

Coffee



1. Introduction :

Coffee cultivated and processed in a sustainable and viable agro-ecosystem without using any synthetic chemicals is generally referred to as organic coffee. Further, it has to be certified to claim as organic. In high value plantation commodities like coffee, tea and spices there is a very good scope for switching over to organic farming. Because, many of these commodities are exported, it is possible to realise higher returns from unit quantity exported, when produced by organic means. Secondly, as these crops are generally grown in ecologically sensitive hilly tracts, adopting organic farming methods would entail not only protection of the environment but also in preventing contamination of rivers that originate from these hills.

2. International Scenario :

Organic coffee is being produced by about 20 countries in the world such as Bolivia, Brazil, Cameroon, Costa Rica, Colombia, Dominican Republic, East Timor, EL Salvador, Ethiopia, Guatemala, India, Indonesia, Madagascar, Mexico, Nicaragua, Papua New Guinea, Peru, Tanzania, Uganda and Vietnam, with the major production share coming from Mexico, Nicaragua, Brazil and Papua New Guinea. Recently many countries like India, Kenya, Uganda etc., have taken major initiatives in promoting organic coffee production for exports. Mexico is the largest producer of organic coffee in the world with one thirds of its total production being certified as organic. In this country, smallholder groups grow majority of organic coffee.

The largest groups have around 5000 members. It is roughly estimated that some 1,00,000 coffee producers are involved in organic coffee production. The first organic coffee cultivation was recorded at the Finca Irlanda in Chiapas, Mexico in 1967, and the first

organic coffee to be imported into Europe from small farmers Cooperative came from the UCIRI cooperative in Oaxaca, Mexico in 1985. Major consumers of organic coffee are USA, Japan and European countries. The estimated consumption of organic coffee in major consuming countries is estimated as 700, 000 bags (2004).

3. National Scenario :

The area, production and productivity of coffee in the country is to the tune of 343040 ha, 288000 t, 840 t/ha respectively during 2006-07. The state/region wise bearing area, production and productivity of coffee in the country during 2006-07 is given in Table 1.

States/ Region	Bearing Area (ha)			Production (t)			Productivity (Kg/ha)		
	Arabica	Robusta	Total	Arabica	Robusta	Total	Arabica	Robusta	Total
Traditional areas									
Karnataka	98673	106155	204828	73950	117625	191575	749	1108	935
Kerala	3622	80493	84115	1300	47700	49000	359	593	583
Tamilnadu	24588	5553	30141	14050	4050	18100	571	729	601
Sub total	126883	192201	319084	89300	169375	258675	704	881	811
Non - Traditional areas									
Orissa & Andhra Pradesh	17032	268	17300	3110	65	3175	183	243	184
N.E. Region	4439	1490	5929	90	60	150	20	40	25
Grand Total	148354	193959	342313	92500	169500	262000			

Source : Coffee Board

Even though 70% of the country's production is meant for exports, India's share in global market is hardly 4.04%. In the absence of assured quotas and with liberalization of market, there is an increasing need for production of high quality coffees, in order to make the Indian coffee competitive in the International trade. Some of the Indian specialities like Monsooned Malabar, Mysore

Nuggets EB and Robusta Kaapi Royale have already made their mark in the International market. Organic coffee, which fetches a premium in the world market, could be one of the India's best options for competing in the global market as well as for boosting the export earnings. Coffee cultivation in India offers a great scope for production of organic coffee, as the conditions are far more favourable than in any other coffee producing country.

4. Organic coffee production :

4.1 Selection of site

In choosing a site for a new plantation due consideration should be given to the altitude, aspect, rainfall, exposure to wind, slope of land, sources of water and approach etc. Arabica coffee grows well at an elevation of 1000-1500 m above MSL, while robusta coffee comes up well at lower altitudes of 500 -1000 m above MSL. Locations with gentle to moderate slopes covered with a good canopy of evergreen trees are to be preferred. Southern and western aspects should be avoided especially at lower elevations. In unavoidable circumstances, such areas should be provided with more shade to protect coffee from afternoon sun.

In wind prone areas, wind belts consisting of tall trees like silver oak, tree coffee etc. should be raised. The site selected for planting of organic coffee should be provided with appropriate isolation distance (it varies from 3-10 m) or buffer zone which is decided by the Inspector depending upon the probability of contamination from the conventional estates/ blocks, to prevent contamination with chemicals.

4.2 Varieties

The varieties selected for organic coffee production must be well adapted to local conditions and tolerant/resistant to pests/diseases. In case of Arabica, varieties with wider adaptability such as S.795, Sln.5-B,Sln.6 and Sln.9 may be preferred, while in case of robusta improved varieties like S.274 and CxR may be selected.

4.3 Raising a nursery

Seeds for raising nursery should be collected from organic estates/ blocks only. However, if not available, seeds from conventional

estates/ blocks not treated with any chemicals can be used. The organic nursery should be clearly separated from conventional nursery, if both the activities are carried out in the same estate.

4.4 Land preparation

Clean felling of trees is not advocated when land is prepared for planting coffee. Selective retention of evergreen trees providing filtered shade at a spacing of 9 - 12 m is desirable. The land should be divided into blocks of convenient size by laying out footpaths and roads in between. Uprooting and in situ burning should clear the ground level bushy growth. Land preparation should be completed well ahead of commencement of South - West monsoon (June).

4.5. Soil conservation

The loss of top soil is negligible when the land is covered by a two tier shade canopy comprising of lower tier of temporary shade trees like dadap (*Erythrina lithosperma*) and top canopy of permanent shade trees. The soil erosion attains serious dimension on steep slopes without proper shade coverage. In such fields, appropriate soil conservation measures like contour planting and terracing should be practiced.

4.6. Preparations for planting

4.6.1. Line marking

In each block, the spots for planting of coffee and shade trees should be marked at recommended spacing soon after land preparation. The following spacing is suggested for different coffee varieties.

- Arabica - (Tall varieties) - 1.8 x 1.8 m / 1.8 x 2.1 m / 2.1 x 2.1 m
- Robusta - S.274 - 3 x 3 m
- C x R - 2.4 x 2.4 m

4.6.2.Pits for planting

Pits of size 45 cm x 45 cm x 45 cm are to be opened during the months of April- May and exposed to sun for about a fortnight to kill soil pests like cockchafers (root grubs), nematodes etc. Later, they should be filled with top fertile soil and well-decomposed farmyard manure or compost (1-2 kg/ pit) prepared on the estate.

4.7. Planting of shade trees

It is advisable to plant temporary shade trees like dadap at closer spacing initially, for providing optimum shade to young coffee plants. In large open spaces, evergreen permanent shade trees such as *Ficus* sp., *Albizia* sp., *Artocarpus* etc. should be planted at suitable intervals. The recommended spacing for shade trees is as follows.

- Temporary shade trees – 4.5 - 6 m apart
- Permanent shade trees – 9 – 12 m apart

For planting shade trees, pits should be taken out during pre-monsoon period and filled with top soil after exposing for about a fortnight. Planting of shade trees should preferably be completed before the onset of South - West monsoon.

4.8. Planting of coffee

Planting of coffee seedlings should be taken up during August-September towards the end of heavy monsoon rains. At the time of planting, it is advisable to add about 50 g of rock phosphate to each pit, for encouraging root growth and better establishment of plants. In cockchafer infested fields, neem cake @ 250 g per pit is advocated.

4.9. After care of young plantations

During the year of planting, the following operations help in better establishment of coffee and shade plants. After planting, the coffee seedlings should be provided with staking and mulching to protect against wind damage and to conserve soil moisture for the ensuing dry period. Towards the commencement of dry period, erecting temporary shade huts with jungle tree twigs should protect the young plants in open area. Stems of young dadap plants should be coated with lime solution to prevent sun scorching.

4.10. Maintenance of new plantations

4.10.1. Green manuring for soil enrichment

In newly planted fields, green manure crops like cow pea and horse gram could be cultivated for two or three years to build up soil fertility. These crops should be grown during *kharif* season (June-September), so as to prevent competition for soil moisture. These green manure crops contribute around 6-10 t/ha of dry matter and also effectively suppress weed growth in the early years. As most of these crops are leguminous in nature, they fix nitrogen from atmosphere. The green manure crops should be cut before flowering and incorporated into soil to improve soil fertility.

4.10.2. Nutrition management

The following practices would be essential for meeting the nutrient requirement of young coffee holdings.

- Correction of soil pH using agricultural lime or dolomite, based on soil test values, at least once in 2-3 years.
- Application of farmyard manure or compost prepared on the farm @ 500 kg/acre per year.
- Deficiency in nutrient supply can be met by using other permitted products like rock phosphate, bone meal, wood ash etc.
- Use of bio-fertilizers may also be resorted to, in a restricted manner to improve nutrient use efficiency.

4.10.3. Weed control

Weeds pose a serious problem especially in new coffee clearings. Grasses need to be controlled in the initial years itself. The following measures are suggested for controlling weeds.

- In new clearings, cultural practices such as cover digging (30 cm deep) during the year of planting and scuffling (10 - 15 cm) for the next two to three years carried out during post-monsoon season, would not only bring down the weed growth but also help in conservation of soil moisture. However, in sloping terrain, avoid soil digging to prevent soil erosion. In such areas, adopt only slash weeding.
- Cultivation of green manure crops/ cover crops and mulching with weed slashings and shade tree leaf litter etc. would also help in smothering of weeds. Once the coffee bushes cover up, the weed growth would naturally get suppressed and manual slash weeding alone would be sufficient.

* Use of any kind of herbicides is strictly prohibited.

4.10.4. Plant training and pruning

The young coffee plants should be trained to provide proper shape to the bushes and to improve efficiency of operations like spraying, harvesting etc., at later stages. Generally, single stem system of training is recommended for coffee grown under shade. In this system, the plant height is restricted by topping (capping) at prescribed heights. The tall arabica varieties are topped at two stages (two-tier system) while the dwarf arabicas as well as the robustas are capped at single level (single tier system). The prescribed topping heights for different coffee varieties are:

- a. Tall arabicas - 1st topping at 0.75 m. 2nd topping at 1.35 - 1.50 m (second topping is done after harvesting 4-5 crops, when the spread of lower canopy is complete)
- b. Dwarf arabicas - Single topping at 0.9 – 1.5 m depending on soil fertility, wind proneness etc.
- c. Robustas - Single topping at 1.35 – 1.50 m. In topping operation, the terminal portion of main stem is decapitated at the prescribed height, by providing a slant cut.

In case of arabicas, one of the top most primary branches is also cut near to the base so as to prevent splitting of main stem due to crop load. After topping, all the new suckers produced on the main stem are to be removed periodically. Apart from periodic removal of suckers, the young plants require very little pruning.

4.10.5. Pest management

No serious pest attack is observed in young coffee plantations except for sporadic incidence of some foliar and soil borne pests. The damage by sucking pests like mealy bug, green scale and foliar pests like leaf miner and grasshoppers could be avoided by spraying neem kernel extract, other plant based extracts and other permitted products. Application of neem cake @ 250 g/plant can be effective against soil borne pests like cockchafers (root grubs) and nematodes.

4.10.6. Disease management

Young coffee plants are usually free from major diseases. However, in exposed areas, brown eye spot disease may cause defoliation. Providing adequate shade against exposure, mulching to conserve moisture and spraying with 1% Bordeaux mixture can take care of this minor disease.

4.11. Inter cropping

Cultivation of short duration vegetables and fruit crops like ginger, elephant foot yam, pineapple, banana, papaya etc can be adopted to augment income during the pre-bearing stage of coffee.

5. Post Harvest Management :

For processing of organic coffee at estate level, following guidelines may be adopted.

- In case of holdings having both conventional and organic farming activities, the processing, drying and storage facilities should be distinctly separate for each kind of coffee.
- Only mechanical and physical processes with natural fermentation should be adopted for processing. The by-products like coffee pulp, cherry husk should be recycled to the field after composting.
- When wet method of processing is followed, appropriate effluent treatment measures should be implemented as per the requirements of State Pollution Control Board regulations. The following steps are suggested for improving the processing quality of coffee by both wet and dry methods of processing.

5.1 Wet method of Processing

- Harvest only just ripe fruits for processing.
- Use mats during harvesting to prevent gleanings.
- Sort out over ripe and green fruits before pulping.
- Pulping should preferably be done soon after harvesting.
- Wherever possible follow natural fermentation and manual washing for removing mucilage.
- In case of shortage of fresh water, machine washing using aqua washers may be adopted.
- Use clean water for washing of parchment.
- Soaking of washed parchment under water for 4-6 hours would help in upgrading the quality of beans.
- Sort out unpulped fruits, fruit skin and other extraneous matter before drying of parchment.
- Drying of wet parchment initially on wire mesh trays for 1 to 2 days and then on tiled/concrete yards should be adopted for maintaining the quality.
- In small holdings where pucca drying yards are not available, polythene sheets or tarpaulins may be used for drying of coffee.
- Do not dry the coffee on mud/ cow dung plastered surfaces.
- Dry the parchment slowly by spreading upto desired thickness.

- Follow frequent raking of parchment to facilitate uniform drying.
- Cover the parchment during night hours to prevent rehydration.
- Dry parchment coffee upto a moisture level of 10.5% and pack in clean gunny.
- Do not store the parchment coffee for long duration at the estate level as it may lead to rehydration of parchment, which may encourage mould growth.

5.2 Dry method of processing

- Use mats during harvesting to prevent gleanings.
- Do not heap the fresh fruits before drying.
- Sort out the greens and over ripe fruits from the normal fruits and dry them separately.
- Do not dry the coffee on mud/ cow dung plastered surfaces.
- Dry the fruits on tiled or concrete yard upto a moisture level of 11.0% and pack them in clean gunny/IJIRA bags. Cherry coffee can be stored at estate level for upto three months without any perceptible decline in quality.
- In small holdings where pucca drying yards are not available, polythene sheets or tarpaulins may be used for drying of coffee.

6. Inspection and certification :

The following requirements must be fulfilled.

- The entire farm unit should be organic.
- At least once a year an inspection is made during the growing season. The visit may be unannounced to the producer. Producers are visited at random, determined by the inspector as agreed with the certification body. Inspection is done by field visits, by checking the organic growing techniques and by a check of the book keeping.
- As far as co-operatives of farmer's groups are concerned, an internal control system has to be established which is also checked at random.
- The conversion towards organic cultivation is planned by making a conversion plan (or project), which is presented to the certification body when applying for certification, or to the inspector upon the first visit. Qualification as organic depends on the fulfillment of this conversion plan.

- A contract has to be made between producer or producer organization and the certification body.
- A farm documentation with general data, a map of the farm and a list of registered fields must be made available.
- Book keeping has to include farm inputs, yields, flow of products in processing, storing, packing and sales.
- Samples may be taken for residue analysis.
- A detailed list of farm inputs has to be made available for approval by the certification body.
- At the beginning of the conversion, xi. social parameters like housing, food and hygienic conditions are inventoried and a plan for improvement is presented. These are implemented according to the time frame agreed upon.

7. Financial Aspects :

7.1 Unit Cost

Taking into account the general package of practices recommended for organic coffee the unit cost has been worked out and details are given in the Annexure–I (Arabica) and **Annexure VI** (Robusta). The Unit cost of organic coffee works out to Rs. 46700/acre and Rs. 39300/acre for arabica and robusta respectively and summary of the unit cost is given below:

Year	Unit cost (Rs./acre)	
	Arabica	Robusta
1	20500	15900
2	9800	8800
3	7000	5900
4	9400	8700
Total	46700	39300

7.2 Margin Money

The percentage of margin / down payment to investment cost prescribed is 5, 10 and 15% for small, medium and large farmers respectively. The rest of the investment cost will be provided as bank loan. Margin considered in the present model is 10%.

7.3 Bank Loan

Bank loan of 85 - 95 % shall be available from the financing institution. Bank loan considered in the model is 90%.

7.4 Interest Rate

The rate of interest to be charged to the ultimate borrower would be guided by RBI guidelines issued from time to time. However, the ultimate lending rate has been considered as 12 % for working out the bankability of the model scheme.

7.5 Security

Banks are guided by RBI guidelines issued from time to time in this regard.

7.6 Financial analysis

Detailed financial analysis is given in **Annexures I-IV** (Arabica) and **Annexures VI-IX**(Robusta). The project is found financially viable and bankable. The major financial indicators of the project are as under:

Type	NPW @ 15 % DF (Rs.)	BC Ratio @ 15 % DF	IRR(%)
Arabica	38640	1.57 : 1	28
Robusta	21347	1.38 : 1	23

7.7 Repayment schedule

Based on the cash flow the detailed repayment schedule has been worked out. The detailed repayment schedule is furnished in the Annexure –V (Arabica) and Annexure-X (Robusta). In the case of Arabica and Robusta Coffee, the repayment works out to 12 years including six years grace period. The interest during first five years to be deferred and collected during VI to XII year in Arabica coffee and VII to XII year in Robusta Coffee.

8. Conclusion :

Organic cultivation of coffee is a technically feasible, financially viable and bankable activity.

Reference: Package of practices for organic coffee by Coffee Board, GOI