.

**Medicinal & Herbal Products:** Rosemary, Spirulina Powder and Tulasi leaves.

**Food Items:** Maida, Vermicelli, Noodles, Pickled Chillies and Fish.

**Chemical Powder:** Silicon Carbide and Cellulose.

### **Technical Details of Solar Dryer**

#### **Solar Dryer Technology**

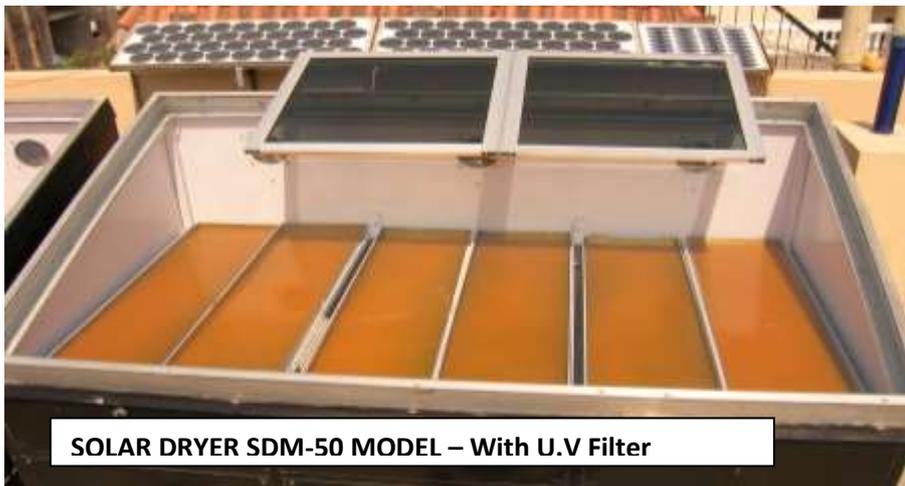
New and innovative Solar Drying Technology is the outcome of research and development wing of SEED for processing vegetables and fruits on micro level in rural areas.

The project was initiated in 1996 with grants sanctioned by UNDP and subsequently funded by Development of Science and Technology, (1999-2001&2003-2005) USAID for commercialization of technology (1998) and application of the dryers to Agri-Horticulture produce drying.

#### **New Innovative Dryer**

The Society for Energy, Environment & Development (SEED) has successfully designed and developed a novel and unique solar cabinet dryer in 1999 under the sponsorship of UNDP. It was put to test for its groundbreaking technological innovation with several applications in drying of forest produce, fruits, vegetables, and spices. This was carried out through the projects, sanctioned by Department Of Science and Technology (DST) and further commercialized the model SDM-50 with the financial grant by REPSO(USAID Assistance). As a result, the drying technology is coupled with the practices of food science and technology in the area of horticultural products. The out come is the emerging solar food processing technology with special emphasis on dehydration of fruits and vegetables in the form of fruit bars and dried fruits and vegetables.

## High Efficient Direct Cabinet Solar Dryer



### Principle of Solar Dryer

The solar radiation passes through the transparent glass window, located on the top of the cabinet, which is oriented to south with a tilt equal to altitude to collect maximum solar radiation. The cabinet is made of anti-corrosive material and of modular nature to meet the varying sizes and loading capacities of food products, ranging from 8kgs to 1000kgs and above.

The ambient air enters from the bottom of the cabinet and gets heated up with solar radiation incident from the top window. The heat energy is trapped in the cabinet and heats up the air. As result the wavelength of solar radiation shifts to infrared region, causing green house effect. The hot air passed through the trays, carries the moisture from the product to the space below the glass. Then it is exhausted by Solar Photovoltaic Fans. The forced circulation of air in the cabinet is achieved through this solar fan.

The electrical heaters are provided as stand by to meet any exigencies on non-sunny days.

The **SOLAR POWERED SOLAR AIR DRYER** has capacity to evaporate 15kgs of water per day from the processing food and 50kg of maximum capacity of loading of wet products.

### DRYER SPECIFICATIONS

SPECIFICATIONS	SDM – 50
Solar window	2.23 Sq.m

Drying area	3.60 Sq.m
Loading capacity (Max)	50 Kgs
Solar panel	21 W
No of fans	3
Electrical backup	3.6 KW
Physical dimensions	6'L X 4'W X 4.5'H
Construction material	Aluminium Cabinet, stainless steel Trays, brass and hardware

### Special Features of this Technology

The special features of these solar dryers are:

- The temperatures achieved in the cabinet are in the range of 40-65°C on clear sunny days.
- The temperature difference between the ambient and inside cabinet is 15 to 30°C on good sunny days.
- The moisture control in the product is achieved by the regulation of drying time, basing on the intensity of solar radiation.
- Thermostat control at set temperature in mixed solar and electrical mode.
- Closed or mesh trays are provided for easy loading and unloading of product.
- Solar PV fan for air circulation.
- A special glass filter is provided to cut off U.V radiation and reduce the solar intensity for special applications.
- A clean and hygienically prepared product, meeting the cleanliness specifications of ASTA of USA and other countries, is processed in these dryers.
- These dryers are modular and to scalability of the design to any size of demand.

### The solar drying process has the following advantages:

- Zero Energy cost
- Moisture control
- Export quality
- Income generation
- Self employment
- Sizes for small farmer to commercial production

### Complete system cost of one unit of Solar dryer with break- up- in Andhra Pradesh

Particulars	In A.P. (Rs.) (Single user) Five dryers in unit
Solar Dryer – SDM-50 Model	6,25,000/-
Additional trays	15,000/-
A.P. Vat –5%	32,000/-
Packing & Handling Charges	25,000/-
Transport charges (By Road)& Installation and commissioning charges	75,000/-
Annual Maintenance (5 Years)	50,000/-

Insurance At 2 % On Dryer Cost	10,000/-
Tools and accessories	1,00,000/-
<b>TOTAL(One lakh twenty thousand one hundred only)</b>	<b>9,32,000/-</b>

## Mango Fruit Rolls



### **SEED Contact Details**

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## **11. Fisheries and Allied Activities**

Fishing activities in Rivers and Khadis is one of the traditional activities of this area. The allied supplementary activities is that of Head Loaders who are mainly landless who purchase the fish from the fisher man and take it for sales to nearby villages and market places. The Fisher man as enhancing livelihood activities require help in small boats, rafs, net, etc. in order to improve their livelihood opportunities. Fish is either sold fresh or in a processed state such as sun dried. There is a great demand for both locally in the villages and in near by markets. Women can purchase fish in bulk from fisher men and transported.

The head loaders require seed capital for buying fish, ice boxes, ice, bi-cycles, etc. to facilitate and enhance in capacity of buying more fish, storage and transportation in order to earn a decent livelihood.

## Farm Pond Fisheries

The farm pond fisheries are proposed to increase the production of fisheries in individual farm ponds by way of building technical capacity of farmers who are interested in initiating the fisheries in their own farms. One of the technical core is to supply quality healthy fingerlings and release them at the right time in order to ensure their survival rate. Following will be the technical core activities –

- Capacity building of the local individual farmers
- Technical know-how of preparing specially individual farm ponds before releasing & stocking of fishes. Protection & guarding farm ponds
- Technical know-how of fish farming, different breed of fishing and their feeding requirements
- Technical know-how of basic low cost fish hatcheries, fish seed supplier and nursing from fish larvae to fry and then to fingerlings
- Technical concepts of relating fishes with agriculture, dairy, poultry, horticulture and other allied areas
- Technical core of netting, transport, storage and marketing of fresh fishes

The linkages can be developed with Shramjivi Janata Sahayyak Mandal, Mahad for Training and Capacity Building of Farmers as they are actively involved in Fishery Activities. SJSM will also help farmers in supplying the finger lings.

### Contact Details:

**Shri. Ram Akhade**

**Shramjivi Janata Sahayyak Mandal**

**Mahad Vithai Complex, Behind State Bank ATM, Above Shantai Nursing Home**

**In front of Pariwar Showroom, 1<sup>st</sup> Floor, Flat No. 101**

**Tal. Mahad, Dist. Raigad, Maharashtra - 402301**

**Mob: 9423866509 / 9404790509**

**Email: [sjism\\_mahad@rediffmail.com](mailto:sjism_mahad@rediffmail.com)**

**9. Bamboo Products:** Bamboo is a locally available material, easily processed by rural communities specially the women SHGs. It is very versatile, and because it splits linearly it is very easy to process. The development of bamboo based enterprises requires low capital, raw materials and tools and machinery investments as compared to other micro – small and medium enterprises. Bamboo has a unique role to play in generating a renewable and sustainable source of income and employment and providing a viable eco friendly livelihood option to the poor women. Some products are particularly good for women to produce and build upon women's inherent skills. The Bamboo products such as Mats, Baskets, Bags, Candle Stand, Pen Stand, Flower Basket, Photo Frame, Key Stand and other products can be prepared and marketed. Traditional rural bamboo products have demand in rural and urban areas for its low cost environment friendly and socially equitable products as they are produced by rural artisans as day to day utility as well as ethnic handicraft utility items. Recently, a local training centre for bamboo product has been set up.

## **10. Promoting and Setting up Service Centre through SHG, Landless & Farmers :**

To extend all agriculture and allied services to the farmers under a single roof it is proposed to establish and set up a Service Centre comprising of SHG members, landless & farmers in the proposed project area. This service centre will supply fertilisers, pesticides, agricultural farm equipments & machines (treadle pumps, markers, weeders and other agricultural tools), seed and other inputs. Besides, a wide range of services including cultivation, harvesting and marketing, seed certification, soil testing and other allied services will be extended to the farmers.

## **11. Marigold Cultivation**

### **Package of Practices for Growing Marigold**

Botanical Name : *Tagetes erects*, (African Marigold)

*Tagetes patula* (French marigold) Family : Asteraceae

### **Importance:**

Marigold is one of the most important flowering cultivated in Sindhudurg District. It is one of the most commonly grown flowers, extensively used as loose flowers for making garlands for religious and social functions.

Its habit of free flowering, short duration to produce marketable flowers, wide spectrum of attractive colours, shape, size and good keeping quality has attracted the attention of flower growers.

Marigolds are ideal for cut flowers, especially for making garlands. They can be planted in the beds for mass display or grown in pots. The French Marigolds are suitable for hanging basket and edging. The demand for Marigold flowers during Dashara and Diwali is very high.

### Soil and Climate:

Marigold can be grown successfully in a wide variety of soils. The soil should be well drained, well aerated, deep, fertile, good water holding capacity and neutral soil reaction (pH 6.5 -7.5). Saline and acidic soils are not suitable for cultivation. An ideal soil for marigold cultivation is fertile sandy loam. African and French marigold both are hardy in nature. They can grow well throughout the year under tropical and subtropical conditions but requires mild climate for luxuriant growth and flowering. In very high temperature plants cease to growth, flower production is affected adversely and flower size is also reduced to a great extent. Mild climate during growing period (14.5 -28.6 °C) greatly improves flowering while higher temperatures (26.2 -36.4°C) adversely affect flower production.

### Types of Varieties of Marigold:

Varieties of Marigold are grouped in two groups :

- A) African Marigold: Tall growing plant / big size flowers
- B) French marigold: Dwarf plant with small flowers

The growth and flowering in marigold are generally controlled by light duration and temperature, therefore, selection of varieties should be according to climatic conditions. The suitable varieties for growing in different seasons are

Suitable varieties for growing in different seasons

Seasons	Varieties
Winter	Pusa Narangi Gaiinda, Pusa Basanti Gaiinda, African Gaint Double Yellow, African Giant Double Orange, Tiger (yellow and red).
Summer	Cracker-Jack and Locals
Rainy	African Giant Tall Yellow, African Giant Tall Orange, Jaffri (yellow and orange), Laddu Gaiinda.

**Propagation:** There are two common methods of propagation of marigold i.e. by seeds and by cuttings. Plants raised from seeds are tall, vigorous and heavy yielder and hence, seed propagation is preferred to cuttings.

**Seed Rate:** 1 to 1 1/2 kg per ha

### Sowing time and season:

Depending on environment planting of marigold can be done in three seasons i.e. rainy, winter and summer and seeds are sown accordingly. Hence, flowers of marigold can be obtained throughout the year. The seasons of sowing and transplanting of seedling for obtaining flowers at different seasons of a year are as under:-

Seasons of seed sowing and transplanting of seedlings

Flowering seasons	Sowing time	Transplanting time
Late rains	Mid-June	Mid-July
Winter	Mid-September	Mid-October
Summer	Jan-February	February- March

### Raising of Seedlings and Transplanting:

**Nursery raising:** The marigold seeds are black in colour and remain viable for about 1-2 years for rising of seedlings, seeds should be sowed in pots, seed boxes or raised nursery beds. Nursery beds are prepared by digging area and incorporating well rotten FYM. Before sowing the seeds, the soils should be drenched with Captan to avoid the ants, which carry away the seeds. Seeds should be sown thinly (6-8 cm row to row) and 2cm deep and covered with sieved leaf mold. The nursery beds should be remained moist during entire period. The quantity of seed required depends upon the level of its purity and germination rate. Generally 200-300g seed/acre is required for raising the nursery in summer and rainy season, and 150-200g/acre for winter season. The seed germinate 4-5 days after sowing and seedlings become ready for transplanting after 3-4 weeks for sowing.

### Transplanting of seedlings:

Marigold seedlings are easily transplanted and established in the field without much mortality. At the time of transplanting, they should be stocky and bear 3-5 true leaves. Thin and long seedlings do not make a good plant. Very old seedlings are also not desirable. When seedlings will attend the age of one month or a height of 10-15 cm then those seedlings are transplanted in well manured and fertilized bed at the spacing of 60 x 60 cm or 45 x 45 cm.

Transplanting should be done in well prepared land and soil is pressed around root zone to avoid air pocket. After transplanting, a light irrigation or watering with rose cane should be done.

### Manures and Fertilizers:

Since marigold is fast growing crop, it requires high dose of nitrogen and moderate level of phosphorous and potash for better root development and quality flowers. Therefore, 40-50t/ha FYM should be applied at the time of land preparation. In addition to FYM it is advisable to apply 200 kg/ha nitrogen and 80 kg/ha each of phosphorous and potash for good flower yield. The full dose of phosphorous and potash should be given before transplanting while nitrogen is given in two split doses (30 and 60 days after transplanting).

### Interculture Operations irrigation:

Weeds are a major problem in marigold especially in rainy season crop. If the weeds are not removed in time, a great loss would occur in terms of growth and productivity of marigold. Normally 3-4 manual weeding and hoeing are required to check weed growth and to keep the field clean

**Irrigation:** . Irrigate the crop in 7-8 days interval, but the frequency and quantity of water also depend upon soil and season. In lighter soil, more frequent irrigation is required than that in heavy soil. Moisture stress at any stage affects normal growth and flowering.

### Pinching:

Pinching (removal of terminal portion) is done as breaking of apical dominance mechanically to promote laterals and increasing the number of flowers. In African marigold pinching is recommended after 30-35 days of transplanting.

### Diseases and Pests:

Marigold is relatively free from diseases and insect pests. However, occasionally the following diseases and insect-pests have been observed.

Important diseases and pest, their symptoms and management of marigold

Diseases/ Pests	Symptoms and damage	Managements
Damping off Rhizoctonia solani	Brown necrotic spots and girdling on the radicle, later on extends to plumule and causes pre-emergence mortality.	Infected seedlings are pulled, sterilization of soil with Formalin @ 2% or Captan 2g/ litre of water.
Leaf spot and blight Alternaria sp., Septoria sp., Cercospora sp.	The minute brown circular and brownish-grey spots appear on the leaves.	Spraying fungicides regularly.
Collar and root rot Pellicularia filamentosa, Pythium ultimum, Sclerotinia sclerotiarum	Rotting of root and collar portions is noticed in nursery stage which resulting in wilting of the plant.	Soil sterilization and controlled watering.
Flower bud rot Alternaria dianthi	Buds are shriveled, turn dark brown and dry up. Symptoms are less prominent on matured buds but these buds also fail to open.	Spraying Dithane M- 45 and Ridomil @ 2.5g/lit of water.
Bud caterpillars Helicoverpa armigera and Phycita sp.	Eggs are laid singly on young buds. Larvae feed on developing flowers by damaging florets. Larvae of Phycita sp. feed on heads of buds and flowers.	Collection and destruction of infested buds and flowers.
Aphids Aphis gossypii	Aphids mainly infest lower surface of flowers and base of petals. Nymphs and adults suck the sap from the flowers causing discolouration and withering.	2-3 sprays of Imidachloropid solution 0.25%.

**Harvesting and Yield:** Plucking of flowers at proper stage is important during harvesting to keep the flowers fresh for a longer time for export purposes. French Marigold starts flowering 1 to 1 1/2 months after transplanting while African Marigold 1 to 2 months after transplanting of seedlings. For Garland stalk less fully opened flowers (loose flowers) are picked, while for vase decoration also fully opened flowers with stalk are plucked.

From one plant near about 100 to 150 flowers are obtained. Blooming duration is near about 3 months.

Plucking of flowers should be done in cool hours of the day either in the morning or evening. Flower yield in both types varies with cultivars, cultural practices like planting time, spacing and fertilizers. The flower yield in African marigold ranges from **125-150q/ha** whereas, it is **80-120 q/ha** in French marigold.

## 12. Cultivation of Okra or Lady's Finger or Bhendi (Abelmoschus esculentus)

### Package of practices

#### **Botanical Name:**

Abelmoschus esculentus L. Syn. Hibiscus esculentus

## **Family:**

Malvaceae.

Bhendi is one of the popular vegetable in India. It is cultivated extensively all the year round for its immature fruits. Bhendi fruits are used as a vegetable. The stem of the plant is used for the extraction of the fiber.

## **Climate:**

Bhendi is a warm season vegetable crop and requires a long warm growing season. In India it is grown in summer months and during the rainy season. It is highly sensitive to frost. Seeds germinate poorly at ground temperature of 20 °C or less. The best germination takes place between 24°C to 30°C.

## **Soil and its Preparation:**

Bhendi can do well in all kinds of soil. But sandy loam and clay-loam soils rich in organic matter are best for its cultivation. The optimum pH range is between 6 and 6.8. The land is prepared by giving 5-6 ploughings. Cartloads of FYM or Compost should be incorporated during land preparation.

## **Sowing:**

Sowing of Okra is done by two methods :

1. Sowing on ridges
2. Flat sowing

### **1. Sowing on Ridges**

This method is particularly important for the early crop sown in February. The field is divided into plots and within each ridge is made 45 - 60cm apart. Seeds are dibbled 1cm below the soil surface keeping a distance of 15 - 30cm between hills.

### **2. Flat sowing**

This method is used for the later crop when the days are quite warm. Sowing is done in rows 45cm apart, with 30cm distance between two plants. The advantage of this method over ridge sowing is that it is less labour consuming.

## **Seed Rate & Sowing Time:**

For kharif season seeds are sown in the month of June - July. The seed rate for rainy season is 8 to 10 kg. For summer season it is sown in the month of January-February. The seed rate for summer season is 12 to 15 kg/ha. For winter season it is sown in August"- September.

In order to get good germination it is always advisable to soak the seed overnight before sowing. For early crop the soaked seeds may be kept covered at some warm place for sometime so that germination initiates there and slightly sprouted seeds can then be planted in the field. Seeds older than two years lose their viability and should be avoided.

## **Improved Varieties:**

Pusa Makhamali, Pusa sawani, Vaishali, Vagmi, pb. Padmini, Selection 2-2, Pusa sawani is fairly mosaic tolerant Parbhani Kranti (Resistant to virus disease).

### **1. Parbhani Kranti:**

It is yellow vein mosaic resistant variety released in 1985 by MAU, Parbhani- It is derived from back cross of *Abelmoschus manihot* x *A. esculentus*. Two back crosses were made using Pusa sawani (*A. esculentus*) as a recurrent parent followed by selection in the subsequent generations- It is a yellow vein mosaic virus (YVMV) resistant variety isolated in F8 generation. Plants flower in 45-60 days. Fruits are dark green in colour, smooth, lender and slender.(MAU, Parbhani)

### **2. Phule Kirti:**

It is the F1 hybrid of okra suitable for both the kharif and summer seasons. It is also suitable for warm and moderate humid regions. Stem is green in colour with red patches. Fruits are green in colour. It is resistant to yellow vein mosaic virus. Shelf life is 3-4 days. It gives on an average yield of 163 quintals per hectare. Besides it is released through the State Variety Release Committee of Maharashtra, it is also notified by the Central Sub Committee on Crop Standards, Notification and Varietal Release at the national level.(MPKV, Rahuri)

### **3.Punjab Padmini:**

Plants are tall and green with mils purple tinge on the stem and the leaf petioles. Leaves are dark green, deeply lobed and hairy. Fruits are quick growing, dark green smooth, thin, long, five ridged and retentive of tenderness. Fruits starts after 55-60 days after sowing in the spring crop. It has field resistance to yellow vein mosaic.

### **4.Pusa Sawani:**

This is an old variety of bhindi and has a wide popularity all over the country. It has been developed by I.A. R. I., New Delhi, and used to show field resistance to yellow vein mosaic. Fruits are five ribbed, dark-green in colour and free from bristles.

### **Manures & Fertilizers:**

20 to 25 tonnes well rotted FYM mixed with soil during field preparation. 50 kg each of  $P_2O_5$  AND  $K_2O$  per hectare incorporated in the soil at the time of final ploughing, 100 kg of nitrogen/ha is applied 1/3 as basal and the remaining 2/3 in two split doses at 30<sup>th</sup> and 45<sup>th</sup> day.

### **Interculture Operational:**

Weeding, thinning and earthing up is the important intercultural operations of bhendi. Earthing up in the rows should be done in rainy season crop. Application of herbicides for controlling weeds in bhendi is found effective. Basalin (Fluchoralin 48 per cent) @ 1-2 liter per hectare, and soil application of Tok-E-25 @ 5 liter per hectare effectively controlled the weeds.

### **Irrigation:**

Pre sowing irrigation should be given in the soils having no sufficient moisture. First irrigation is given just after sowing and then the field is irrigated after 4 to 5 days in summer and 10 to 12 days in winter season.

### **Harvesting:**

Flowering begins from 35 to 40 days after sowing and fruits are ready for harvest four to five days after flowering Bhendi pods may be harvested continuously at some intervals. The young fruits can be harvested in the morning. Delay in harvesting may make the fruits fibrous and they loose their tenderness and taste.

## Yield :

The yield vary from 5-6 tons/ha in summer to 8-10 tons/ha in rainy season. The average seed yield is 12q/ha.

## IPM in Bhendi

- Seed treatment with Thiram or Bavistin @ 3g/kg followed by 4g of *Tricoderma viridii*.
- Apply 100 kg/ha of Neem cake during last flowering.
- Keep yellow traps in the field @ 4/acre.
- Release Tricograma @ 20,000/acre 4 times at weekly intervals at the time of flowering.
- Don't spray insecticides during this time.
- Spray HNPV, SNPV @ 250 larval equalence/acre.
- Spray Phasolone or Fipronil or Dimethoate @ 2ml/lit to control sucking pests.
- Spray 1.5g/lit Acephate for the control of White flies.
- Spray Endosulphon 2ml or Carboryl 3g or Profenophos 2ml/lit.

## Plant Protection

### Pests

#### Shoot and fruit borer (*Earias vittella*, *E.insulana*)

The infected shoot and fruit is plugged with excreta.

#### Control

The affected shoots and fruits should be clipped along with the insect. Spray Quinalphos 2ml/lit or Carbaryl at 3 g/lit 2ml/lit. at 10 days interval. Before flowering spray Thaidocarb @ 1g/lit.

#### Jassids (*Sundapteryx biguttula*)

Bothe nymphs and adults suck the sap. Hopper burn symptom is noticed

#### Control

Spray Malathion 3ml/lit or Methyl Demeton or Dimethoate or Fipronil @ 2ml/lit.

**Red mites** It is a problem in summer crop. It affects the crop by sucking the sap.

#### Control

Spray Dicofol 2ml/lit or Wettable sulphur 3g/lit.

#### White Fly (*Bemisia tabaci*)

Suck sap from leaves and transmit yellow vein mosaic virus, particularly during summer. Losses may be even 80-90%.

#### Control

Spray twice Dimethoate @ 2ml/lit. at 10 days interval. In severe cases spray Acephate 1.5g/lit. and keep yellow traps in the field.

### **Diseases**

#### **Powdery mildew (*Erysia cichoracearum*)**

Greyish powdery growth on either side of leaves.

#### **Control**

Spray Wettable sulphur 3g/lit. or Dinocrab or Hexagonazole at 2ml/lit.

#### **Yellow Vein Mosaic or Vein clearing disease (Pallaku Tegulu)**

The disease is characterized by yellowing of veins and veinlets of the leaves. In severe infestations, the younger leaves turn yellow, become reduced in size and the plants are stunted. If the crop is affected at harvesting stage, the fruits become small and whitish in colour.

#### **Control**

Grow resistant varieties like Arka Anamika, Arka Abhay. Spray Dimethoate 2ml or Acephate @ 1.5g/lit. Sown the seeds before July 15<sup>th</sup> for rainy season crop.

#### **Wilt (*Fusarium vasinfectum*)**

- The conspicuous symptom is a typical wilt, beginning with a yellowing and stunting of the plant, followed by wilting and rolling of the leaves as if the roots were unable to supply sufficient water.
- Finally, the plant dies.
- If a diseased stem is split lengthwise, the vascular bundles appear as dark streaks.
- When severely infected, nearly the whole stem is blackend.
- The fungus has mostly three-septate spores.
- It is soil organism that enters the host through the roots and is disseminated in any way in which soil is transported from one field to another.
- Once the inoculum enters a field, it slowly increases until Okra crops become unprofitable.

#### **Control**

Seed treatment with Immidachloprid @ 5g/kg followed by 4g of *Tricoderma viridii*. Drench with Croper Oxychloride @ 3g/lit. near the base of the plant. Apply 100 kg/ha of Neem cake during last flowering. Follow crop protection.

## **13. Turmeric Cultivation**

### **Package of Practices for Cultivation of Turmeric**

**Botanical Name:** *Curcuma longa*  
**Family:** Zingiberaceae

**Origin:** South East Asian region (India)

### **Uses of Turmeric:**

1. Used as a conditioner.
2. Useful as a dye with varied uses in drug and cosmetic industries.
3. Used medicinally for external application and consumed as a stimulant.

### **Area and Production:**

India is the largest producer of turmeric with an annual production of 3.49 lakh tones (1991-92) and 4.35 lakh tones (96-97). The turmeric export stands at 18.95 thousand tones (92-93) and 25 M thousand tones (96-97). The major producing states are Tamil Nadu, A. P. and Orissa.

### **Soil:**

1. Different kinds of soils such as sandy loam to clay loam or alluvial soils are suitable. Well-drained loamy soils are the best.
2. Soil should be rich in organic matter and uniform in texture.
3. Rich loamy soils having natural drainage and irrigation facilities are the best.
4. Turmeric cannot withstand water stagnation or alkalinity.

### **Climate:**

1. Tropical crop, requiring warm and humid climate.
2. Temperature range-24°C to 28°C.
3. Growth ceases when temperature falls below 20°C, and hence early-planted turmeric gives good yield.
4. Thrives well in localities with annual rainfall from 70 - 225 cm.
5. Can be grown at an altitude of 1200 m.

### **Cultivation of Turmeric:**

#### **I) Seed Material:**

##### **a. Seed Selection:**

1. Seed of turmeric consists of rhizomes.
2. Both mother and finger rhizomes are used.
3. The fingers are cut into pieces, each 4-5 cm long with 1-2 buds. Mother rhizomes are planted as such or split into two, each having one sound bud.
4. Mother rhizomes are preferred since they give 50% more yields than the finger rhizome and also give good growth.
5. Large sized, plump and healthy mother rhizomes at least 100 g in weight should be used.

##### **b. Seed Rate:**

1. Varies according to type of planting material, spacing and weight of rhizomes.
2. Mother rhizomes: 2000-2500 kg/ha.
3. Finger rhizomes: 1500-2000 kg/ha.
4. For Maharashtra: 2250 kg/ha.
5. As an intercrop in fruit garden: 400 - 500 kg/ha.

##### **c. Seed Treatment:**

Rhizomes are treated with 50 Lindane powder and Bavistine (2 g/l) by dipping for 15-20 minutes for prevention of diseases and rhizome fly during early period.

#### **II) Preparation of Land:**

1. Starts immediately after harvest of previous crop or with/onset of early rains in plains.
2. Land is ploughed 15-20 cm deep and exposed to sun for one month. 2-3 crosswise harrowing are given.
3. Temporary ridges are opened to prevent soil erosion on slopy lands.

### III) Systems of Planting:

1. Flat Beds: Used under rainfed conditions where soils are light. Flat beds 1 m in width and-of suitable length varying according to the slope of land are prepared.
2. Ridges and Furrows: Under irrigated-conditions where the land is leveled or plain and soils are heavy, planting is clone on ridges and furrows, opened at 75 cm distance and having 3-3.5 m length. Broad ridges should having 90 -100 cm width and 3 - 6 m length depending on the slope.

### Planting of Ginger:

a) Season of Planting: May to July depending on tract. In Maharashtra, second forth night of May is the best time of planting rhizomes.

### Method of Planting:

- i) On Flat Beds: (25 x 2.5 cm) in each direction.
- ii) On ridges and furrows: 40-60 x 25 cm.

Rhizomes are planted at 1/3rd height of ridge on broad ridge.

### Manuring and Fertilization:

Turmeric is a heavy feeder crop. In Maharashtra, on the basis of experiments conducted at Turmeric Research Station, Digraj recommended fertilizer dose is; 25-31 ton FYM, 120 kg N, 50 kg P205 and 50 kg K20/ha.

### Time of Application:

Sr. No.	Time	Manure (tones/Ha)	N (kg/ha)	P (kg/ha)	K (Kg/ha)
1.	At preparatory tillage i.e. before last harrowing	30	-	-	-
2.	Basal application at planting	-	-	50	50
3.	One month form planting	-	60	-	-
4.	Two months from planting	-	60	-	-
	Total	30	120	50	50

### Intercropping:

Mixed crops like chilli, onion, brinjal and maize can be taken. In Maharashtra, it is recommended to grown French bean as an intercrop.

### Aftercare:

#### a) Mulching:

1. Done when-planted on raised beds
2. 2-3 mulching, are given
3. 1st immediately after planting
4. 2nd and 3rd at an interval of 40 - 50 days.

#### b) Earthing up:

1. To avoid exposure of developing underground rhizomes to sun due to soil erosion.
2. Done with light digging, 2 - 2.5 months after planting.

#### c) Weeding:

1. Pot is kept clean during first 4-6 weeks.
2. Depending on intensity of weeds, 5-6 weeding are given.

### **Irrigations:**

1. First irrigation is given before planting.
2. Second is given just after planting.
3. Subsequent irrigations are given at 7-10 days interval depending on soil.
4. A total of 20-25 irrigations are given, during the life period of the crop.

### **Harvesting:**

1. Starts from Feb. and continues till April.
2. Rhizomes are ready for harvest in 7-9 months after planting.
3. Longa type - 9 months, Amada type - 8 months and Aromatica type - 7 months.
4. State: Turmeric is harvested when leaves start yellowing and ultimately the stem dries down. The plants are cut close to the ground.
5. The crop is irrigated lightly for easy digging.
6. Harvesting consists of digging of underground clumps of rhizomes with Pick axe or digging fork.
7. Fingers are separated from mother rhizomes.

### **Yield:**

- \* 250-300 q/ha for fresh rhizomes.
- \* In Maharashtra the average yield is 225 g/ha.
- \* Cured Produce: 20-25 % of fresh rhizome by weight

### **Preservation of Seed:**

- \* Rhizomes for seed are heaped in the shade of trees or in well ventilated sheds and covered with turmeric leaves.
- \* Sometimes the heap is plastered over with earth mixed with cow dung.

### **Quality of Finger:**

1. Should be free from chemichrome
2. Extraneous matter should be less than 2 %

### **Quality of Powder:**

1. Chemichrome test should be negative
2. Total ash less than 9 %
3. Moisture less than 13 %

### **Turmeric Oil:**

A volatile oil is obtained by steam distillation of ground turmeric after 8-10 hours. The oil is pale yellow to orange yellow in colour. The aroma of oil is due to tumerone and artumerous.

Turmeric oleoresin is obtained by solvent extraction method and is highly valued.

## 14. Groundnut Cultivation

### Packages of practices for Groundnut

#### 1. Land Preparation

- a. Irrigation before sowing Rainfed
  - b. Tillage One deep ploughing by mould board plough followed by two shallow ploughings by Harrow ,cultivator or desi plough along with planking to level the land.
  - c. Soil treatment : treat the areas effected by termites with BHC or Aldrin dust.
2. Variety : Select the best variety suitable for the area
  3. Time of Sowing : June 15<sup>th</sup> to July 15<sup>th</sup>
  4. Seed Rate : 70 Kgs - 75 Kgs Per hectare  
90Kgs – 95 Kgs Per hectare
    - a. Spreading type
    - b. Bunch type
  5. Seed Treatment : Treat 2 Kgs Seed with the mixture of 20 gms of Thiram and 1.0 gms of Carbendazim 50% WP or 1 Kg of seed with 1.5 gms of Thiofenate.
    - a. Fungicide treatment.
    - b. Insecticide treatment : Treat 1 Kg of seed 3 -4 hours before sowing with 25 ml of chlorphy riphos 20 EC or Quinalphos 25 EC
    - c. Rhizobium treatment : Treat 10 Kgs of seed with  
  
1 packet of the recommended rhizobium culture.
  6. Sow the seed behind the plough in lines
  7. Fertilizers: Apply 20 kg Nitrogen + 30kgs phosphate + 45 kgs potash 2 -3 cms below the seed during sowing.
  8. Spacing :
    - a. Spreading type 45cms.
      - i) Row to row 20cms.
      - ii) Plant to plant
    - b. Bunch type
      - i) Row to row 15cms.
      - ii) Plant to Plant
  9. interculture : First Operation should be done 15 -20 days after sowing and the second operation second be done 30 -35 days after after sowing interculture should not be done at peg initiation stage.
    - a. Physical : done at peg intiation stage.
    - b. Chemical control : perndimethlin 30 EC 3.3 lit /ha Oxyphlorphen 23.5 EC 420 ml/ha Alachlor 50 EC 4 lit /ha Mix any of the above in 600 -800 liters of water and apply before germination about 3-4 days after sowing.
  10. Crop Protection : As Required.
  11. Irrigation : In case of no rains irrigate at the Peg development stage and pod formation stage.
  12. Harvest when the pod cover, (shell) becomes rough and hard, grain is pink in colour inner shell is reddish brown.

13. Remarks : I ) Apply 100kgs of gypsum + 4 kgs of Borax /ha about 3 weeks after sowing into the soil and mix 3 -4 cms deep into the soil.

ii) Do not harvest immature groundnuts

iii) To control whitegidar spray insecticides on the host plants.

## 15. Backyard Poultry

Backyard Poultry is an intervention with dual purpose improved birds, which can thrive well under poor feeding and management practices followed in village, can grow faster than indigenous birds and lay more eggs, thus leading to improvement in the livelihood security of the poor. Backyard Poultry requiring hardly any infrastructure set-up is a potent tool for upliftment of the poorest of the poor. Besides income generation, Rural backyard poultry provides nutrition supplementation in the form of valuable animal protein and empowers women. It has also been noticed that the demand for rural backyard poultry is quite high in Kankavali, Taluka of Sindhudurg. Backyard Poultry is to have a ready source of eggs and meat, or as a backyard help in pest control.

The Vanaraja and Gramapriya bird were identified for intervention, due to multiple colours, looks like ind The best poultry producers (having interest, skill and locally available indigenous resources to rear birds) within Woman of the adopted village interested in poultry production were identified as first line beneficiaries, who would initially receive assistance from IWMP project.

KVK organises several training and demonstration programmes on "Backyard Poultry Rearing" for farmers and farm women and the women, landless, farmers and others can be trained under KVK. The precautions to be taken of giving timely vaccination, treatment to the birds, the good quality and healthy birds will get good price in terms of meat and egg in the market, etc.

Before taking up backyard poultry activities each beneficiary has to build a semi- permanent house with rough pucca floor, two feet brick wall with wire net in uncovered upper portion of the poultry house.

## 16. Goat Rearing

Goat is a multi functional animal and plays a significant role in the economy and nutrition of landless, small and marginal farmers in the country. Goat rearing is an enterprise which has been practiced by a large section of population in rural areas. Goats can efficiently survive on available shrubs and trees in adverse harsh environment in low fertility lands where no other crop can be grown. In pastoral and agricultural subsistence societies in India, goats are kept as a source of additional income and as an insurance against disaster. Goats are also used in ceremonial feastings and for the payment of social dues. In addition to this, goat has religious and ritualistic importance in many societies. The advantages of goat rearing are :

i) The initial investment needed for Goat farming is low.

ii) Due to small body size and docile nature, housing requirements and managerial problems with goats are less.

iii) Goats are friendly animals and enjoy being with the people.

iv) Goats are prolific breeders and achieve sexual maturity at the age of 10-12 months gestation period in goats is short and at the age of 16-17 months it starts giving milk. Twinning is very common and triplets and quadruplets are rare.

v) In drought prone areas risk of goat farming is very much less as compared to other livestock species.

vi) Unlike large animals in commercial farm conditions both male and female goats have equal value.

vii) Goats are ideal for mixed species grazing. The animal can thrive well on wide variety of thorny bushes, weeds, crop residues, agricultural by-products unsuitable for human consumption.

viii) Under proper management, goats can improve and maintain grazing land and reduce bush encroachment (biological control) without causing harm to the environment.

ix) No religious taboo against goat slaughter and meat consumption prevalent in the country.

x) Slaughter and dressing operation and meat disposal can be carried without much environmental problems.

xi) The goat meat is more lean (low cholesterol) and relatively good for people who prefer low energy diet especially in summer and sometimes goat meat (chevon) is preferred over mutton because of its "chewability"

xii) Goat milk is easy to digest than cow milk because of small fat globules and is naturally homogenised. Goat milk is said to play a role in improving appetite and digestive efficiency. Goat milk is non allergic as compared to cow milk and it has anti-fungal and anti bacterial properties and can be used for treating urogenital diseases of fungal origin.

xiii) Goats are 2.5 times more economical than sheep on free range grazing under semi arid conditions.

xiv) Goat creates employment to the rural poor besides effectively utilising unpaid family labour. There is ample scope for establishing cottage industries based on goat meat and milk products and value addition to skin and fibre.

xv) Goat is termed as walking refrigerator for the storage of milk and can be milked number of times in a day.

### **Package of Common Management Practices Recommended for Goat rearing**

#### **I. Housing management:**

- 1) Construct shed on dry and properly raised ground.
- 2) Avoid water-logging, marshy areas.
- 3) In low lying and heavy rainfall areas the floors should be preferably elevated.
- 4) The shed should be 10 ft. high and should have good ventilation.
- 5) Bucks should be housed in individual pens.
- 6) Does can be housed in groups upto 60 per pen.
- 7) Provide proper shade and cool drinking water in summer.
- 8) Dispose of dung and urine properly.
- 9) Give adequate space for the animals. The housing space required for

#### **II. Selection of breeding stock and it's management:**

1. Immediately after release of the loan purchase the stock from a reliable breeders or from nearest livestock market.
2. Animals in good health and having good physical features must be purchased in consultation with Veterinarian/ Bank's technical officer.
3. Purchase animals which are ready to breed and in prime stage of production.
4. Identify the newly purchased animals by suitable identification mark.

5. Vaccinate the newly purchased animals against the diseases
6. Keep the newly purchased animals under observation for about 15 days and then mix with the general flock.
7. Unproductive animals should be culled promptly and should be replaced by the newly purchased animals or farm born one
8. Animals are to be bred at the interval of 8-9 months for maximum productivity.
9. Cull the old animals at the age of 6 years and above.
10. Avoid the kidding during peak periods of summer and winter.

### **III. Feeding management:**

1. Ensure Bushes/shrubs for browsing of animals
2. As an alternative to above, supply of cultivated fodder from own farm or from surrounding farms may be ensured.
3. Offer roughages adlib.
4. As a thumb rule 2/3rds of the energy requirements should be met through roughages. Half of the roughages should be leguminous green fodders and rest half should be grasses/tender tree leaves.
5. In the absence of good quality green fodders, concentrates must be considered to replace them.
6. Kids should be fed colostrum upto 5 days of age. Later on they can be put on Kid starter rations.
7. Green leguminous fodders should be offered adlib. to kids from 15 days onwards.
8. Provide salt and water to kids at all times
9. Additional concentrates should be given to bucks and does during breeding season.

### **IV. Protection against diseases:**

1. Be on the alert for signs of illness such as reduced feed intake, fever, abnormal discharge or unusual behaviour.
2. Consult the nearest veterinary aid centre for help if illness is suspected.
3. Protect the animals against common diseases.
4. In case of outbreak of contagious diseases, immediately segregate the sick animals from healthy one and take necessary disease control measures.
5. Deworm the animals regularly.
6. Examine the faeces of adult animals to detect eggs of internal parasites and treat the animals with suitable drugs.
7. Provide clean and uncontaminated feed and water for minimising the health disorders.

### **V. Breeding care:**

1. It should be planned to obtain 3 kiddings in 2 years period by adopting optimal management conditions.

2. For every 25 does one buck should be provided in one breeding season.
3. Breed the animals 12 hours after the onset of the first symptoms of heat for maximum conception.

#### **VI. Care during pregnancy:**

In advanced stage of pregnancy the does must be transferred to either kidding pens or separately earmarked space for kidding with in the main shed after thoroughly disinfecting it. After kidding, the does should be provided with warm bran mash for two days.

#### **VII. Care of kids:**

1. Take care of new born kids by providing guard rails.
2. Treat / disinfect the naval cord with tincture of iodine as soon as it is cut with a sharp knife.
3. Protect the kids from extreme weather conditions, particularly during the first two months.
4. Dehorn the kids during first two weeks of age
5. Male kids should be castrated for better quality meat production.
6. Vaccinate the kids as per the recommended schedule
7. Wean the kids at the age of 8 weeks
8. Proper selection of kids on the basis of initial body weight and weaning weight should be initiated by maintaining appropriate records for replacing the culled adult stock as breeders.
9. Additional feed requirements of lactating does must be ensured for proper nursing of all the piglets born.

## **Goat Farming**

Goats are among the main meat-producing animals in India, whose meat is one of the choicest meats and has huge domestic demand. Due to its good economic prospects, goat rearing under intensive and semi-intensive system for commercial production has been gaining momentum for the past couple of years. High demand for goat and its products with potential of good economic returns have been deriving many progressive farmers, businessmen, professionals to take up the goat enterprise on a commercial scale. The emerging favourable market conditions and easy accessibility to improved goat technologies are also catching the attention of entrepreneurs. A number of commercial goat farms have been established in different regions of the country.

### **OSMANABADI**

Distribution : The goats are mainly distributed at Latur, Tuljapur and Udgir taluks of Osmanabad district of Maharashtra.

Breed Characteristics

Size (Average)	Adult Male	Adult Female
Body weight (kg)	34	32
Body length (cm)	68	66
Chest girth (cm)	72	71



Features: The goats are large in size. Coat colour varies, but mostly it is black (73%) and the rest are white, brown or spotted. Ninety per cent males are horned; females may be horned or poled.

Performance: The breed is considered useful both for meat and milk. Average daily yield varies from 0.5 to 1.5 kg for a lactation length of about 4 months. The dressing percentage varies from 45 to 50. In favourable conditions the does will breed regularly twice a year and twinning is common.

- The farm will comprise of goats with previous track records (if & where possible) only so as to improve the genetic potential & optimize Productivity.
- It will be ensured that around 89% of the goats will always give kids.
- The Farm will initially hold 10 Goats of Good Breed and 1 Breeding Bucks.
- Feeding cost of Goats is taken @ Rs. 4–5 Per Day.
- Goat gives kids twice a year, gestation period of 150 Days.
- Under Stall Fed conditions the ratio of kids is 60% Twins, 38% Single and 2% Triple. Expenses on Vaccinations are Rs.15 a Year per Goat.
- Deworming the goats routinely.
- Use animal manure (day manure) to make vermin compost for additional income from this business. Use manure (night manure) to improve the soil of own farm for cultivation of green fodders.
- Suggested Green Fodders: CO3, CO4, Luzern, Bar seem, Stylo, Dashrath, Hybrid Napier, African Tall, Sorghum, Molato, Gini Grass, Subabul.
- Dry Fodder: Maize, Ground Nut etc.

## 17. Nagali Cultivation

Ragi / Nachni/ Naagli Papad 200g : Made of extremely nutritious Ragi. Having Nachni in your regular diet helps to improve your health, Specially the Bone Tissue of your body is strengthened with Ragi. Moreover, one just cannot neglect the extremely yummy tasty of these Ragi Papad  
Natural Nachni/Ragi Seed Extracts

We are engaged in the manufacturing and export of natural supplement produced by "Nachni", a popular variety of cereal very well known in regions of Maharashtra. Inhabitants of Maharashtra know this cereal with the name of "Ragi". All that includes calcium, iron, carbohydrates and ample of proteins.

### Cultivation

India is a major cultivator of finger millet with a total cultivated area of 15870 km<sup>2</sup>. The state of Karnataka is the leading producer of finger millet, known as Ragi in the region, accounting for 58% of India's Ragi production.

## 1.1 Storage



1.2 Once harvested, the seeds keep extremely well and are seldom attacked by insects or moulds. The long storage capacity makes finger millet an important crop in risk-avoidance strategies for poorer farming communities.

## 1.3 Preparation as food ( Papad )

In Konkan, Ragi flour is boiled in water and the resultant preparation, called Ragi Mudde is eaten with Sambar

We are counted as one of the prominent processors and suppliers of Nagli Papad (Ragi Papad). Processed using optimum quality ingredients, these products are free from contamination, mouth watering aroma and highly nutritious. We obtain our ingredients from the reputed and reliable in the vendors. Our products are processed in a hygienic and safe infrastructure unit. We mix all the ingredients and after mixing, these papads are rolled into papads and sun-dried. Furthermore, we offer these products in seal proof packaging to keep the nutritional value intact. We offer these products are at the most reasonable prices to our valuable client

1.4 Finger millet in its commonly consumed form as a porridge

1.5 In Maharashtra, bhakri (भाकरी in Marathi), a type of flat bread is prepared us

1.6 In Maharasta, finger millet is used as a medicine for women when they give birth.

1.7 In Konkan, it is called Nagali and is traditionally fed to women after child birth. In East parts of Maharashtra, pediatricians recommend finger-millet-based food for infants of six months and above because of its high nutritional content, especially Iron and calcium.

1.8 In India, Ragi recipes are hundreds in number and even common food stuffs such as dosa, idly and laddu are made out of ragi

## 18. Value Addition, Processing and Utilisation of Medicinal Plants – local health care & security

It is evident that the Indian Community have a tremendous passion for medicinal plants and use them for a wide range of health related applications from a common cold to memory improvement and treatment of poisonous snake bites to a cure for muscular dystrophy and the enhancement of body's general immunity. In the oral traditions local communities in every ecosystem from the trans Himalayas down to the coastal plains have discovered the medical uses of thousands of plants found locally in their ecosystem. India has one of the richest plant medical cultures in the world. It is a culture that is of tremendous contemporary relevance because it can on one hand ensure health security to millions of people and on the other hand it can provide new and safe herbal drugs. The medicinal plants found in part of Maharashtra and its uses are given below -

Sr No.	Scientific name	Marathi name	Sanskrit name	Other uses	Medicinal use	Method of use	Remark
1	<i>Acorus calamus</i>	Vekkhanda	Vacha, Ugragandha	Pesticide	Depression, mental ailments, as an insecticide, paediatric cough and colicky problems.	Fresh rhizome is crushed to express juice which is given as 1/2 tsf twice a day orally. Also powder made from dried rhizome is given as 1 tsf twice a day. It is best when administered with honey or warm water. In case of mental diseases it is given with ghee.	Home garden & cultivated
2	<i>Aerva lanata</i>	Karadu	Bhadra		Urinary tract disorders, urinary calculi, hyperglycaemia.	Root of this plant is dried and powdered. This powder is given internally 1 tsf thrice a day with water. This herb is described as "one of the best known remedies for bladder and kidney stones." Ayurvedic practitioners recommend a decoction of the plant to be taken internally for a few days to dissolve the stone and to clear the urinary path.	Weed
3	<i>Aloe vera</i>	Korphad	Kumari, Ghritakumari		Jaundice, menstrual disorders, skin diseases, scalp disorders, burns, haemorrhoids	For jaundice and menstrual disorders juice from the pulp of leaves is used as 1 tsf twice a day. For external use the juice from the pulp is applied on the given part.	Home garden & cultivated
4	<i>Alpinia galanga</i>	Kosta Kulinjan	Rasna, Sugandhamula	Condiment. Used in Thai cooking	Respiratory tract disorders, gastrointestinal tract disorders like indigestion, nausea, diarrhoea etc.	Powder made from dried roots is given as 1 tsf thrice a day for the given problems .	Available in forest

5	<i>Andrographis paniculata</i>	Kalmegh	Bhuinimbah, Kiratatiktah		Burning sensation, Intermittent fevers, malaria, intestinal worms and liver disorders.	The whole plant is dried and powdered and administered in a dose of 1 tsf thrice a day with honey or ginger juice .	Available in any area
6	<i>Asparagus racemosus</i>	Shatavari	Shatavari, Abhiru	Edible	Galactagogue, leucorrhoea, fatigue, abortions and general debility.	Shatavari kalpa made of root juice is given as 1-2 tsf with milk. Also powder can be given as 1 tsf twice a day.	Forest & cultivated
7	<i>Bacopa monnieri</i>	Brahmi	Brahmi, Sarasvati		Epilepsy, mental disorders, insomnia sterility and as a general tonic.	Fresh leaf juice is considered best and 1 tsf is taken internally thrice a day. If fresh leaf juice is not available, leaf powder is given as 1 tsf thrice a day with honey.	weed
8	<i>Basella alba</i>	Mayalu	Pothki	Vegetable	Used to treat Dysentery, Leprosy, Bilioussness	1/2 to 1 tsf leaf juice given internally 3 times a day.	Cultivated
9	<i>Boerhaavia diffusa</i>	Punarnava	Punarnava, Shophagni		Urinary tract disorders, urinary calculi, generalised oedema, cardiac problems	Roots are dried and powdered which is given as 1 tsf thrice day with warm water.	Available in forest & road side
10	<i>Caralluma fimbriata</i>	Makad shingi	Markatshringi	Edible	Abdominal pain, Digestion, Jaundice	1 tsf juice given 2 to 3 times a day.	Home garden & forest
11	<i>Celastrus paniculatus</i>	Mankanguni	Jyotishmati, Pitataila	Vegetable	Depressive disorders, arthritis	Seed powder is given internally in case of depression whereas oil from seed is used externally in case of arthritis.	
12	<i>Centella asiatica</i>	Mandukparni	Mandukparni, Manduki	Can be made into "Tumbli" to eat with rice.	Skin diseases, epilepsy, mental disorders, insomnia etc.	Fresh leaf juice is considered best and given as 1 tsf thrice a day. Also leaf powder is given as 1 tsf thrice a day with honey.	Weed
13	<i>Cissus quadrangularis</i>	Haadsandhi, Kaandvel		Also an interesting plant for rock gardens	For treatment of traumatic swelling	Fine paste of the stem is applied externally on the affected part.	Home garden & forest
14	<i>Cullen corylifolia</i>	Bawchi	Vakuci, Bakuci		Skin disease, leucoderma	1/2 tsf seed powder given 2 times a day	
15	<i>Curculigo orchoides</i>	Kali musali	Musali		General debility, tonic, aphrodisiac.	Roots are dried and powdered which is given as 1 tsf twice day with warm milk .	Forest

16	<i>Curcuma amada</i>	Ambehalad			Carminative, Stomachic. Also used to treat traumatic swelling.	Apply paste externally with warm water on affected part for traumatic swelling.	Forest & cultivated
17	<i>Curcuma longa</i>	Halad	Haridra, Varavarnini	Condiment	Appetizer, antiseptic, skin diseases, liver disorders, digestive disorders etc.	Rhizome of this plant are dried and powdered which is used as 1/2 tsf twice to thrice a day for the given problems. In case of skin diseases paste made from the rhizome is applied on the affected part.	
18	<i>Cynodon dactylon</i>	Durva	Niladurva, Durva		Bleeding disorders and Gynaecological disorders.	1 tsf of fresh leaf juice taken 3 times a day.	Any places
19	<i>Cymbopogon flexuosus</i>	Gavati chaha		For flavouring tea	Respiratory and digestive problems.	1/2 cup infusion of fresh/dried leaves taken internally 3 times a day for both conditions.	Cultivated & Home
20	<i>Cymbopogon nardus</i>	Citronella gavat		As a mosquito repellent	To keep away mosquitoes	Leaves crushed and rubbed on skin.	Cultivated
21	<i>Dioscorea alata</i>	Ghorkand	Alukam	Edible	General tonic, aphrodisiac	Cooked and eaten.	Home garden & forest
22	<i>Dioscorea bulbifera</i>	Karanda	Varahikand	Edible	General tonic, aphrodisiac, general weakness after fever.	Fresh root is chewed as a small piece at a time, also powder made from dried root can be given as 1 tsf thrice a day.	Home garden & forest
23	<i>Eclipta alba</i>	Maka	Bhringaraj, Tejarajah		Liver disorders, general tonic, greying of hairs, skin disorders.	Fresh, leaf juice is used to prepare maka oil which is used externally on greying of hairs, Dried leaves are powdered and powder is given as 1 tsf twice a day in other given problems.	Weed
24	<i>Ensete superbum</i>	Rankeli		Good ornamental plant	Kidney problems, difficulty in urination.	Pith of flowering shoot is eaten once or twice a day to induce urination and flush out toxins from the body.	Forest
25	<i>Gymnema sylvestre</i>	Bedki-chapala	Madhunashini, Mesashringi		Renal calculi, diabetes, oedema	Leaves are dried and powdered which is given as 1/2 tsf thrice a day.	
26	<i>Hemidesmus indicus</i>	Anantmul	Anantmulah, sariba	Flavouring tea	Skin diseases, asthma, general debility.	The roots are dried and powdered which is given as 1 tsf twice a day for the given disorders.	Available in forest

27	<i>Hibiscus rosa-sinensis</i>	Laal Jaswand	Japa, Ondrapushpi	Good ornamental plant	Gynaecological disorders, hair disorders, diarrhoea	Flowers of plant are dried and powdered and given as 1 tsf thrice a day with warm water. In case of hair disorder powder is applied externally.	Home garden & cultivated
28	<i>Hibiscus rosa-sinensis</i>	Pandhri Jaswand	Japa, Ondrapushpi	Good ornamental plant	Gynaecological disorders, hair disorders, diarrhoea.	Flowers of plant are dried and powdered and given as 1 tsf thrice a day with warm water .In case of hairs disorder powder is applied externally .	Home garden & cultivated
29	<i>Holostemma adakodien</i>		Jivanti	Edible flowers	General tonic, infertility, aphrodisiac	Root is powdered and given with milk as 1 tsf twice a day.	Forest
30	<i>Ipomoea mauritiana</i>	Bhui kohola	Ksiravidari	Good ornamental plant	General tonic, infertility, aphrodisiac	Root is powdered and given with milk as 1 tsf twice a day.	Home garden & cultivated
31	<i>Justicia adhatoda</i>	Adulsa	Vasa	Good hedge plant	Expectorant, general cough, menstrual disorders, colicky pain in abdomen.	Leaf juice is used as 2 tsf thrice a day for the given problems. Powder made from dried leaves are also used as 1 tsf thrice a day with warm water.	Home garden & cultivated
32	<i>Kalanchoe pinnata</i>	Panphuti	Parnabijah		Urinary tract disorders	1 tsf leaf juice taken 3 times a day	Home garden & cultivated and any places
33	<i>Lawsonia inermis</i>	Mendhi	Medhini, Madayantica, Nakharanjani	Hair dye	Greying of hairs, burning of extremities, menstrual disorders, diarrhoea, dysentery	Leaves are dried and powdered which is given as 1 tsf thrice a day. Externally fresh leaves juice is applied on the extremities.	Home garden & cultivated
34	<i>Lepidium sativum</i>	Ahliv	Asalika		Galactagogue, aphrodisiac, general nerve tonic.	Root of this plant is dried and powder is used on the given disorders as 1 tsf thrice a day.	Available in forest
35	<i>Mentha arvensis</i>	Pudhina	Pudina, Putiha	Condiment	Cough, asthma, bronchitis, halitosis (bad breath), cardio tonic, digestive	Leaves are dried and powdered which are given as 1/2 tsf twice a day with water. Fresh leaves are also boiled in water and vapours used for local fomentation.	Home garden & cultivated
36	<i>Mentha arvensis piperescens</i>	Japani Mint		Scented tea	The whole plant is anaesthetic, antiphlogistic, antispasmodic, antiseptic, aromatic, carminative, diaphoretic,	A tea made from the leaves has traditionally been used in the treatment of fevers, headaches, digestive disorders and various minor ailments. The crushed	Home garden & cultivated

					emmenagogue, galactofuge, refrigerant, stimulant and stomachic.	leaves can also be used as an inhalation with boiling water for congestion.	
37	<i>Mimosa pudica</i>	Lazalu	Lajjalu, Samanga		Haemorrhoids, dysentery, wounds, vaginopathy.	Leaf powder is given as 1 tsf twice a day. Leaf juice can also be given as 1 tsf thrice a day. In case of vaginopathy leaf juice is applied locally.	Weed & available anywhere
38	<i>Murraya koenigii</i>	Kadhipatta	Kalacakah, Kaidaryah	Condiment	Indigestion, nausea, vomiting, flatulence, diarrhoea, dysentery.	Leaves are chewed fresh to have the desired effect as 1-4 leaves at one time.	Home garden, cultivated & forest
39	<i>Ocimum basilicum</i>	Sabza	Barbari, Arjakah, Sitarjakah, Krsnarjakah	Condiment	Cough, asthma, bronchitis, halitosis, cardio tonic, digestive, urinary tract disorders	Fresh leaves are crushed and juice is used as 1 tsf with honey for respiratory problems, cough and fever. Seeds are made into powder and taken 1/2 tsf with milk in case of hyperacidity and urinary tract infections.	Home garden & cultivated
40	<i>Ocimum kilimandscharicum</i>	Kapur tulas		Ornamental	Asthma, joint pain	Fresh leaves are crushed and juice is used as 1 tsf with honey for respiratory problems. Juice can also be used externally for joint pain.	Home garden & cultivated
41	<i>Ocimum tenuiflorum</i>	Tulsi	Surasah, Tulasi	Flavouring tea	Cough, respiratory problems, fever, hyperacidity and urinary tract infections.	Fresh leaves are crushed and juice is used as 1 tsf with honey for respiratory problems, cough and fever. Seeds are made into powder and taken 1/2 tsf with milk in case of hyperacidity and urinary tract infections .	Home garden & cultivated
42	<i>Origanum marjorana</i>	Marva		Religious offerings	As an antiseptic, to ease colds, settle upset stomach and prevent sea sickness.	A tea made from the leaves helps soothe nerves and settle upset stomachs. A few drops of oil on the pillow will give a peaceful and sound sleep. Oil is also antiseptic.	Home garden & cultivated available in forest
43	<i>Phyllanthus amarus</i>	Bhui Awala	Bhuiamlaki		Jaundice, liver disorders	3 tsf juice of whole plant given once a day (in the morning on an empty stomach) for seven days for Jaundice.	Home garden & cultivated available in forest

44	<i>Piper betle</i>	Nagvel	Tambulavalli, Tambulah	Leaves chewed after meals.	For treatment of halitosis (bad breath), as an expectorant, laxative and for fever.	The most common form of use is that leaves are chewed fresh with some aromatic materials. In some cases, juice of leaves is used as 1 tsf twice a day.	Home garden & cultivated
45	<i>Piper longum</i>	Lendi pippali	Pippali, Magadhi		Respiratory tract disorders, anorexia, flatulent colic, tonic	Dried roots are used for abdominal pain and dyspepsia in powdered form 1/2 tsf twice a day. Dried fruits of this plant are used as tonic and for respiratory tract disorders. It is given as powdered fruits 1/2 tsf twice a day.	Home garden & cultivated available in forest
46	<i>Piper nigrum</i>	Kali miri		Condiment	Cough, cold, indigestion and gastric complaints.	1 tsf decoction of crushed fruit used internally.	Home garden & cultivated available in forest
47	<i>Plectranthus amboinicus</i>	Paan owa		Mixed with "Besan" and fried as Pakodas	For cough, sore throat, stomach cramps, indigestion, headache.	Chew a leaf for sore throat and coughs. Make a tea for bronchitis, asthma, coughs, viral conditions, to relieve indigestion and stomach cramps, convulsions, as a liver tonic and for pain relief. A leaf can be rubbed or laid on the forehead, to relieve headaches. A tea made from the fresh chopped leaf gives sound sleep.	Home garden & cultivated
48	<i>Pseudarthria viscida</i>		Salaparni		Joint pain	1 tsf root powder given 2 times a day	Available in forest
49	<i>Spilanthes acmella</i>	Akkalkara	Akarakarabha		Diarrhoea, dysentery, pharyngitis, angular stomatitis	Flower is chewed in case of pharyngitis and stomatitis whereas flower powder is taken internally in diarrhoea and dysentery.	Available in forest
50	<i>Tinospora cordifolia</i>	Gulvel	Gudichi, Amrta		Burning sensation of extremities, chronic fevers, skin diseases, jaundice and general debility.	Stem juice is the best to give as 1 tsf twice a day, powder of dried stem is also used as 1/2 tsf thrice a day. Starch made from the stem is also used as 1/4 tsf thrice a day.	Available in forest
51	<i>Vernonia cinerea</i>	Kadujira	Sahadevi		Worms, skin disease	1 tsf plant decoction given 2 to 3 times a day.	Available in forest
52	<i>Vetiveria zizanioides</i>	Khas / Wala gavat	Usirah, sevyah, Sugandhimulah	For cooling drink	Excessive thirst, urinary tract disorders, vomiting, skin diseases, mental anxiety	Roots are dried and powdered which is given as 1 tsf twice a day. Powder can also be applied externally in skin diseases.	Home garden

53	<i>Vitex negundo</i>	Nirgudi (3 varieties- Kali Nirgudi, Katri Nirgudi, Sadhi Nirgudi)	Nirgundi	Pest repellent	Arthritis, skin diseases, diarrhoea, paralysis, haemorrhoids	Leaf juice is used to make siddha oil which is applied externally on the affected parts. Also leaves are dried and powdered which is given as 1 tsf twice a day.	Available in forest and anywhere
54	<i>Zingiber officinale</i>	Suntha	Ardrakam	Condiment	Indigestion, constipation, fever, expectorant, cardiopathy and nausea	Rhizome of this plant is dried and powdered which can be given as 1/2 tsf twice day also fresh piece of rhizome can be chewed with salt and sugar. Ginger along with black and green pepper is a very good appetizer.	Home garden & cultivated