Package of Practices for Organic Coffee

Central Coffee Research Institute
Coffee Research Station-577117
Chikmagalur District
Karnataka, INDIA

Published by
Dr. Jayarama, Director of Research, Central Coffee Research Institute

Prepared by

Dr. Y. Raghuramulu, Head, Division of Agronomy, Central Coffee Research Institute

S. Kamala Bai, Res. Asst., Division of Agronomy, Central Coffee Research Institute

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1. INTRODUCTION

1.1. World Sustainable Coffee Scenario

The coffee world has changed dramatically in the last decade and half. There is no doubt that coffee economy is suffering under structural conditions that are unsustainable. In this crucial situation, striking emergence of dynamic markets for sustainable coffees may firmly place the coffee industry at the forefront in developing innovative response relevant to the difficulties faced by the coffee growers world over. The types of coffees collectively that could be grouped under sustainable are organic, fair trade and eco - friendly coffees.

Sustainability means meeting the needs of the present without compromising the ability of future generations to meet their environment, social, and economic needs.

Organic coffee

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. 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, majority of organic coffee is grown by small holder groups. 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 Irelanda in Chiapas, Mexico in 1967, and the first organic coffee to be imported in to 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 (Appendix-I)

Fair Trade coffee

Fair Trade coffee is purchased directly from co-operatives of small farmers that are guaranteed a minimum pre – set contract price.

Eco - friendly or shade coffee

Eco - friendly or shade coffee is certified to be grown in shaded forest settings in a manner that is good for bio-diversity, bird habitat etc., Organizations like Rainforest Alliance and Smithsonian Migratory Bird Center are involved in certification of these coffees.

In recent times, the sustainable coffees have been receiving substantial remuneration in the global coffee market and it is likely to show significant growth. However, in the export market as well as the consumers often do not perceive different types of sustainable coffees as separate entities and they closely associate all these coffees without drawing any distinction. Among sustainable coffees, particularly organic and fair trades have accumulated credibility and goodwill among the consumers who prefer not to make a choice between them. At times, request made is to have double certified coffees with both certifications of organic and fair trade.

A brief look at the recent exports market potential, trends & premiums for the sustainable coffees in the Europe and Japan is as follows.

European market for sustainable coffees

In Europe, organic coffee constitutes the most significant component of overall sustainable market growth and has been estimated that it can grow more than 80% in volume between 1999-2004. The European sustainable coffee market is expected to grow from 55 % in 1999 to 65% by 2004. The increase in demand for these coffees in Europe is mainly due to wider social interests such as health, food safety, the environment and social accountability. During 2001, it was observed that Germany, Sweden and Denmark are top three consumers of organic coffee.

Germany is both the dominant coffee consumer in Europe and also the most important consumer of sustainable coffees. The Netherlands also has considerable sales and its company's play an important role in shipping the sustainable coffees to other European countries. The United Kingdom stands third in consuming these coffees. Sustainable coffees have the highest market share in Switzerland and Denmark and are also strong in Sweden, Finland and Norway, while in Italy and France the markets are growing. Japan has become the second largest consumer of organic coffees.

Sustainable Coffee in Belgium

Organic coffee was first introduced in Belgium in 1986-87, while fair trade in 1991. Among the sustainable coffees,

fair trade coffee constituted the largest segment with 730 tonnes, while organic coffee accounted for 495 tonnes including double certified coffees during 2001. The premium for organic green coffee ranged from US cents 18 to 30 per pound, while the fair-trade premium is around 70 cents per pound for milds (2002). Mexico and Peru are major suppliers of sustainable coffees, followed by Guatemala, Nicaragua and Costa Rica.

Sustainable coffee in Denmark

Denmark is known to have strong hold for sustainable coffee for long time. In its market of organic products, organic coffee got an early start followed by fair trade coffees and most of them are double certified. In 2001, the market for organic coffee reached about 2.9% and fair trade 1.7% and has been stabilized. Organic premium commonly ranged between US cents 15 to 21 per pound in 2002 with a low point of 10 cents and high point of 35 cents per pound. The Industry forecasts that there would be modest growth for organic coffee over the next few years, while fair trade and double certified coffees may decline for next few years. Mexico and Peru dominate as suppliers of these coffees, followed by Guatemala.

Sustainable coffee in Finland

Coffee is a National beverage in Finland. Fins have topped the world in consumption of coffee. The per capita consumption ranged between 11 to 12kg / year. The markets for organic and fair trade are at infant stage. In terms of volume, the Finnish population consumes the smaller amount of sustainable coffee of the European shares. Market for sustainable green coffees in 2001 constitutes 6 tonnes for double certified, 97 tonnes for organic coffee and 110 tonnes for fair trade coffees. The Finnish sustainable market represents a small percentage of only 0.4% in 2001 and 0.5% being projected in 2004. Organic coffee has a very small market share of 0.2% and fair trade has less. It is learnt that the premium in 2002 for organic and fair-trade coffees was reasonable and may not change for next few years. Mexico and Peru are the leading suppliers followed by Colombia and Guatemala.

Sustainable coffee in France

In 2001, the market for fair trade was measured at 1,185 tonnes which is equivalent to 0.35% of the market and nearly 38% of these fair trade coffees was certified as organic. The size of the organic coffee market is estimated at 850 tonnes or nearly 0.26% of the market and about 2 / 3rds of this coffee is also fair trade. Of the 2001 sales, 85% of the sustainable coffees are fair trade, 45% have organic certification and therefore 40 % are double certified. Fair trade sales are growing very strongly and its sales volume has more or less doubled ever since 1999. The prices for these sustainable coffees are about

15 to 20% higher than the conventional products. Double certified coffees are only approximately 25% more. It is believed that these premiums will not significantly diminish in the next few years. A considerable majority of the French coffee traders and roasters do not import sustainable coffees directly from producer countries. They have a history of sourcing their sustainable coffees via traders in other European countries like the Netherlands and Belgium.

Sustainable coffee in Germany

The market for coffee is believed to be unique for the presence of a considerable number of health concerns. With the outbreak of BSE (Bovine Spongiform Encephalopathy commonly known as mad cow disease) and foot and mouth disease "organic - conscious " arouse. In fact, Germany was one of the first countries, where organic coffees was introduced originally from Finca Irlanda in Mexico's Chiapas region. The German organic coffee market is estimated at 3900 tonnes in 2001, which is about the same size as the fair trade segment, and roughly equivalent to 0.7 % of the total market. The market for sustainable green coffees in 2001 was 1838 tonnes for organic, 2059 tonnes for fair trade and 2048 tonnes for double certified coffees. The premium quoted for organic coffees are 10 to 25 US cents per pound on green coffee with a median of 15 cents per pound and a high of 70 cents per pound. Regarding the fair trade premiums, all buyers follow official Fair Trade Label Organization (FLO) - regulations on prices, while some pay additional small premium on top of this. Mexico is the most popular origin for both organic and fair-trade coffee. Guatemala ranks second followed by Peru.

Sustainable coffee in Italy

The sustainable coffee market in Italy is very much in its infant stage. Organic coffee in Italy is known as "Caffe biologico" or "Caffe bio", while fair trade coffees is referred as "Caffe equo solidate". Both categories of these sustainable coffees have approximately the same size, while a significant portion is double certified. The share of sustainable coffees in the form of green during 2001 was 385 tonnes for organic, followed by 305 tonnes for fair trade. The retail prices for these sustainable coffees vary from US$ 10.20 to US$ 14.95 per kg for fair trade coffees and from US$12.20 to US$16.40 per kg organic coffees. Similar quality conventional coffee cost from US$9.00 to US$ 16.00 per kg, which shows that fair trade coffees start at about 15 % more than conventional coffee. Organic however starts at 35 percent more than conventional coffee.

The Italian market tends to source better quality robustas from Africa, South East Asia and Brazil. Fair trade and double certified coffees are being imported (in order of importance) from

Mexico, Nicaragua, Guatemala, Costa Rica, Dominican Republic, Honduras and Colombia. Organic coffees are being imported from Mexico, Guatemala, Bolivia, Peru, Indonesia, Sri Lanka, Thailand, Colombia, Brazil, Madagascar and Uganda.

Sustainable coffee in Netherlands

The Netherlands is one of the pioneering countries for fair trade coffee. Organic coffee was first introduced to the Netherlands 1985. The Dutch organic coffee market is estimated at 825 tonnes of green coffee in 2001 which corresponds to 0.6% of the total coffee market. About half of this is also fair trade certified i.e., double certified. The premium paid for organic is between US cents 15 to 35 per pound. The over all median value is 24 cents per pound. As for as the fair trade premiums are considered, the buyers follow the official Fair Trade Labeling Organization Regulations (FLO). Currently the fair trade premium is around US cents 70 per pound for mild coffees.

Mexico is the most popular supplier of sustainable coffees, followed very closely by Peru and Bolivia.

Sustainable coffee in Norway

Norway is small market (population 4.5 million), which has consumed about 40,000 tonnes of coffee in 2001. The sustainable coffees represented approximately 1.1% of total consumption, while organic coffee amounts to less than 0.5% of the total market in 2001. Premiums paid for organic green beans range from US cents 10 to 35 per pound, with 25 cents as median price. Fair trade buyers pay the minimum price defined in the Fair Trade Labeling Organization standards. In the current market, this represents approximately 50% more than conventional coffee.

The primary suppliers are Mexico, Peru, Guatemala, Brazil and Papua New Guinea.

Sustainable coffee in Sweden

Sweden is the leading Nordic coffee nation in terms of volume. Organic coffee dominates market with approximately 1500 tonnes of green coffees sold in 2001. Though fair trade started in the 1990, it is now growing at faster pace than organic coffees. Its volume was only slightly above 300 tonnes of green coffee in 2001, all of which was double certified. Sustainable coffees hold 1.9 per cent of the total market for coffee in Sweden. Organic coffees hold an equal share of 1.6 per cent of which 0.4 percent is also fair trade certified (double certified). The premium quoted for organic green beans range from a low of US cents 20 to a high of 80 cents per pound with an average of approximately 30 cents per pound. For fair trade coffees, standard minimum prices are paid as defined by Fair Trade Labeling Organization.

Peru is the dominant supplier of sustainable coffees, followed by Guatemala, Mexico, Bolivia, Costa Rica and Uganda.

Sustainable coffee in Switzerland

The sustainable coffee market in Switzerland has been particularly active and successful in the last decade. The total market share of sustainable coffee was at 2.8 per cent in 2001, one of the highest markets shares in Europe. Fair trade is by far dominant type in Switzerland. About $1/4^{th}$ of the sustainable coffees are certified organic. While nearly all of the organic coffees are fair trade certified. The retail prices for fair-trade is found to be 10 per cent more. Organic and double certified coffee ranged up to 25 percent more than conventional coffees.

The major suppliers of double certified, fair trade and organic coffees are Mexico, Colombia and Venezuela.

Sustainable coffee in United Kingdom

The U.K market is unique in the Western Europe for its predominance of instant coffee. The overall British market for sustainable coffee has increased rapidly from 1.0 per cent in 1999 to 1.7 per cent in 2001. During October 2002, organic bean premiums varied from a low of 10 US cents per pound to a high of 80 US cents per pound. The median premium was 15 cents per pound. Premium is often a respect of better quality. For fair trade coffee, all buyers pay at least the official Fair Trade Labeling organization (FLO) minimum prices. With current market prices, the FLO premium price is around 70 cents per pound for mild coffees.

Mexico, Peru and Colombia are the most popular suppliers of these coffees, followed by Uganda and Costa Rica.

Sustainable coffee in Japan

Japan is the largest Asian market for organic products and especially for coffee. During 1991, both organic and fair-trade coffees made a head way in the Japanese market. The volume of major sustainable coffee in the form of green during the year 2002 was 320 tonnes of fair trade coffee, 4550 tonnes of organic coffee and 102 tonnes of double certified coffee.

The premium paid by the Japanese traders is 20 percent or more for average to good quality organics and more if quality is exceptional. While for fair trade the premiums paid are uncomfortable.

To date Colombia, Brazil and Guatemala are largest organic suppliers to Japan.

Summary

Sustainable coffees collectively refer to organic, fair trade and Eco friendly coffees. These coffees are in dynamic continuum and can be perceived as an ongoing process rather than a static

achievement in the export market. These coffees not only provide direct economic benefit through premium price but also provide additional superior benefits that help producers improve their sustainability by providing distinct environment and social advantage at the producer level in the field. They include:

1. Improved natural resource management and biodiversity conservation.
2. Crop resilence to weather and climatic risk.
3. On- farm diversification and fewer external input costs reduce financial exposure.
4. Community or organizational development and increased use of rural labour
5. Fewer healths risks due to less or no use of agrochemicals.

The business for these coffees has recently grown quite robust at all levels of the supply chain. Sustainable coffees now involve 32 producer countries, many hundreds of producer organization, dozens of specialized traders, more than 20 consuming countries, hundreds of roasters and brand owners and thousands of retailers. In some countries between 10 and 20 percent of households are regular buyers of these coffees.

The marketing of coffees as sustainable is a relatively new idea for the coffee industry. For less than two decades they have been typically available in very small quantities from a handful of countries. In the past these coffees were inconsistent in both their quality and their availability. In the last few years this has begun to change dramatically and these coffees are now at crossroads with many opportunities in new, high volume distribution channels.

Reference:

Daniele Giovannucci and Freek Jan Koekoeck, 2003, The State of Sustainable Coffee: A Study of twelve major markets. Published by -Feriva.S.A Cali-Colombia, 199pp.

1.2. Organic Coffee Scenario in India

About the coffee industry

The coffee industry has a prime place among the plantation crops in India. At present, coffee is mainly cultivated in the traditional states of Karnataka, Kerala and Tamil Nadu and to a small extent in non-traditional areas such as Andhra Pradesh, Orissa, and seven North Eastern States. It is only in India that both the commercially important species viz., arabica and robusta are cultivated in almost equal proportions. At present (2005 - 06), arabica coffee is cultivated in an areas of 1. 70 lakh ha with a production of 1.03 lakh tonnes while robusta is grown in 1.85 lakh ha with a production of 1.72 lakh tonnes.

Indian coffee industry is characterised by marked cultural dualism between subsistence oriented small growers and market oriented large and corporate producers. Small growers with less than 10 ha land account for 98.4% of the 1,75,475 number of holdings covering approx. 71.84% of land under coffee and contribute around 60% towards the country's production. Indian coffee industry provides direct employment to nearly four lakh workers in the plantations, besides providing indirect employment to thousands of people in processing and trade. India exports nearly 70% of its coffee to destinations all over the world, and the remaining quantity is consumed in the domestic market. During 2005-06 India exported 1.57 lakh tonnes of coffee worth Rs.1147 crores.

Relevance of organic farming in coffee in India

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.

Scope for organic coffee production in India

Even though 70% of the country's production is meant for exports, India's share in global market is hardly 3.5%. 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 specialties 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. Some of the natural advantages in India are;

i) Coffee is mainly cultivated in deep fertile jungle soils under a two tier mixed shade canopy comprising of evergreen leguminous and non-leguminous shade trees. Growing under shade has several advantages. Shade trees provide a natural habitat for vast population of birds and natural enemies of insect pests / diseases, help in reducing the soil erosion, contribute towards the fertility of coffee soils by recycling nutrients from deep soil in the form of leaf litter and finally protect the coffee bushes from vagaries of changing weather conditions.

ii) Traditional farming practices such as use of cattle manure, composting, manual weeding etc., are in vogue in vast majority of small holdings.

iii) Availability of sufficient skilled manpower for labour intensive operations like manual weeding, shade regulation and soil conservation measures etc.

iv) The horticultural practices followed in Indian coffee plantations are considered as one of the best in the world, in which emphasis is mainly towards manipulation of microclimate and plant health, so as to reduce excessive dependence on agro-chemical inputs.

Apart from these natural advantages, the Indian coffee industry is characterised by predominantly small holdings. Majority of these small holdings especially in the Idukki zone of Kerala, Bodinayakanur zone of Tamil Nadu regions and all the tribal holdings in Andhra Pradesh and the North-Eastern states are basically organic by default. These small and tribal coffee growers do not use chemical fertilizers and plant protection chemicals due to their poor economic status and due to their belief in natural farming. Consequently the yields are low and are only at subsistence levels. Thus, there exists a good scope for converting these small and tribal holdings into certified organic without much change in the existing cultivation practices.

Characteristics of a typical organic farm

For production of organic coffees, a high level of technology is not required,

but a commitment to improve the cultivation and the ability to implement the system is necessary. In organic coffee estates, agronomic practices like soil conservation, composting, manual weeding, recycling of organic wastes, shade regulation etc., form the essential requirements, which demands greater amount of labour. As the demand for animal manure is high, appropriate measures like maintenance of pastures and sufficient live stock is essential which again demands more labour. Thus manual labour is an important investment in organic coffee estates. At the same time, it is important in case of big plantations to provide appropriate housing, food, education, transport and health facilities to the workers.

In a case study conducted in Mexico, it is reported that in Organic Coffee estates, 82% of total production costs are towards the labour as against 85% in case of traditional estates and 44% in case of intensively cultivated coffee estates. The net return for the organic farm is approximately 10 per cent lower compared to intensively cultivated estates and approximately 80 per cent higher than in traditional coffee growing.

Although there is a good potential for production of organic coffee in India, the concept is yet to catch up among the growers. This is basically due to several bottlenecks such as high cost involved in certification, long conversion period and lack of adequate marketing arrangements for organic coffees.

About The National Programme for Organic Production (NPOP)

To provide a focused on well and directed development of organic agriculture in the country, the Ministry of Commerce and Industry, Govt. of India launched the National Programme on Organic Production (NPOP) in the year 2000, which was formally notified in October 2001 under the Foreign Trade & Development Act (FTDA). The NPOP provides for an institutional mechanism for implementation of National Standards on Organic Production (NSOP) through a National Accreditation Policy and Programme. The aims of the NPOP include the following:

a) To provide the means of evaluation of certification programmes for organic agriculture and products as per approved criteria,

b) To accredit certification programmes,

c) To facilitate certification of organic products in conformity to the National Standards for organic production and

d) To encourage the development of organic farming and organic processing

The NPOP is implemented by Govt. of India through the Ministry of Commerce and Industry as the Apex

Body. The Ministry constituted a National Steering Committee on Organic Production (NSCOP) by drawing members from the Ministry of Agriculture, Ministry of Commerce & Industry, APEDA, Coffee Board, Tea Board, Spices Board and other Government and Private Organisations associated with organic movement. The National Steering Committee formulates the National Accreditation Policy and Programmes and draws up national standards for organic production as well as regulations for use of National Organic Certification Mark.

The National Steering Committee also acts as a National Accreditation Body (NAB) which will define the policy and programmes for the accreditation of certification bodies. A Technical Committee advises the NAB on periodical review of accreditation programme and organic standards. The work of the NAB includes;

i) Drawing up of procedures for evaluation and accreditation of certification programmes, and

ii) Accreditation of Inspection and Certification Agencies

An Evaluation Committee appointed by the National Accreditation Body is responsible for conducting the evaluation of Inspection and Certification Agencies. The Evaluation Committee submit its recommendations to the NAB for consideration of accreditation of the Inspection and certification Agencies. Based on the recommendations of the Evaluation Committee, the inspection and certification agencies will be accredited by NAB.

The National Programme for Organic Production (NPOP) of Govt. of India has been accorded the status of equivalence by the European Union for its Organic Regulation EC 2092/91 as well as by the United States Department of Agriculture for the National Organic Programme (NOP) of USA. The accredited inspection and certification agencies will be authorised to certify the organic status of the products and operations as per the National Standards of Organic Production (NSOP) as well as other International Standards like Regulation EC 2092/91 of the European Union and National Organic Programme (NOP) of USA etc.,

2. ESTABLISHMENT AND MAINTENANCE OF NEW ORGANIC COFFEE PLANTATIONS

While establishing new coffee plantations under organic production system, attention has to be paid to certain aspects so that the basic requirements of certified organic farming could be achieved. This chapter describes the steps involved in establishment of new plantations and their management under organic production systems.

2.1. 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 MSL, while robusta coffee comes up well at lower altitudes of 500 -1000 m 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. Incase unavoidable, 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 mts) 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.

2.2. Choice of 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 robustas improved varieties like S.274 and CxR may be selected.

2.3. 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.

2.4. Land preparation

Clean felling of trees is not advocated when land is prepared for planting coffee. Selective retention of evergreen trees providing filter shade at a spacing of 30-40 ft is desirable. The land should be divided into blocks of convenient size by laying out footpaths and roads in between. The ground level bushy growth should be cleared by uprooting and *in situ* burning. Land preparation should be completed well ahead of commencement of South - West monsoon (June).

2.5. 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.

2.6. Preparations for planting

2.6.1. 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) – 6'x6' / 6'x7' / 7'x7'

Robusta - S.274 - 10'x10'

\- CxR - 8'x8'

2.6.2. Pits for planting

Pits of size 45 cu. cm. (L x B x D) 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.

2.7. 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., *Albizzia* sp., *Artocarpus* etc. should be planted at suitable intervals. The recommended spacing for shade trees is as follows.

Temporary shade trees -15'-20' apart

Permanent shade trees -30'-40' 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 onset of South - West monsoon.

2.8. 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 50g of rock phosphate to each pit, for encouraging root growth and better establishment of plants. In cockchafer infested fields, neem cake @ 250g per pit is advocated.

2.9. 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, the young plants in open area should be protected by erecting temporary shade huts with jungle tree twigs.
* Stems of young dadap plants should be coated with lime solution to prevent sun scorching.

2.10. Maintenance of new plantations

2.10.1. 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 tonnes of dry matter/ha 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.

2.10.2. 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. (see Appendix II).
* Use of bio-fertilizers may also be resorted to, in a restricted manner, to improve nutrient use efficiency.

2.10.3. 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 (12 inches deep) during the year of planting and scuffling (4 to 6 inches) 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.

2.10.4. 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:

Tall arabicas	-	1st topping at 2.5 feet.
		2nd topping at 4.5 feet to 5 feet (second topping is done after harvesting 4-5 crops, when the spread of lower canopy is complete)
Dwarf arabicas	-	Single topping at 3 feet to 5 feet depending on soil fertility, wind proneness etc.
Robustas	-	Single topping at 4.5 feet to 5 feet

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.

2.10.5. 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 (see Appendix III).

Application of neem cake @ 250g/ plant can be effective against soil borne pests like cockchafers (root grubs) and nematodes.

2.10.6. 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.

2.11. 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.

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3. CONVERSION OF ESTABLISHED PLANTATIONS

When an existing coffee plantation is proposed for conversion to organic, it is essential to know about the consequences and requirements. Traditionally cultivated plantations with low to medium yield levels (i.e.,100-250kg/acre) can be easily brought under organic farming without any significant yield reduction. However, when the intensively managed estates with higher yield levels (i.e., above 500 kg/acre) are converted, there will be a substantial reduction in yield upto 30% in the first 3 to 4 years after conversion. However, if managed systematically these plantations would reach original high productivity levels within 6-7 years.

The requirements for conversion of existing plantations into organic holdings are as follows.

3.1. Conversion plan

- Preferably, the entire farm unit should be converted to organic in a phased manner and the operator (grower) should present a conversion plan to the certification body when applying for certification.
- In case of conversion of a portion of existing coffee plantation into organic, adequate buffer zone should be maintained between organic plots and conventional blocks, so to prevent contamination with chemicals. The buffer zone may vary from 3 to 10 meters depending upon slope, nature of adjoining blocks etc. The inspector visiting the farm would prescribe the suitable buffer zone based on site specifications.
- In case of small and marginal holdings, maintaining a buffer zone would be very difficult as it would drastically bring down the net area under organic cultivation. In view of this, a community approach is suggested for a group of contiguous farms forming a large belt or zone. The small growers within this large belt or zone may form a co-operative or a self-help group and adopt group certification to reduce cost of certification. Formation of groups would also facilitate for sharing of common processing and storage facilities.

3.2. Conversion period

- For existing plantations, a minimum period of three years is required as conversion period to

qualify for organic certification. During conversion period, the yield from such blocks could be labelled as "Organic - In conversion"

- For newly planted or replanted area, the first yield itself could be considered as organic, as the coffee has a pre-bearing period of 3-4 years.

3.3. Choice of varieties

The choice of selecting plant varieties does not arise incase of established plantations. However, it is advisable to replant blocks having susceptible plant material with recommended varieties in a phased manner during the conversion period. In case of arabica, varieties with wider adaptability such as S.795, Sln.5B, Sln.6 and Sln.9 may be preferred. In case of robusta, the need for replanting will not arise except in case of very old, senile plantations with very low productivity. However, the off-type robusta plants may be rejuvenated by top working with S.274 or CxR varieties to increase productivity.

3.4. Soil conservation measures

As coffee is usually grown in hilly slopes, there is a need to prevent the erosion of top fertile soil. In established plantations, opening of cradle pits (20 inches wide, 10-12 inches deep) across the slope in between the coffee rows in a staggered manner, would not only help in prevention of soil erosion but also in better harvesting of rain water and conservation of soil moisture for dry months. These pits also act as *in situ* compost pits for leaf litter, weed biomass and shade tree loppings. These pits are to be renovated every year just before the onset of South - West monsoon.

3.5. Shade management

Shade plays a vital role in maintaining the ecosystem and required micro-climate in coffee plantations. A two-tier mixed shade canopy consisting of a lower canopy of temporary shade trees like dadap (*Erythrina lithosperma*) and a top canopy of permanent shade trees belonging to *Ficus sps.* and *Albizzia sps*. is recommended for coffee. The optimum shade requirement would be 50% for arabica coffee and 30% for robusta coffee. By maintaining optimum shade, the incidence of pests such as white stem borer and green scale and diseases such as leaf rust and black rot could be brought down substantially in arabica coffee. Similarly, the shot hole borer incidence in robusta could be minimized by maintaining optimum shade.

Temporary shade plants like dadap should be lopped just before onset of South West monsoon to facilitate better light penetration and aeration during monsoon season. The newly sprouted branches should be thinned out towards the end of South West

monsoon to retain an umbrella shaped frame for providing shade during post-monsoon period. The canopy of permanent shade trees should be regulated once in two to three years to provide optimum shade.

3.6. Composting of on-farm organic wastes

The by-products of coffee processing namely coffee pulp and cherry husk are rated higher than cattle manure in terms of their manurial value and soil conditioning properties. It is estimated that for every tonne of clean coffee produced on the estate, around one tonne of dry pulp or cherry husk is produced. These by-products when composted and recycled would contribute approximately 17 kg of nitrogen, 1.0 kg of phosphorus, 52 kg of potassium, 1.0 kg of sulphur and 5.0 kg of magnesium. Thus the micronutrient requirement of coffee is also taken care of. The coffee processing by-products should be composted along with weed biomass, within the estate by following aerobic "Heap method" (see Appendix-VII).

3.7. Nutrition management

Regulations on organic production stipulate that the fertility and biological activity of the soil must be maintained or increased by using natural and as much as possible local resources and organic by-products.

In India, the coffee soils are fairly deep (0.7 - 4.6m), well drained, rich in organic matter content (1.64 to 2.81%) and medium in available 'P' and 'K' status. Also, the mixed canopy of shade trees contribute substantial amounts of leaf litter (ca. 10 tons/ha) every year, which not only contributes to the humus content of soil but also help in recycling of nutrients from deeper layers. The coffee soils are also rich in the beneficial soil microflora. These favourable conditions alone can support a sustainable crop level of 150 to 200 kg clean coffee/acre. However, in order to support regular crops, the following measures may be adopted.

- Correction of soil pH using agricultural lime or dolomite based on soil test values once in two to three years.
- Application of farmyard manure or compost prepared on the farm @ 1000 kg/acre per year in two splits.
- Deficiency in nutrient supply can be met out by application of permitted products like rock phosphate, bone meal, wood ash etc., (Appendix -II).
- Bio-fertilizers may also be used for improving the use efficiency of applied nutrients.

3.8. Weed management

Weeds should be controlled by manual (slashing) weeding or by

scuffling. However, in slopes only hand weeding should be followed. Mulching with weed slashings and shade tree leaf litter etc. would also be beneficial in suppressing the weed growth especially the grasses. Cultivation of cover crops like cowpea, horse gram etc., in vacant spots would help in suppression of weed growth also. Use of all kinds of herbicides is prohibited.

3.9. Pruning

Coffee being an evergreen plant requires regular annual pruning, in order to create a balance between the vegetative and cropping wood. The coffee plants trained on a capped single stem system require regular pruning once in a year especially in case of arabica coffee. Pruning should be done immediately after harvesting of the crop. Only in case of die- back affected bushes, pruning should be delayed till receipt of few showers and recovery of plants with new vegetative growth.

In pruning operation, the following criterion is recommended.

* Never cut primary branches to their base, as they can not regenerate and the lost primaries can not be replaced easily,
* The primary branches which have exhausted all cropping nodes, should be cut back by leaving some nodes from the base,
* Remove the secondaries and tertiaries, which have produced two to three crops to encourage new branches,
* Remove all the criss-cross branches, and those growing upwards (gormandisers), downwards and inwards towards main stem,
* Remove all the suckers,
* Remove all the diseased, damaged and lean and lanky branches.

In case of robusta, it has a self-pruning habit by shedding of laterals after 3 to 4 crops. Also, it exhibits more determined growth habit in which the production of secondaries and tertiaries are pre-determined. Hence, regular pruning is not required. However, removal of shot hole borer affected twigs, gormandisers, suckers etc. should be carried out three to four times a year. In irrigated fields, light pruning every year after harvest is suggested to regulate the cropping wood.

3.10. Handling, centering and desuckering

Handling is thinning out of young flush that arises after main pruning. Handling should be carried out at least once or twice in a year depending on the growth characteristics of varieties. The first round of handling is done during June-July and in case required a

second round during September. In handling operation the following criterion is suggested.

- Retain one healthy young flush on each side of the node on primary branch and remove the remaining flushes. In essence, each primary branch should have four to six secondaries.
- Remove all the new growth arising on primary branches within six inches radius of the main stem (centering), to allow aeration of the main stem,
- The suckers should be removed all the time, at least three to four times a year.

3.11. Crop protection

International regulations stipulate that pests and diseases should be primarily tackled by use of tolerant/ resistant cultivars; manipulation of microclimate through shade regulation and pruning etc.; use of eco-friendly approaches like biological control. Only in exceptional cases should other permitted compounds be used (see Appendix III). Some of the approaches for pest and disease management in organic coffee estates would be as follows;

3.11.1. White stem borer *(Xylotrechus quadripes)*

White stem borer is the most serious pest of arabica coffee in India. This pest is prevalent in all the arabica zones in the country and its effect is visible when the population build up reaches to high levels under favourable conditions.

However, the economic damage can be avoided by adopting following integrated measures viz., i) Maintenance of optimum shade; ii) tracing the infested plants prior to flight periods (i.e., in March and September) every year by looking for ridges on the main stem and thick primaries; rejuvenating the infested plants by collar pruning, if the infestation has not reached root zone; Uprooting and destruction of the infested plant, if the borer has entered the root system. The uprooted stems also could be immersed in water for about 10 days to kill the pest stages. Subsequently, such stumps could be used for fuel wood purposes on the estate. iii) Removing the loose scaly bark of the main stem and thick primaries of healthy plants using coir gloves or coconut husk during the beginning of the flight period i.e., by April and September will be beneficial in avoiding egg laying and also killing the first stage larvae. iv) Repeated sprays of neem oil on the main stem and thick primaries at higher concentrations (2-5%) at short intervals of 10-15 days during the flight period (April –May and October –December) is effective against the pest. v) Alternatively application of lime solution @ 10% on

the main stem and thick primaries during April and October is also effective. vi) Seedlings should be planted in place of uprooted plants in the same season to maintain the plant population and to avoid patch formation. vii) Planting of temporary shade trees like dadap should be taken up in exposed patches, if any, developed on the estate. All these measures should be adopted on a community approach within a village or zone for efficient control of this dreaded pest.

3.11.2. Coffee berry borer *(Hypothenemus hampei)*

This pest attacks berries of both arabica and robusta coffee. This pest could be effectively tackled by adopting the following integrated measures involving cultural, phytosanitary and biological measures.

Cultural Measures: Maintain optimum shade and good drainage; timely harvesting; thorough and clean harvest.

Phytosanitary measures: i) Use gunny bags / picking mats / polythene sheets on the ground while harvesting to minimise the gleanings. ii) Collect the gleanings and subject to hot water treatment(dipping for two minutes)if infestation is noticed. iii) If gleanings could not be collected, they may be swept along with the mulch and buried in the soil. iv) Ensure complete and timely harvest of all coffee from tree coffee species. v) Dry the coffee to the prescribed moisture level (arabica / robusta parchment 10% i.e., 15.5 kg / forlit, Arabica cherry 10.5% i.e., 16 kg / forlit and robusta cherry11% i.e., 18 kg / forlit) to avoid further spread of pest during storage. vi) Removal of off-season, infested and left over berries. vii) In drying yard, cover the harvested coffee heap with the oil smeared polythene sheet to trap the beetles. viii) Maintenance of trap plants around drying yard, followed by clean harvest from the trap plants and treating the berries in boiling water, to avoid further spread of pest.

Biological measures: Timely spray of entomopathogenic fungus *Beauveria bassiana* as bio-pesticide immediately after the cessation of monsoon when beetles are waiting near the navel region. The parasitoid, *Cephalonomia stephanoderis* could be released during the post harvest period to reduce the pest innoculum in any left over fruits.

Mass trapping: Installation of berry borer traps during the post harvest period (from February to May-June) to trap the adult beetles.

Fumigate the coffee during store and transport using permitted products (Appendix-III).

3.11.3. Shot hole borer *(Xylosandrus compactus)*

A major pest on robusta coffee. The incidence could be minimised by

providing optimum thin shade, good drainage, regular pruning and burning of affected twigs and suckers, especially during April- May and Sept. – December. Desuckering should be done regularly to avoid the establishment of the pest.

3.11.4. Mealy bugs *(Planococcus citri; P. lilacinus)*

Mealy bug is an endemic pest on both arabica and robusta. The pest incidence is generally seen in exposed areas and in irrigated blocks.

The pest can be effectively controlled by providing optimum shade and release of exotic parasitoid *Leptomastix dactylopii* as a biocontrol agent. Some times root mealy bugs may pose a problem in young coffee. Drenching the soil around the root zone with neem oil solution may be helpful to control root mealy bugs. Spraying neem oil (3%) emulsion will also be effective against mealybugs and other sucking pests.

3.11.5. Nematodes

Incidence of root lesion nematodes (*Pratylenchus coffeae*) is noticed only in certain endemic patches on arabica coffee.

The best way of tackling the nematode problem is by uprooting and burning the affected coffee plants, digging and exposing the uprooted patches to sunlight for one year before planting, planting of arabica grafted on to tolerant rootstocks like robusta, excelsa, abeokutae and arnoldiana and application of well decomposed farmyard manure or compost @2-3 kg / plant or neem cake @200-250g / plant.

3.11.6. Leaf rust *(Hemileia vastatrix)*

Coffee leaf rust, caused by *Hemileia vastatrix* is a major disease of arabica coffee with great economic significance. This disease could be effectively controlled by adopting integrated measures like maintaining optimum shade; judicious pruning and spraying of 0.5% Bordeaux mixture as pre-monsoon, mid-monsoon and post-monsoon applications. In die-back affected blocks, an additional spray of Bordeaux mixture during pre-blossom period may also be necessary.

3.11.7. Black rot *(Koleroga noxia)*

Black rot disease occurs only in endemic patches in valleys under thickly shaded conditions on both arabica and robusta during the rainy season. This disease can be effectively checked by adopting preventive measures like thinning out the shade, regular pruning, handling, centering (opening up the center of the bush) followed by prophylactic sprays with 1% Bordeaux mixture in the endemic blocks.

3.11.8. Root diseases

Four types of root diseases viz., Brown, Red, Black and Santavery root

disease occur in endemic patches only. Of these the first three diseases attack both arabica and robusta, while the latter is specific to arabica coffee only. Generally, the decaying stumps of shade trees harbour the disease causing pathogens, which later spread to nearby coffee bushes.

The following measures are suggested to prevent the spread of root diseases to neighbouring areas and to recover the infected areas.

* Uprooting of shade tree stumps after timber extraction
* Uprooting and burning of affected coffee bushes
* Making an isolation trench around the affected plants by including a ring of surrounding healthy plants
* Application of 1-2 kg of agricultural lime to the uprooted pit and exposing the spot for atleast six months before replanting.
* Application of 5 to10 kg/plant of well-decomposed farmyard manure/compost fortified with biocontrol agent *Trichoderma* to the surrounding healthy plants.

3.11.9 Coffee trunk Canker (Coffee stem disease)

The disease caused by fungus *Ceratocystis fimbriata,* was first noticed in endemic patches in North Coorg during the year 1996. The plants subjected to mechanical injury, made either during stem borer tracing or bark scrubbing, were most commonly affected by this disease. The symptoms include gradual yellowing of leaves, brown & black discoloration spreading both horizontally & vertically, on the bark of the affected plants, wilting of branches and finally leading to death of whole plants.

The following interim control measures may be followed to check the spread of the disease.

* Provide optimum shade
* Uproot and burn affected coffee plants
* The plants which are not affected from ground level may be collar pruned and rejuvenated. The cut surface should be treated with Bordeaux paste.
* In endemic areas avoid injury to the main stem while performing bark scrubbing, tracing for white stem borer, pruning, shade regulation etc.
* Uproot and burn the dead shade trees, which are affected by scolytid beetles (pinholes).
* As a prophylactic measure apply Bordeaux paste (75g, CuSO4 and 150g CaO (spray lime) in one litre

of water) to the cut ends and wounds.

3.12. Mixed cropping and diversified farming

Planting of compatible crops like pepper and orange in the coffee blocks at 20 feet -30 feet distance and associate crops like cardamom, arecanut etc., in valleys is a common feature among majority of coffee estates in India. Of late, high value crops like vanilla are gaining popularity in coffee areas. Under such a situation, due attention should be paid for cultivation of all such mixed crops in an organic way. The nutritional requirement of coffee and its' associate crops should be met by proper recycling of all the by-products available within the farm. For this purpose, all the produce from various crops should be processed within the farm and the crop residues should be recycled after composting, so as to minimise the net loss of nutrients from the farm.

It is also advisable to go for diversification, by maintaining subsidiary activities like apiculture, dairy farming etc. For maintaining dairy cattle, appropriate area should be demarcated for pastures especially in slopes and marginal lands, which are generally not very ideal for coffee. Similarly, areas unsuitable for coffee planting such as scrubby, rocky jungle may be left out undisturbed as a natural habitat for birds and natural enemies of pests.

This approach of mixed cropping and diversified farming not only enables additional income to the grower but also minimises economic losses associated with crop failures and market fluctuations.

4. HARVESTING AND PROCESSING

Organic coffee is a specialty coffee targeted especially for select consumers who are quality conscious. Hence, it is essential to adopt good agricultural and manufacturing practices to maintain quality standards at all levels. Despite practicing good cultivation practices, the quality of final produce may be adversely affected if proper care is not bestowed during processing stage.

4.1. Processing at estate level

Coffee fruits can be processed by wet method and dry/natural method. Generally, arabica is processed by wet method to obtain parchment/ plantation coffee while robusta is processed by dry method to obtain cherry coffee. The plantation coffee produced by wet method of processing is preferred in the export market. But, this method requires elaborate infrastructural facilities like pulpers, washers and pollution abatement systems. While, this method of processing may suit well for large holdings, the small coffee holdings may not be in a position to have all these facilities for economic reasons. In view of this, it is better for the small growers to organise themselves into co-operatives or self-help groups for establishing and sharing common processing and pollution abatement systems economically. This would also facilitate common inspection by the certifying agency.

For processing of organic coffee at estate level the 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.

4.1.1. 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 the parchment coffee upto a moisture level of 10.5% and then pack in clean gunny/ IJIRA bags.
* Do not store the parchment coffee for long duration at the estate level as it may lead to rehydration of parchment, which would encourage mould growth.

4.1.2. 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.

4.2. Processing at curing factories

Once the produce is dried at estate level, the same is cured at curing factories to obtain clean, marketable coffee. As far as possible, the curing factories should be separate for processing the organic coffee. In case such an exclusive arrangement is not possible, the processing of organic coffee should take place separately from the conventional coffees. The curing factories processing organic coffee should be certified by an accredited certifying agency. In the curing works, there should be a provision for separate drying, handling and storage of organic coffee. In case of small organic coffee producers, it would be worthwhile to have common curing and storage facilities of a smaller capacity, if they are interested in holding their coffee for better returns. This would also facilitate common inspection by the certifying agency.

5. STORAGE & TRANSPORT

Apart from cultivation and processing, the subsequent steps in the production chain like on - farm storage and transport, will have to be certified for qualifying as organic.

The following measures have to be followed to get the storage and transport sector to be certified as organic.

* New clean gunny bags / IJIRA bags should be used for packing/ storing green coffee both at estate and at curing factories.
* Contact of organic coffee with conventionally produced coffee must be completely avoided. In case where only part of estate is under organic, the organic coffee should be stored and handled separately from conventional coffee. In order to maintain the identity, the storage structures and transport containers should be clearly labelled for 'organic' and 'conventional' products.
* Spraying or fumigation with toxic agents is not permitted and special measures must be taken to prevent contact with areas where fumigation has taken place. However, storage structures and transport containers carrying organic coffee may be cleaned using methods and materials permitted in organic production.
* Adequate records are to be kept of incoming and out going coffee so that the entire product flow can be documented and accounted for.
* All the steps in production, processing, storage & transport chain should be documented and administered for easy trace back of the origin of the product and to ensure no contamination with conventional coffee has taken place.

Appendix- I

Table 1- Estimated consumption of organic coffee in 2002-03 in major consumer countries.

Country	consumption of organic coffee (in Bags)	Marketshare of organic coffee (%)
United States	200,000	1.1
Canada	27,000	1.1
Japan	33,000	0.5
Germany	110,000	1.2
France	49,000	0.9
Italy	48,000	0.9
United Kingdom	23,000	1.0
Denmark	22,000	2.8
Spain	22,000	2.8
Switzerland	18,000	2.3
Austria	15,000	2.0
Netherlands	15,000	0.8
Sweden	12,000	1.0
Finland	9,000	0.8
Belgium/Luxembourg	7,000	0.9
Norway	7,000	0.9
Other Europe*	33,000	0.4
Unspecified	20,000	-
Brazil	30,000	0.2
Total	700,000	-

** Including Eastern Europe*

Source- Coffee- An exporters guide-2002. Published by International Trade Centre UNCTAD/WTO, Geneva, 310pp.

Appendix- II

LIST OF PRODUCTS FOR USE IN FERTILISING AND SOIL CONDITIONING

In the organic agriculture maintenance of soil fertility may be achieved through recycling of organic material whose nutrients are made available to crops through the action of soil micro - organisms.

Many of these inputs are restricted for use in organic production. In this appendix “restricted” means that the conditions and the procedure for use shall be set by the certification programme. Factors such as contamination, risk of nutritional imbalances and depletion of natural resources shall be taken into consideration.

Matter produced on an organic farm unit	
• Farm yard & poultry manure, slurry, urine	Permitted
• Crop residues and green manure	Permitted
• Straw and other mulches	Permitted
Matter produced outside the organic farm unit	
• Blood meal, meat meal, bone meal and feather meal without preservatives	Restricted
• Compost made from any carbon based residues (animal excrement including poultry)	Restricted
• Farmyard manure, slurry, urine	Restricted preferably after control fermentation and / or appropriate dilution) "factory" farming sources not permitted.
• Fish and fish products without preservatives	Restricted
• Guano	Restricted

• Human excrement	Not allowed
• By-products from the food and textile industries of biodegradable material of microbial, plant or animal origin without any synthetic additives	Restricted
• Peat without synthetic additives (prohibited for soil conditioning)	Permitted
• Saw dust, wood shavings, wood provided it comes from untreated wood	Permitted
• Sea weed and sea weed products obtained by physical processes, extraction with water or aqueous acid and / or alkaline solution	Restricted
• Sewage sludge and urban composts from separated sources which are monitored for contamination	Restricted
• Straw	Restricted
• Vermicasts	Restricted
• Animal charcoal	Restricted
• Compost and spent mushroom and vermiculate substances.	Restricted
• Compost from organic house hold refuse	Restricted
• Compost from plant residues	Permitted
• By product from oil palm, coconut and cocoa (including empty fruit bunch, palm oil mill effluent (pome), cocoa peat and empty cocoa pods).	Restricted

• By products of industries processing ingredients from organic agriculture.	Restricted
Minerals	
• Basic slag	Restricted
• Calcareous and magnesium rock	Restricted
• Calcified sea weed	Permitted
• Calcium chloride	Permitted
• Calcium carbonate of network origin (chalk, limestone, gypsum and phosphate chalk)	Permitted
• Mineral potassium with low chlorine content (eg. Sulphate of potash, Kainite, sylvinite, patenkali)	Restricted
• Natural phosphates (eg. Rock phosphate)	Restricted
• Pulverised rock	Restricted
• Sodium chloride	Permitted
• Trace elements (Boron, Fe, Mn, Molybdenum, Zn)	Restricted
• Wood ash from untreated wood	Restricted
• Potassium sulphate	Restricted
• Magnesium sulphate (Epsom salt)	Permitted
• Gypsum (calcium sulphate)	Permitted
• Stillage and stillage extract	Permitted
• Aluminium calcium phosphate	Restricted
• Sulphur	Restricted

• Stone meal	Restricted
• Clay (bentonite, perlite, zeolite)	Permitted
Microbiological Preparations	
• Bacterial preparations (bio-fertilisers)	Permitted
• Biodynamic preparations	Permitted
• Plant preparations and botanical extracts	Permitted
• Vermiculate	Permitted
• Peat	Permitted

'Factory farming' refers to industrial management systems that are heavily reliant on veterinary and feed inputs not permitted in organic agriculture.

Appendix - III

LIST OF PRODUCTS FOR PLANT PEST AND DISEASE CONTROL

Certain products are allowed for use in organic agriculture for the control of pests and diseases in plant production. Many of these products are restricted for use in organic production. Such products should only be used when absolutely necessary and should be chosen taking environmental impact into consideration.

In this appendix "restricted" means that the conditions and the procedure for use shall be set by the certification programme.

I. Substance from plant and animal origin	
• *Azadiracta indica* [neem preparations(neem oil)]	Restricted
• Preparations of rotenone from *Derris elliptica, Lonchocarpus, Thephrosia* spp.	Restricted
• Gelatin	Permitted
• Propolis	Restricted
• Plant based extracts [e.g. neem, garlic, pongamia etc.,)	Permitted
• Preparations on basis of pyrethrins extracted from *Chrysanthemum cinerariaefolium*, containing possibly a synergist pyrethrum cinerafolium.	Restricted
• Preparations from Quassia amara	Restricted
• Release of parasites / predators of insect pests	Restricted
• Preparation from *Ryania* species	Restricted
• Tobacco tea	Not allowed
• Lecithin	Restricted

• Casein `	Permitted
• Sea weeds, sea weed meal, sea weed extracts, sea salt and salty water	Restricted
• Extract from mushroom (Shitake fungus)	Permitted
• Extract from Chlorella	Permitted
• Fermented product from Aspergillus	Restricted
• Natural acids (vinegar)	Restricted
II. Minerals	
• Chloride of lime/ soda	Restricted
• Clay (e.g. bentonite, perlite, vermiculite, zeolite)	Permitted
• Copper salts / inorganic salts (Bordeaux mix, copper hydroxide, copper oxychloride) used as a fungicide, maximum 8 kg per ha per year depending upon the crop and under the supervision of inspection and certification agency.	Restricted
• Mineral powders (stone meal, silicates)	Not allowed
• Diatomaceous earth	Restricted
• Light mineral oils	Restricted
• Permanganate of potash	Restricted
• Lime sulphur (calcium polysulphide)	Restricted
• Silicates (sodium silicate, quartz)	Restricted
• Sodium bi carbonate	Permitted
• Sulphur (as a fungicide , acaricide, repellent)	Restricted

III. Microorganisms / Biocontrol agents	
• Viral preparations (e.g. Granulosis viruses, Nuclear polyhydrosis viruses etc.)	Permitted
• Fungal Preparations (e.g., Trichoderma species etc.)	Permitted
• Bacterial Preparations (e.g., Bacillus species etc.)	Permitted
• Parasites, predators and sterilised insects	Permitted
IV. Others	
• Carbon dioxide and nitrogen gas	Restricted
• Soft soap (potassium soap)	Permitted
• Ethyl alcohol	Not allowed
• Homeopathic and Ayurvedic preparations	Permitted
• Herbal and Biodynamic preparations	Permitted
V. Traps	
• Physical methods (e.g., Chromatic traps, mechanical traps, light traps, sticky traps and pheromones)	Permitted
• Mulches , nets	Permitted

BIODYNAMIC MANURE PREPARATIONS

1. BIODYNAMIC PREPARATION 500 (Cow Horn Manure)

This preparation is made from fresh cow dung of lactating cow. The dung is packed in the cow horns and is buried in the soil during autumn and winter months. The cow horns can be procured from slaughter houses or from bone meal centers. Only cow horns have to be used. These horns are identified by being solid at the top and have characteristic lactating rings at the base. The dung inside the horn undergoes a breakdown process due to various microbial activities during the autumn and winter months. The horns containing dung are dug out in the spring (Feb-March). The dung gets totally transformed into sweet smelling humus. Soon after removing the manure from the horn, it must be protected from drying out by storing in suitable glass or ceramic vessel or mud pot covered by wet peat or sphagnum moss.

Application Rate:

One set (35g) of preparation 500 in 13.5 litres of water for 0.4 ha (one acre) is the standard recommendation.

Stirring:

The recommended amount of preparation 500 (35g in 13.5 litres of water/0.4 ha) is stirred in a bucket of capacity 15 litres. For larger area sufficiently large barrels have to be used.

Stirring is done with the help of a wooden stick, which is sufficiently long enough. The preparation 500 is put into the recommended quantity of water and is stirred in one direction until a funnel (vortex) is created in water reaching the bottom of the container. Once such vortex is obtained, the direction is abruptly changed. Again a funnel (vortex) is created and the direction of the vortex is changed again and so on. Likewise stirring is carried out for one hour.

Method of Preparation:

The solution after one hour stirring is highly energized and is sprayed on to the field with a knapsack sprayer or by hand application using a brush or a broom.

For small areas, hand application of preparation 500 with the help of a whiskbroom or hearth brush is a simple and an efficient method. Drop the

brush into the stirred preparation 500 and spread the liquid using an action similar to a backhand tennis stroke with an upward movement as one walks along. This will spread large droplets over a width of about 9.14 meters.

Time of Application:

The best time to spray biodynamic preparation 500 is during evening hours when the moon is in a descending period according to the biodynamic planting calendar.

Benefits of Preparation 500 Spray:

i) Increases earthworm and microbial activity in soil.

ii) Develops a deeper rooting system.

iii) Increases availability of insoluble minerals.

iv) Improves soil structure and moisture holding capacity.

v) Increase in plant quality.

2. BIODYNAMIC PREPARATION 501 (Horn Silica)

This preparation is made from ground quartz crystals. The quartz is powdered by crushing it with a pounding stone, a mortar and pestle and finely ground in between glass plates. The quartz powder should be of talcum powder consistency. The powder is made into a slurry by adding water and packed into the horns and buried during the spring and summer months (March-April). The horns are dug out of the ground in Sep-Oct. and stored in transparent glass containers near window sil.

Application Rate:

One set (one gram) of preparation 501 in 13.5 litres of water for 0.4 ha (one acre) is the standard recommendation.

Stirring:

The recommended amount of preparation 501 (one gram in 13.5 litres of water per 0.4 ha) is stirred in a bucket of capacity 15 litres. For larger area sufficiently large barrels has to be used.

Stirring is done with the help of a wooden stick, which is sufficiently long enough. The preparation 501 is put into the recommended quantity of water and is stirred in one direction until a funnel (vortex) is created in water reaching the bottom of the container. Once such vortex is obtained, the direction is abruptly changed. Again a funnel (vortex) is created and the direction of the vortex is changed again and so on. Likewise, stirring is carried out for one hour. The solution is sprayed above the crop (at least one-foot above) in a gentle mist by turning the sprayer nozzle upwards.

Time of Spray:

The optimum time for the spray is during the early morning hours, when

moon is in opposition to Saturn or during the ascending period of the moon, according to the biodynamic planting calendar. Never spray during hot sunshine hours. It causes shock to the plants and detrimental to crop growth. Hence, spray during the faint sunshine hours in early morning.

Benefits of Preparation 501 Spray:

i) Application of this preparation enhances the sunlight and photosynthetic processes resulting in increased bulk of growth when applied to young plants and hastens maturity when sprayed later in the plants' development.

ii) Improves the nutritional quality.

iii) An increased resistance to a wide range of plant diseases.

3. LIQUID MANURES

Liquid manures are fermented products obtained by active fermentation of plant or animal residues with the aid of biodynamic preparations. These are of two types:

a. Plant based liquid manures :

These are prepared from green plants, tree leaves and tender stems of plants.

- Green manure plants like *Sunhemp, Daincha, Sesbania, Erythrina* etc. and other leguminous plants can be used.
- Leaves from *Neem, Pongamia, Subabool* and leaves of other local medicinal trees.
- Tender stems of *Lantana, Calotropis* and local plants
- Weeds such as *Parthenium, Stinging nettle* and other local weeds before flowering.

A mixture of different plants results in a good quality liquid manure.

b. Animal based liquid manures :

They comprise of cattle dung, sheep and goat droppings, chicken manure, fish manure etc.

Method of Preparation :

The basic principle is to allow the materials to ferment over a certain period.

1. A non-corrosive drum of capacity of 200 litres or more of food or water storage grade plastic is taken.
2. Based on availability of plant materials or animal residues, they are chosen.
3. The plant materials are shredded properly and put into the drum occupying approximately 1/3rd the area. This would be about 10-15 kg of materials or more depending on the type of plant/animal residues.
4. The drum is filled with good quality of water up to the brim.

5. One set of biodynamic preparations 502-507 is added.

6. Every week the mixture has to be stirred with a long stick to aid fermentation and extensive stabilization of odour.

7. In a month the liquid manure is ready for use.

Application:

The liquid manure has to be diluted with water prior to application. The rule of thumb is diluting one part of liquid manure to ten parts of water.

Advantages:

1. Act as tonic or stimulant to plants.

2. Can be used as insecticide and fungicide when Neem, Vitex, Calotropis, Stinging nettle are used as raw materials for liquid manures.

3. Improves the nutrient utilization.

4. COW PAT PIT (CPP) MANURE PREPARATION

The manure from the cow pat pit is a useful vehicle or medium for spreading the influence of the compost preparations 502-507 over a large area of farmland, orchard or garden.

Method of Preparation:

Materials required:

1. Cow dung – 60 kg of fresh cow dung is collected from a lactating cow, which is fed with good quality fodder.

2. Crushed egg shells 100g as a calcium source.

3. Borewell soil/ Basalt rock/ Blue granite dust 100g as they contain silicon dioxide ($Si0_2$) and minerals.

4. 2 sets (2g each) of biodynamic preparations 502-506 and 20 ml of (4%) solution of preparation 507.

Method:

1. Dig a pit and line the four sides of the pit with baked bricks. The size of the pit with baked bricks lining should be 3 feet x 2 feet x 1 feet (0.9 m x 0.6 m x 0.3 m) dimension. The bottom of the pit should not be lined.

2. A site with good drainage and not prone to dry out should be chosen. A vegetable garden is ideal.

3. Sprinkle water to turn the cow dung into dough like consistency.

4. The above mentioned minerals and crushed eggshells are sprinkled over the cow dung.

5. The brick lining is moistened with water before placing the dung mixture.

6. Mix the dung for 10-15 minutes and place it in the pit to a height of 15 cm. The dung should not be tightly packed.

7. Insert two sets preparations 502-506 by making holes over the dung layer. Two sets of preparation 507 (20 ml of 4% solution) is stirred for 15 minutes in 2 litres of water and sprinkled over the cow dung from the top.
8. Place a wet jute sack over the cow pat pit to maintain moisture. The pit should be in a well shaded and aerated area.
9. After one month the manure is gently aerated with a garden fork for uniform mixing.
10. Cow Pat Pit (CPP), manure matures in 2-3 months.

Storage:

The Cow Pat Pit manure is stored in earthen pot placed in a dark room. Avoid the cow pat pit from drying.

Application:

Cow Pat Pit manure can be applied along with preparation 500. It requires 15 minutes of stirring. The common practice is after 45 minutes of stirring of preparation 500 add 1 kg of CPP (per acre) to the solution and stir both 500 and CPP for another 15 minutes. The spray solution is then sprayed.

Benefits:

1. Fastest way to get the influence of all preparations to the soil.
2. An array of beneficial microbes build up which reduce many plant diseases.
3. Provides nutrients and stimulates plant growth.

PREPARATIONS FOR PEST AND DISEASE MANAGEMENT IN ORGANIC COFFEE

1. BORDEAUX MIXTURE (0.5%)

Dissolve 1 kg. Copper sulphate in 5 l. of water. In another vessel slake 1 kg of spray lime by adding small quantity of water preferably warm water. If lime is not fresh, use around 1.50 kg of lime. When slaking is over add 5 l. of water and stir well to get a uniform suspension of lime. Take 190 l. of water in a barrel and add 5 l. of lime solution followed by 5 l. of copper sulphate solution by constant stirring with a wooden stirrer. The resultant sky blue coloured mixture is the 0.5% Bordeaux mixture having a pH range between 9 and 10.

Important points

1. For dissolving copper sulphate or preparing Bordeaux mixture use copper, wooden or earthenware or plastic pots or drums.
2. Use fresh quick lime.
3. Bordeaux mixture should be filtered using a sieve before pouring to the spray mixture vessel.
4. Bordeaux mixture should be used on the same day of preparation.
5. For spraying against Black rot disease, use 1% Bordeaux mixture, which can be prepared using 2 kg Cu SO_4 and 2 kg spray lime per barrel of water.

2. PLANT BASED PEST CONTROL PREPARATIONS

2.1. Neem products

Farmers in India are aware of the insecticidal properties of neem (*Azadirachta indica* and *Melia azadirachta*) even before the invention of chemical pesticides. Neem leaves and seeds contain azadirachitin, miliantriol etc., having insecticidal properties. These constituents are more in seeds (in the oil) than in other parts. Various products with insecticidal activities are prepared using neem tree parts and seeds.

2.1.1. Neem decoction

For preparing one litre of decoction 20 g kernel is required. This can be obtained from 30g dried seed. Well-crushed kernels are tied in a cotton cloth and kept soaked in water for about 6-10 hours. After soaking the bundle is to be taken out and pressed to get the extract. The extract first coming out will resemble rice water mixed with turmeric powder. The process is repeated many times till the colour of extract is clear. The extract thus prepared can be sprayed on plants as insecticide.

2.1.2. Neem oil

Neem oil mixed with any non-ionic wetting agent like Tween-80, Teepol etc. can also be used as a good insecticide. For preparing one litre of solution 20 ml neem oil is required. Take the required quantity of neem oil in a vessel containing water and wetting agent and mix thoroughly till a complete suspension is obtained.

2.1.3. Neem cake

Neem cake can be used for controlling nematodes and cockchafers. At the time of planting, apply 250g neem cake into the pits.

2.1.4. Neem leaf decoction

This can be prepared by boiling 100g neem leaves in 5 l. of water. The decoction after cooling can be sprayed as insecticide.

2.1.5. Neem seed kernel extract

Neem seed kernel extract can also be used against foliar pests. Soak 1 kg of neem seed kernel in 5 l. of water for about 12 hours. The final volume can be made up to 20 l. by adding water before use. Add any non-ionic wetting agent like Tween 80 or Teepol.

2.2. *Acorus calamus*

Rhizomes of this plant contain calamus, which has insecticidal properties. Saponins and tannins are the main active principles. Pest control formulations are obtained by drying and powdering the rhizomes and making an aqueous extract in solvents such as petroleum ether or kerosene or ethyl ether. The rhizomes that are cut into small round slices and dried can be kept with stored products (1:100) to ward off storage pests.

2.3. Rotenone

The roots of *Derris elliptica* a leguminous plant, contain 4-11% Rotenone. The roots can be used either by drying and powdering or by mixing with water. The spray liquid should contain 0.002% to 0.004% active ingredient. It is useful against sucking pests, caterpillars and some beetles. It acts as a contact and stomach poison.

2.4. *Annona squamosa*

The leaves and seeds of this plant contain linoclain and anonaine having insecticidal properties. They are stable and have a long storage period. The seeds are to be dried, powdered and made into a solution by mixing with water or alcohol for application. It is useful against shoot borer, fruit borer, sucking pests, scale insects, hoppers.

2.5. *Lantana camara*

The flavanoids, triterpenoids and alkaloids such as lantanine are the substances having insecticidal action. The leaves and flowers after drying can be extracted using acetone or methanol and used to control many insects including aphids.

2.6. *Ocimum basilicum*

The plant contains alkaloids in stems, roots and leaves. The plant parts can be dried and alkaloids extracted using water, ethanol or acetone. It is useful to control flies, mosquitoes and nematodes.

2.7. *Pyrethrum*

It is extracted from the dried flowers of *Crysanthemum cinerariafolium*. Pyrethrum or pyrethroids is a mixture of six different substances. Since they do not have much persistence they get degraded fast and the insecticidal property diminishes. The main active principle is the alkaloid stachydrine.

It has the ability to paralyse pests when it comes into contact. Pyrethrum can be effectively used to control bugs, ants, flies, cockroaches, mosquitoes, sucking pests like hoppers, thrips, scale insects, mealy bugs etc. It is also useful against storage pests.

2.8. Artemisia extract

Collect Artemisia plants before flowering and cut the leaves and stems into small pieces. Take one kg of cut leaves and stems in a bucket, pour 10 litres of water and keep for 16-24 hours till fermentation starts. Then filter through muslin cloth or suitable sieves and get the clear liquid. This liquid may be sprayed against common insect pests.

2.9. Garlic or Onion extract

Make a paste of garlic or onion and mix 100g of paste in 0.5 l. hot water (not boiling temperature) and keep for 3 hours. Filter to get the clear liquid and spray against fungal diseases.

2.10. Garlic-chilli extract

Cut 2 – 5 kg green chilli into small pieces and soak in 3 – 8 l. of water for 12 hours. Also soak 0.5 to 1 kg garlic in 100 to 200 ml kerosene for the same time. Filter both these solutions and mix with 100g soap powder. It can be either sprayed immediately after diluting with water or stored for 3 to 4 days by mixing with cow urine.

2.11. Red chilli powder

Mix 250 –500g chilli powder in 40 to 60 l. water and use against aphids.

3. ANIMAL BASED PEST CONTROL PREPARATIONS

3.1. Collect cow urine in iron container and ferment for one week. Then add 6 times water, filter and spray for repelling insect pests.

3.2. Adathoda leaves, neem leaves and leaves of *Euphorbia* sp. are soaked in cow urine for three days. The leaves are crushed and the clear liquid is taken out after a while. It is diluted with water 20 times and sprayed against common insect pests.

BIOLOGICAL CONTROL AGENTS FOR PEST/ DISEASE CONTROL IN ORGANIC COFFEE ESTATES

1. PREDATORS AND PARASITES OF MEALY BUGS

Biological control of coffee mealy bugs (*Planococcus* sp.) is practiced using two introduced natural enemies viz., predatory lady bird beetle (*Cryptolaemus montrouzeri*) and the parasitoid *Leptomastix dactylopii*. Both these can be easily multiplied at field level using mealy bugs grown on pumpkins as feed. For this purpose wooden cages of size 30x30x30 cm with sliding glass door on one side, cloth covering on the remaining three sides and zinc sheet at the bottom are used. Cloth sleeves are provided on either sides of the cage to handle the multiplied predators/ parasites. The cages are arranged in a room where temperature is maintained at 28$\pm$ 1^{0}C.

Mass production of parasites/ predators

1. Select ripe, medium sized pumpkins, wash them in water and rinse with 0.1% Bavistin 50 WP solution (1g/l) and allow for surface drying.
2. Transfer few adults or egg masses of mealybug (*P. citri*) onto the pumpkins using a camel hair brush.
3. Keep the pumpkins in wooden cages in the culture room. The mealybugs multiply and cover the entire pumpkin in about a month period.
4. At this stage, release around 200 adults of parasitoid *L. dactylopii* or 10 pairs of predator *C. montrouzeri* into each cage.
5. The progeny of the parasitoid will start emerging after about two weeks and the predator after about a month.
6. Collect the parasitoid by introducing an aspirator into the cage through sleeve and transfer them into plastic jars having a wire mesh window on the lid.
7. The predators can be collected by using small plastic tubes and later transferred to plastic jars.
8. In the collection jars small paper strips or wood shavings are placed for mobility of the predators/ parasites. A little cotton soaked in diluted honey is placed inside the jars as a feed for parasites/ predators.
9. The jars prepared as above can be transported long distances.

Field release of parasitoids/ predators

1. The parasites / predators should be released onto the mealybug infested plants preferably during evening hours.

2. The parasitoid *L. dactylopii* is specific to *P. citri* species of mealybug and the predator *C. montrouzeri* is effective on other species of mealybug.

3. In case of parasitoids, about 17,500-25,000 numbers should be released initially and followed by augmentation with 5,000-7,500 numbers during subsequent years.

4. In case of predators, around 10,000 to 15,000 beetles should be released for effective control.

5. Apart from direct release into the field, the parasites could be released in branches covered with cloth @ 25 branches / ha with a population of 100 predators per branch.

2. Beauveria bassiana
AGAINST COFFEE BERRY BORER

Beauveria bassiana is a fungal pathogen of the dreaded pest Coffee Berry Borer. It is commonly used as one of the components in the integrated management of coffee berry borer in many countries. In India, this fungus has shown promising results under field conditions, with a success rate of 15-50% depending on the weather conditions and timing of spray. This fungus can be easily mass multiplied under field conditions.

Mass culturing of *Beauveria bassiana*

1. Soak rice in water for one hour and drain out excess water for two hours.

2. Take 300g of this medium in polypropylene bags of size 14"x10" and plug the mouth of the bag with a little non-absorbant cotton, using a rubber band.

3. Sterilise the bags with medium in a pressure cooker / autoclave for 30 min. at 15 psi and allow them to cool.

4. Take 50g of one month old stock culture of *B. bassiana* and dilute in 500 ml sterilised water containing 0.5ml of wetting agent and 250mg of tetracycline.

5. Strain the suspension into a sterilised bottle using a sterilised muslin cloth.

6. Inject 20ml of the suspension into each bag using a sterilised syringe, seal the hole with a cello tape and mix the contents well for uniform distribution of spores.

7. The fungus culture will be ready for use in about three weeks. A white powdery mass in abundance shows good growth and spore production.

Method of application

1. Mix 500 ml of groundnut oil with 500 ml of any wetting agent thoroughly. Add this emulsion to 200 l of water and mix well.

2. Take 1kg of medium containing *B. bassiana* culture and mix thoroughly in small quantity of water containing emulsion and strain through muslin cloth. Repeat this step for 3-4 times to extract maximum number of fungal spores into the solution.

3. Add the spore suspension to the remaining quantity of water and mix thoroughly.

4. This solution should be sprayed on to the berries during Aug.-Sept. when the relative humidity is high and when beetles are waiting near the navel region.

3. TRICHODERMA FOR CONTROL OF ROOT DISEASES

Trichoderma sp. is a beneficial fungus, which shows antagonistic action against soil borne pathogens and has the ability to suppress the activities of these pathogens. The mode of action may be antagonistic (competition), antibiotic (viridin) or mycoparasitic (through enzyme action). Two species viz., *Trichoderma viride* or *T. harzianum* can be mass multiplied in carrier media such as cow dung, coffee husk, tea waste, neem cake, coir pith compost etc., for 30 to 45 days before application.

Method of application

1. Laboratory and preliminary field trials have indicated the effectiveness of *Trichoderma* against brown, red and Santavery root diseases in coffee.

2. *Trichoderma* should be applied twice during a year to the affected plants once during April-May and again during Sept.-Oct. when there is adequate moisture in the soil.

3. Mix 500g of *Trichoderma* inoculam thoroughly with 30 kg well decomposed farmyard manure and keep it covered for about a week period in shade.

4. Apply 3kg of mixture to each root disease affected bush and the surrounding healthy plants in a circular band of 15-20cm around the main stem, by incorporating into the soil to a depth of 3-4 cm.

5. *Trichoderma* should preferably be applied after correcting the soil pH by lime application.

6. Do not use fungicides for drenching the soil when *Trichoderma is applied.*

DIFFERENT METHODS OF COMPOSTING

A) COMPOSTING OF COFFEE WASTES

In Coffee plantations, various bio-degradable farm wastes are available in the form of shade tree leaf litter, prunings, weed biomass and coffee processing wastes like coffee pulp and cherry husk. It is estimated that shade trees alone contribute about 4 tonnes of bio-mass per acre every year. Besides this, for every tonne of clean coffee processed, one tonne of fruit skin or cherry husk are produced. But in nature all the available biomass is not effectively recycled and there will be slow decomposition and loss of nutrients. Composting is an effective means of recycling the available farm wastes for obtaining high value organic compost in coffee plantations.

Composting is a process wherein larger particles are broken down into smaller ones by the action of soil micro and macro fauna. The end product, which is friable, is called compost. The compost produced on the farm would be useful in minimizing the dosage of chemical fertilizers used for coffee. Besides, the application of compost has several advantages such as improvement in soil texture and structure; minimizing soil erosion by binding soil particles; increasing water holding capacity of soils; providing ideal environment for growth of beneficial microorganisms in the soil and increasing the use efficiency of applied nutrients.

Methods of composting

Different methods of composting like aerobic (heap method), anaerobic (pit method) and vermicomposting can be followed. The aerobic method (heap method) is simple and efficient for composting of organic material available at farm level.

Material required for composting

Any biodegradable farm wastes could be composted. However, for effective composting and also for obtaining good quality compost different raw materials are required as indicated below.

- *Farm wastes*: Any farm wastes like cherry husk, coffee pulp and other crop residues like straw etc. would form the basic raw material for compost preparation.
- *Animal wastes*: Cattle shed wastes containing dung and urine, goat droppings, piggery and poultry wastes.
- *Green material*: Any green plant material (preferably of legumes) like leaves, shade tree loppings, weed biomass etc.

Selection of site

It is better to take up composting under shelter of trees to prevent drying of heaps and to preserve moisture. Avoid low lying areas prone to water logging conditions. There should be enough space so that turning may be done conveniently.

Size of compost heap

The compost heaps should essentially have one-and-half to two meters width and about one to one and half meters height. They can of any convenient length depending upon the availability of raw materials.

Preparation of the material

Although many materials can be used directly, some may need pre-treatment before composting, as given below.

- Material containing high moisture content (eg. Coffee pulp) should be allowed to wither a little.
- Rough and coarse materials such as stalks of maize, cotton, millets, etc. should be broken or chopped before use. The best way to break these materials is to spread them over cattle shed. It will also help in collecting the urine and dung properly.
- Dry woody material like cherry/ parchment husk, sugarcane trash, tree bark and sawdust should be made moist before being added to the heap, preferably drench them in water for several days.

Construction of heap

All materials may be gathered at a time or may be stored until sufficient materials are available to make one or several heaps. The compost heap needs to be made up layer by layer by spreading different raw material as described below.

Before starting to build a heap, it is always advisable to lay a lattice of old branches or fibrous material like coconut shells etc. at the bottom for providing aeration and preventing water logging. Over the base layer, spread the farm wastes (like cherry husk, coffee pulp, crop residues etc.), green matter (like leaves of shade trees; green manure crops like *Diancha, sesbania;* and weed slashings etc.) and animal wastes (cattleshed wastes) layer by layer alternatively till the suggested height is reached. The thickness of each layer should be around 10-15 cm. Sprinkle cow dung slurry or biogas slurry between each layer to hasten the composting. Sprinkling of supernatant liquid from well-fermented curds is also found to be highly effective, especially for composting coffee wastes like cherry husk and coffee pulp.

Addition of small quantities of rock phosphate on each layer of farm wastes would be advantageous as it not only help in hastening of composting but also enrich the compost.

When the heap is 150 cm high, ventilation holes should be made in the heap by pushing pointed wooden poles vertically into the heap about 1 meter apart. When the heap is finished, it can be covered with a layer of soil and straw. The poles or stalks can be removed on the next day. Temperature will begin to rise slowly. After 4-5 days, the holes should be plastered to avoid the loss of heat and moisture.

Turning the heap

Turning of heaps is essential so that the material from edges, where temperature is lower, is moved to the center where it is warm, while center of heap does not suffer from overheating. All materials in the heap should be exposed to heat in order to kill germs, weed seeds, insects and speed up decomposition. Turning also improves aeration of the heap. Excess carbon dioxide concentrated inside the heap is allowed to escape. Turning gives a chance to check the moisture content of the material and if the material is too dry, it should be watered. Some un-decomposed patches can also be evenly mixed along with the material and good quality compost is ensured.

The first turning should be done after 2-3 weeks of heaping, when the temperature has started to drop after reaching a peak. Materials are properly mixed, starting from one side of the heap ending towards another side. Sprinkle water, if necessary. The heap can be turned again three weeks after the first turning. Depending upon the temperature and kind of residues, turning is done two to three times at an interval of about three weeks. If the heap is prepared using residues having different C:N ratios with proper aeration and moisture, only one turning after 3-4 weeks would be sufficient.

Maturation of compost

The time required for the heap to mature and become good compost, depends on the local climatic conditions and the materials used. If the weather is warm, the heap is moist, well aerated and good combination of materials is used for building the heap, the compost is ready in three months time. In colder or dryer conditions and dominance of materials with high C:N ratio, heap usually takes six months to ripe. When the compost is mature or ripe, except for some small twigs, none of the original components are recognizable. The material is converted from dark brown to gray colour, gives an earthy smell and is coarse. The volume of the mature heap is reduced to half of the original.

Application of compost

In coffee, it is advisable to apply compost at least once in 2-3 years, at the rate of 5-10 kg per plant for obtaining benefits of organic nutrition.

B) VERMICOMPOSTING (PUSA VERMITECH)

It is an efficient method of composting the organic wastes by

employing earthworms. The compost thus produced is known as Vermicompost and is superior to other composts. About, 4-5 kg of wastes can be composted by 1000 worms (approximately 1 kg) in a day. The commonly used earthworms like *Eudrilus* sp., *Perionyx* sp., *Eisenia* sp. or any locally available surface feeding (epigeic) earthworms can be collected from nearby moist soil and then used for vermicomposting.

Structures for Vermicomposting

Large quantity of wastes can be vermicomposted either in tanks or heaps. Brick tanks with dimension 2-3 m in length, 1m in width and 0.5-0.75m in height having a slight slope at the bottom leading to drainage holes are ideally suited. To save costs, even heaps can be preferred for vermicomposting. The heaps should be of about 1m width, 0.5 m height and of convenient length and should be arranged in the form of 'windrows'. In places where the predators of earthworm like rats, lizards, pigs are major problem vermicomposting in tanks covered with wire mesh is advocated, to prevent loss of worms.

Vermicompost preparations

For vermicompost preparations, the following materials are used in layers as described below:

1st Layer (Basal Sand Layer): A layer of sand (2-3 cm thick) at the base of tank or heaps, to drain out excess water and also to prevent the movement of worms into deeper layers of soil, especially in heap method.

2nd Layer (Dung Layer): Over the basal sand layer, one month old dung manure is spread over a thickness of 3-5cm.

3rd Layer (Waste Layer): All biodegradable wastes are spread over the dung layer. In case of Vermicompost bins/tanks the waste layer can be filled up to the brim. In Vermicompost heaps, (usually of 1 m width), wastes can be up to the height of 0.5 m over the dung layer.

4th Layer (Soil layer): The wastes are then covered with a thin layer (1 cm) of soil.

5th Layer (Dung Layer): Above the soil layer, mature dung is uniformly spread up to 3-5 cm thickness, which would be the top layer in a heap or a tank.

The waste material should be pre decomposed before using for vermicomposting, by heaping in layers for about 7 days. After formation of the layers, earthworms are inoculated at the rate of 1000 worms (approx. 1 kg in weight) for every 100-150 kg of wastes. The heaps or tanks are to be watered regularly to maintain moisture level at around 30-40% for better activity of worms. Watering is done in

such a way that the contents in the tank or in heap may not become too moist, as it results in the anaerobiosis of earthworms causing mortality. To prevent evaporation in summer months, gunny cloth or straw is spread over the heap or tank. For large scale composting, thatched roof can be erected for shade.

Collection of Vermicompost

When a thick layer of vermicompost, in the form of tiny pellets, is formed at the top surface of the heap or tank, avoid watering for 3-4 days, to reduce moisture at the top layer and force the worms to move towards deeper layers. The compost is collected gently by using hands or a wooden raft, to avoid injury to the worms. The compost is heaped under shade for a day or two, to collect worms from the compost, which will settle down at the base of the heap. After collecting the compost, the tank or heap can be refilled with wastes starting with a layer of mature dung. A thin layer of soil is used to cover the wastes and over the soil layer dung is spread. The contents are moistened with water regularly. The worms from the base come to the top and start feeding on the freshly added wastes.

Appendix - VIII

CALENDAR OF OPERATIONS FOR ORGANIC COFFEE

Calendar of operations mentioned in this appendix give an approximate idea to the growers about the schedule of various operations. They are listed monthwise for South-West monsoon areas and North-East monsoon areas. The plantation areas in Karnataka and Kerala come under predominantly South-West monsoon influence, while those in Tamil Nadu, Andhra Pradesh, Orissa and North-East region experience North-East monsoon.

January

South-West monsoon areas

1. Continuation of harvesting and processing of arabica coffee.
2. Collection of gleanings and disinfestation / disposal of gleanings infested with berry borer.
3. Commencement of robusta harvesting and processing.
4. Stripping off-season berries in berry borer-infested areas.
5. Pruning and handling of arabica coffee.
6. Nursery: Preparation of germination beds and sowing of seeds.
7. Watering of young coffee in new clearings, when necessary.

North-East monsoon areas

1. All operations as above except item 6.

February

South-West monsoon areas

1. Continuation of robusta harvesting and processing.
2. Stripping off-season berries in berry borer infested areas.
3. Collection of gleanings and disinfestation / disposal of gleanings infested with berry borer.
4. Regulation of permanent shade.
5. Pruning and handling of arabica.
6. Pre-blossom spraying with 0.5% Bordeaux mixture against leaf rust and anthracnose (twig die-back).
7. Collection and destruction of pupae of hairy caterpillars.
8. Cleaning of fire path.
9. Sprinkler irrigation for blossom in robusta during the second fortnight.
10. Watering of young coffee in new clearings, when necessary.
11. Nursery: Preparation of secondary beds, filling, arranging baskets / bags and transplanting.
12. Preparation of land for new planting.

North-East Monsoon areas

1. Harvesting of arabica and robusta
2. Rest of the operations as above.

March

South-West monsoon areas

1. Completing of harvesting and processing of robusta.
2. Stripping off-season berries in berry borer infested areas.
3. Collection of gleanings and disinfestation / disposal of berry borer-infested gleanings.
4. Pruning and handling of arabica and robusta.
5. Permanent shade regulation, when needed.
6. Pre-blossom spraying with 0.5% Bordeaux mixture, if not completed earlier.
7. Tracing and immediate disposal of stem borer affected plants.
8. Collection and destruction of pupae of hairy caterpillars
9. Control measures against root and shoot mealybugs and green scale, if necessary.
10. Install light traps immediately after summer showers to trap the adult beetles of cockchafers
11. Fire path cleaning.
12. Installation of berry borer traps
13. Release of berry borer parasitoid
14. Sprinkler irrigation in robusta for backing.
15. Watering of young coffee in new clearings, when necessary.
16. Nursery: Transplanting and after-care of seedlings.

North East Monsoon areas

1. Same as above

April

South-West monsoon areas

1. Collection of gleanings and disinfestation / disposal of gleanings infested with berry borer.
2. Pruning of robusta.
3. Stem borer control. Tracing and immediate disposal of stem borer affected plants. Spraying the main stem with neem formulations once in 10 days or swabbing with 10% lime solution.
4. Control measures against root and shoot mealybugs and green scale, if necessary.
5. Installation of berry borer traps
6. Release of berry borer parasitoid
7. Application of bulk organic manures / composts.
8. Weeding and desuckering

9. Line marking and opening of pits in new clearings.

10. Maintenance of nursery

North-East monsoon areas

1. Same as above

May

South West monsoon areas

1. Spraying of 0.5% Bordeaux mixture for leaf rust as pre-monsoon application.
2. Stem borer tracing, spraying the stem and thick primaries with neem formulations or 10% lime solution.
3. Control measures against shoot mealybugs and green scale, if necessary
4. Installation of berry borer traps
5. Release of berry borer parasitoid
6. Lopping of dadaps during second fortnight when the monsoon weather sets in.
7. Clearing of drains, renovation of cradle pits/ trenches.
8. Weeding and desuckering
9. Application of bulk organic manures/ composts, is not completed earlier.
10. Application of lime for correcting soil pH, wherever necessary.
11. If berry borer infestation is noticed in a few berries, remove and destroy them.
12. Maintenance of nursery
13. Opening of planting pits in new clearings

North-East monsoon areas

1. Same as above except 3, 4 and 7.

June

South-West monsoon areas

1. Completion of dadap lopping
2. Supply planting with 18 months old seedlings in new clearings.
3. Weeding and desuckering.
4. Installation of light traps for collection and destruction of moths of hairy caterpillars.
5. Control measures against shoot-mealybugs and green scale, if necessary.
6. Pre-monsoon spraying of 0.5% Bordeaux mixture for leaf rust and 1% Bordeaux mixture in black rot endemic areas.
7. Spraying of *Beauveria bassiana,* if berry borer incidence is noticed.
8. Nursery: Thinning and removal of overhead pendal depending on weather and aftercare.
9. Closing of pits in new clearing
10. Planting of shade plants in new clearings.

North-East monsoon areas

1. Liming wherever necessary.
2. Rest of the operations as above, except item 1.

July

South-West monsoon areas

1. Handling, centering and desuckering
2. Removal and destruction of black rot affected twigs, leaves etc. and drenching spray with 1% Bordeaux mixture during break in the rain.
3. Spraying of *Beauveria bassiana* against berry borer.
4. Weeding and desuckering
5. Supply planting of coffee in young fields, if weather permitting
6. Removal and burning of shot-hole borer infested twigs
7. Nursery: Aftercare of seedlings

North-East monsoon areas

1. Lopping of dadaps
2. Planting of dadap stakes, permanent shade seedlings and coffee depending on weather conditions
3. Rest of the operations as above.

August

South-West monsoon areas

1. Weeding and desuckering
2. Planting, if weather permits
3. Removal and burning of shot-hole borer infested twigs.
4. Spraying against black rot and berry blotch (1% Bordeaux)
5. Spraying of *Beauveria bassiana* against berry borer.

North-East monsoon areas

1. Pre-monsoon spraying with 0.5% Bordeaux mixture against leaf rust.

September

South-West monsoon areas

1. Planting of coffee
2. Stem borer tracing and destruction of infested stems
3. Control measures against cockchafers and hairy caterpillars, if necessary
4. Control measures against green scale, if necessary
5. Spraying of *Beauveria bassiana* against berry borer.
6. Post-monsoon spray with 0.5% Bordeaux mixture against leaf rust
7. Weeding and desuckering.
8. Regulation of dadap shade
9. Handling, centering and desuckering
10. Shot-hole borer tracing, removal and burning of infested twigs
11. Application of organic manures/ composts
12. Maintenance of nursery

North-East monsoon areas

1. Same as above.

October

South-West monsoon areas

1. Post-monsoon spraying with 0.5% Bordeaux mixture to be completed.
2. Stem borer control. Tracing and immediate disposal of affected plants. Spraying of neem formulations on the main stem at 10 -15 days interval/ spraying 10% lime solution.
3. Spraying of *Beauveria bassiana* against berry borer.
4. Shot-hole borer tracing, removal and burning of infested twigs
5. Weeding and desuckering
6. Cover digging in new clearings and scuffling in older areas, if necessary
7. Opening of new cradle pits in staggered manner in slopes in established plantations
8. Thinning of permanent shade trees to remove hanging branches
9. Cleaning and preparation of drying yard, pulper site and equipment
10. Removal and burning of shot-hole borer infested twigs
11. Harvesting of borer infested berries, if present and treating them with hot water.
12. Application of F.Y.M. or compost @ 10 kg/plant once in the root disease affected patches.

North-East monsoon areas

1. Planting of coffee. Rest as above.

November

South-West monsoon areas

1. Weeding
2. Liming wherever necessary
3. Cover digging in young fields and scuffling in established plantations to be completed.
4. Regulation of permanent shade.
5. Stem borer control. Tracing and immediate disposal of affected plants. Spraying of neem formulations on the main stem at 10 -15 days interval.
6. Forking, mulching and hutting young plants in new clearings
7. Lime washing young dadap stems
8. Commencement of arabica harvesting and processing
9. Shot-hole borer tracing, removal and burning of infested twigs

North-East monsoon areas

1. Regulation of dadap shade
2. Post-monsoon spraying with 0.5% Bordeaux mixture against leaf rust.
3. Rest as above.

December

South-West monsoon areas

1. Harvesting and processing of arabica.
2. Stem borer control. Tracing and immediate disposal of affected plants. Spraying with neem formulations on the main stem at 10 -15 days interval.
3. Mulching and shade hutting for plants in new clearings
4. Shot-hole borer tracing, removal and burning of infested twigs.

North-East monsoon

1. Spraying with 0.5% Bordeaux mixture to be completed.
2. Rest as above.

IFOAM GUIDELINES ON COFFEE, COCOA AND TEA

Background

The aim of organic coffee, cocoa and tea cultivation includes components in the field of;

- organic agricultural techniques,
- protection of the environment, and
- socio-economic aspects such as:

Organic coffee, cocoa and tea should be produced within a sustainable farming system. Soil fertility should be maintained and improved by using natural, and as possible - local resources as well as organic by-products.

Drawbacks of coffee, cocoa and tea production and processing such as erosion and pollution are reduced to a minimum through the implementation of appropriate conservation principles. The use of fossil fuels and other non-renewable sources must be minimised.

It should aim at supplying residue free products.

Together with the development of organic agriculture within each production system, socio-economic aspects should be improved.

Claims like “no fertilisers, no pesticides used” or “residue free” are not enough to qualify production of coffee, cocoa or tea as organically grown.

A crop may qualify as organic, when all possible or required techniques are used like:

- clearance in a selective way that does not affect the environment and the local population,
- terracing, contour planting, soil covers and mulching to prevent erosion,
- increase of organic matter by using legumes or shade trees loppings,
- soil activation by correcting the pH,
- use of clones or seedlings resistant to pest and diseases,
- regulation of the micro-climate and improvement of the ecological diversity to control pest and diseases,
- return of nutrients removed by using mineral balance calculation,
- shade planting integrated in the organic farm management.

Guidelines for production

1. Clones or seedlings must be adapted to the local climate. They should be as tolerant or resistant as possible to endemic pests and diseases as well as drought resistant.

2. Continuity of production is guaranteed by rejuvenating and or replanting programmes.

3. Erosion is prevented by proper soil conservation methods such as,

   — planting on terraces or contours,

   — by growing soil covers in empty spaces,

   — by abolishing clean weeding and forking,

   — and by making silt traps in drains.

4. All kinds of methods should be used to improve soil organic matter and soil micro-organisms by growing legumes, by applying organic matters like compost, shade tree loppings, etc.

5. Soil activity may be optimised by correcting the pH.

6. Removed nutrients should be replaced in order to maintain mineral balance.

7. To maintain or to increase the long-term fertility of the soil, several activities should be undertaken. All available organic material should be recycled.

8. The nutrient supply is assured mainly by the regular lopping of in situ (leguminous) low and medium shade trees as well as by compost and manure produced on the farm or estate itself. A deficiency in nutrient supply has to be solved by permitted inputs of local sources.

9. The demand for firewood must not lead to deforestation. Sufficient firewood (or other energy sources like bio-gas) must be available from sustainable sources.

10. Processing is only allowed with mechanical and physical processes, with natural fermentation only.

11. Any by-product like coffee and cocoa pulp and tea stalks, is recycled to the fields after composting.

12. As much as possible, processing and packing should be done in the country of origin.

13. The legal regulations regarding the living standards and working conditions for workers and small holders must be assured. This means appropriate housing, food, education, transport and health facilities, relative to the general conditions of life in the region of production.

14. Suitable areas for (organic) home gardens and / or animal husbandry must be available to workers.

Inspection and Certification

The following requirements must be fulfilled.

1. The entire farm unit should be organic.

2. 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.

3. 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.

4. 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.

5. A contract has to be made between producer or producer organisation and the certification body.

6. A farm documentation with general data, a map of the farm and a list of registered fields must be made available.

7. Book keeping has to include farm inputs, yields, flow of products in processing, storing, packing and sales.

8. Samples may be taken for residue analysis.

9. A detailed list of farm inputs has to be made available for approval by the certification body.

10. At the beginning of the conversion, social parameters like housing, food and hygienic conditions are inventoried and a plan for improvements is presented. These are implemented according to the time frame agreed upon.

Appendix X

DEFINITION OF TERMS

ACCREDITATION:

Accreditation means Registration by the National Accreditation Body for certifying organic farms, products and processes as per the National Standards for Organic Products and as per the guidelines of the National Accreditation Policy and Programme for organic products.

ACCREDITED PROGRAMME:

Means programme of accrediting Inspection and Certification Agencies which have been accredited by the Accreditation Agency and which have agreed to comply with the Accreditation contract.

ANNUAL REPORT:

Means the report on operators, products and processors submitted annually to the Accreditation Agency by the accredited Inspection and Certification Agencies.

APPEAL:

Shall be the process by which an Inspection and Certification Agency can request reconsideration of a decision taken by the Accreditation Agency or an operator can request reconsideration of a decision by the Certification Agency.

APPLICANT:

Shall be the Inspection and Certification Agency that has applied for Accreditation to the Accreditation Agency.

AYURVEDA:

Ayurveda is a traditional naturopath system of medicines and health care of India.

BUFFER ZONE:

A clearly defined and identifiable boundary area bordering an organic production site that is established to limit application of, or contact with, prohibited substances from an adjacent area.

CERTIFICATE:

Would mean a document issued by an accredited agency declaring that the operator is carrying out the activities or the stated products have been produced in accordance with the specified requirements in accordance with the National Standards for Organic Products.

CERTIFICATE OF REGISTRATION:

Shall mean the document issued by the Inspection and Certification Agency, declaring that the operator is licensed to use the certificate on specified products.

CERTIFICATION:

Shall be the procedure by which a written assurance is given by the Certification Agency that a clearly identified production or processing system has been methodically assessed and conforms to the specified requirements.

CERTIFICATION MARK:

Shall mean certification programme's sign, symbol or logo which identifies the products as being certified according to the National Standards for Organic Products.

CERTIFICATION PROGRAMME:

Shall mean the system operated by an Inspection and Certification Agency in accordance with the criteria for carrying out certification of conformity as laid down herein.

CERTIFICATION TRANSFERENCE:

The formal recognition by an Inspection and Certification Agency of another certification programme or Agency or projects or products certified by that programme or Agency, for the purpose of permitting its own certified operators to trade or process under the programme's own certification mark, the products which are certified by the other programme.

CHAIN OF CUSTODY:

All relevant steps in the production chain including growing, harvesting, processing, handling and related activities detailed in Section 4 of the accreditation criteria that have been inspected and certified, as appropriate.

COMPETENT AUTHORITY:

Shall mean the official government agency for accreditation.

CONTAMINATION:

Pollution of organic product or land; or contact with any material that would render the product unsuitable for organic certification.

CONSULTANCY:

Shall mean the advisory service for organic operations, independent from inspection and certification procedures.

CONVENTIONAL:

Farming systems dependent on input of artificial fertilizers and/or chemicals and pesticides or which are not in conformity with the basic standards of organic production.

CONVERSION:

The process of changing an agricultural farm from conventional to organic farm. This is also called transition.

CONVERSION PERIOD:

The time between the start of organic management, and the certification of crops as organic.

DECLARATION OF INTEREST:

Declaration of no personal / commercial conflict of interest by all concerned involved in the process of inspection and certification.

DISINFECTANT:

A product that minimizes by physical or accepted chemical means, the number of microorganisms in the environment, to a level that does not compromise food safety and suitability.

EVALUATION:

Shall be the process of systematic examination of the performance of an Inspection and Certification Agency to meet the specific requirements under the National Accreditation Programme.

FARM UNIT:

An agricultural farm, area or production unit managed organically, by a farmer or a group of farmers.

FOOD ADDITIVE:

Food additive is an external permissible ingredient added to improve the keeping quality, consistency, colour and other physico chemical, sensory properties, wholesomeness and safety of food

GENETIC DIVERSITY:

Genetic diversity means the variability among living organisms from agricultural, forest and aquatic ecosystem. This includes diversity within species and between species.

GREEN MANURE:

Manure consisting of fresh green plant matter, which is ploughed in or turned into the soil for the purpose of soil improvement.

GROUP CERTIFICATION:

Certification of an organized group of producers, processors and exporters with similar farming and production systems and which are in geographical proximity.

GUIDELINES FOR ORGANIC PRODUCTION AND PROCESSING:

Standards for organic production and processing established by the Accreditation Agencies for specific crops in accordance with the National Standards for Organic Products.

HABITAT:

The area in which a plant or animal species naturally exists.

HAZARD ANALYSIS CRITICAL CONTROL POINT (HACCP):

A systematic process that identifies food safety hazards, critical control points, critical limits, corrective actions and documentation and integrates monitoring procedures to ensure food safety.

(or)

The Hazard Analysis Critical Control Point (HACCP) system is a science based on systematic approach to producing safe food. Food safety management systems based on HACCP are internationally recognized as the most effective way to ensure food safety and minimize the risks of food poisoning.

HOMEOPATHY:

Homeopathy is a system of medicine based on the principle of "*Similia, Similibus, Curentur* (let likes be treated by likes)".

HOMEOPATHIC TREATMENT:

Treatment of disease based on administration of remedies prepared through successive dilution of a substance that in larger amounts produces symptoms in healthy subjects similar to those of the disease itself.

INGREDIENT:

Shall mean any substance, including a food additive, used in the manufacture or preparation of a food and present in the final product although possibly in a modified form.

INPUTS BANNED :

Those items, the use of which is prohibited in organic farming.

INPUT MANUFACTURING :

Shall mean the manufacturing of organic production or processing inputs.

INPUTS PERMITTED:

Those items that can be used in organic farming.

INPUTS RESTRICTED:

Those items that are allowed in organic farming, in a restricted manner, after a careful assessment of contamination risk, natural imbalance and other factors arising out of their use. Farmers should consult the certifying agency.

INSPECTION:

Shall include the site visit to verify that the performance of an operation is in accordance with the production or processing standards.

INSPECTION AND CERTIFICATION AGENCY:

Shall be the organization responsible for Inspection and Certification.

INSPECTION AGENCY:

Shall mean the agency that performs inspection services as per the National Accreditation Policy and Programme.

INSPECTOR:

Shall be the person appointed by the Inspection and Certification Agency to undertake the inspection of an operator.

INTERNAL CONTROL SYSTEM:

A documented quality assurance system that allows the external certification body to delegate the inspection of individual group members to a body identified from within the operators of the group.

INTERNAL REVIEW:

Shall mean an assessment of the objectives and performance of a programme by the Certification or the Accreditation Agency itself.

IRRADIATION:

High energy emissions from substances for the purpose of controlling microbial, pathogens, parasites and pests in food, preserving the food or inhibiting physiological processes such as sprouting or ripening.

LABELLING:

Means any written, printed or graphic matter that is present on the label, accompanies the food, or is displayed near the food, including that for the purpose of promoting its sale or disposal.

LICENCE:

Shall be the Accreditation contract that grants a certifier the rights associated with its accredited status in line with the National Program for Organic Production.

LIVESTOCK:

Shall mean any domestic or domesticated animal including bovine (including buffalo and bison), bovine, porcine, caprine, equine, poultry and bees raised for food or in the production of food. The products obtained by hunting or fishing of wild animals shall not be considered as part of this definition.

MARKETING:

Means holding for sale or displaying for sale, offering for sale, selling, delivering or placing on the market in any other form.

MULTIPLICATION:

The growing of seed / stock / plant material to supply for future production

NATIONAL ACCREDITATION BODY (NAB):

Shall be the agency set up by the Steering Committee for National Programme for Organic Production for accrediting Inspection and Certification Agencies.

NATURAL FIBRE :

A filament of plant or animal origin.

OPERATOR:

Shall mean an individual or a business enterprise practicing organic farming or organic processing.

ORGANIC:

Refers to a particular farming system as described in these standards and not to the term used in chemistry.

ORGANIC AGRICULTURE

It is a system of farm design and management to create an eco system, which can achieve sustainable productivity without the use of artificial external inputs such as chemical fertilizers and pesticides.

ORGANIC PRODUCTION UNIT:

Shall mean a unit / holding or stock farm complying with the rules of NPOP regulations.

ORGANICALLY-PRODUCED FEEDING STUFFS / FEED MATERIALS:

Shall mean feeding stuffs / feed material produced in accordance with

the rules of production laid down in NPOP regulations.

ORGANIC SEEDS AND PLANTING MATERIAL:

Seed and planting material produced under certified organic system.

PACKAGE OF PRACTICES:

Guidelines for organic production and processing established by the Accreditation Agencies for specific crops, specific to the region.

PARALLEL PRODUCTION:

Shall mean any production where the same unit is growing, breeding, handling or processing the same products both in a certified organic and a non-certified organic system. Similarly a situation with "organic" and "in conversion" production of the same product is also parallel production.

PART CONVERSION:

Shall be when part of a conventional farm or unit has already been converted to organic production or processing and a part is in the process of conversion.

PLANT PROTECTION PRODUCT:

Shall mean any substance intended for preventing, destroying, attracting, repelling, or controlling any pest or disease including unwanted species of plants or animals during the production, storage, transport, distribution and processing of food, agricultural commodities, or animal feeds.

PREPARATION:

Shall mean the operations of slaughtering, processing, preserving and packaging of agricultural and animal products and also alterations made to the labeling concerning the presentation of the organic production method.

PROCESSING AIDS:

A substance or material not consumed as a food ingredient by itself but used in the processing of raw materials, food or its ingredients to fulfil a certain technological purpose during treatment or processing and which may result in unintentional but unavoidable presence of residues or derivatives in the final product.

QUALITY SYSTEM:

Documented procedures, which are established, implemented, and periodically audited to ensure that production, processing, handling, management, certification, accreditation and other systems meet the specified requirements and outcomes by following standardized protocols.

RAW MATERIALS:

All ingredients other than food additives.

SANITIZE:

To adequately treat the produce or food-contact surfaces by a process that is effective in destroying or substantially reducing the numbers of vegetative cells of micro organisms of public health concern, and other undesirable micro organisms, but without adversely affecting the safety and quality of the product.

SPLIT PRODUCTION:

Where only part of the farm or processing unit is certified as organic. The remainder of the property can be (a) non-organic, (b) in conversion or (c) organic but not certified. Also see parallel production.

STANDARDS:

Shall mean the standards for National Organic Products established by the Steering Committee for National Programme for Organic Production.

SURVEILLANCE:

The measures undertaken to provide monitoring of an operator's / certification body's compliance with the standards / criteria for meeting the certification / accreditation requirements.

TRANSACTION / IMPORT CERTIFICATE:

Document issued by a certification body declaring that the specified lot or consignment of goods is derived from production and / or processing system that has been certified.

GMOs AND GMO DERIVATIVES:

A plant, animal, microbe or their derivatives that are transformed through genetic engineering.

VETERINARY DRUG:

Means any substance applied or administered to any food-producing animal, such as meat or milk-producing animals, poultry, fish or bees, whether used for therapeutic, prophylactic or diagnostic purposes or for modification of physiological functions or behaviour.