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Potentials in Organic Farming of Spices

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Spices in Indian Economy

India produces about 4 million tonnes of spices and exports around 180 spice products to more than 150 countries. The world export of spices during 2005 was 3592.48 ('000 t) and import was 3454.40 ('000t) (FAO database 2007). In 2007-08, Indian share of the world trade in spices was about 35% in volume and 37% in value and is planning to increase its share in the world spices trade to 65% both in volume and value by 2017. The country's exports touched a record \$1.1 billion in 2007-08 and likely to raise to US \$1.3 billion in 2008-09 due to good demand for chilli, pepper and cumin seed. Organic spice exports have been growing rapidly in recent years, recorded 25 % increase in quantity, and 11 % increase in value. The share of organic spice is negligible compared to conventional spices trade. The main organic spices traded by volume are pepper (39%), ginger (19%), turmeric (11%), cardamom (8%), chilli (7%), cloves (7%), nutmeg (7%), and others (7%). The largest producers and exporters of organic spices in the world are Sri Lanka (28%), India (12%), Indonesia (10%), Madagascar (8%), Tanzania (10%) and Guatemala (8%). Sri Lanka is the largest producer of organic pepper followed by India. India exported around 700 tonnes of different varieties of organic spices in 2002-03 and Spices Board, Ministry of Commerce, Govt. of India expects to export organic spices worth Rs. 240–260 crore by 2012. The current market size is small but demand is expected to grow at a rate of 15–20% in the coming decade. Given the ever-growing shift towards chemical-free organic food items in western world, the potential for export of organic spices is high, and India is placed at an advantageous position, being a major exporter of spices to the global market.

Organic Spices

According to the ITC and UNCTAD/GAT, more than 130 countries produce certified

organic foods. Internationally, there is a shift towards traditional / ethnic system of medicines. Since spices form part of many of these medicines, the demand for organically produced spices is increasing considerably. Organic pepper is produced and exported to international markets by India Indonesia and Sri Lanka. Organic pepper has established its market share better than other pepper products like dehydrated green pepper, pepper in brine, freeze-dried pepper or frozen pepper. The country at present exports around 50 tonnes of different varieties of organic spices. Exports will get a significant boost in the coming years as more farmers switch to organic methods. The important markets are the European Union, USA and Japan. The current market size is small but demand is growing at an annual rate of 15–20% and may grow to 57,000 tonnes in the next 10 years.

Relevance of Organic Farming in Spices

Farmers in our country have always been practicing traditional ways of using indigenous technologies and inputs mostly in line with modern organic farming principles. India has great potential to capture the expanding global organic spice market as per capita consumption of fertilizers and pesticides in our country is far below that of developed countries and it is very easy for Indian farmers to embrace organic spice farming in its true sense. With global retail sales of organic products fast picking up, India could emerge as a major player by exploiting its own strengths like traditionally followed agriculture systems, diverse agro-climatic regions with self-sustaining agriculture systems.

Most of the North Eastern states of India are having virgin land without any commercial cultivation that are very much suitable for organic cultivation of spices and major spices like black pepper, ginger, turmeric and chillies have larger area in this tract, enabling it to become the “organic spices hub of India”. Most of these spices are cultivated under shade trees, which are available naturally as evergreen forest and left out Jhum land. The North Eastern states viz., Meghalaya and Arunachal Pradesh ranks 2nd and 3rd in production of ginger and Assam holds 4th position in area of turmeric in India. Besides, large cardamom is cultivated in Arunachal Pradesh in an area of 2,192 ha with a production of 512 tonnes and productivity of 500 kg/ha. In the world map of large cardamom production, India shares 54%, in which 87% is contributed by Sikkim and the remaining 13% by Darjeeling (West Bengal). In large cardamom, Sikkim claims the major share in the country with an area and production of 26,734 ha and 5401 tonnes, respectively with a productivity of 242 kg/ha. India is the leader in large cardamom in the world market and there is a vast scope to produce organic large cardamom as well as to export it.

Organic standards, in which the definition is set out for practical application stipulate not only the prohibition of use of certain inputs but dictate a range of practices to be followed that will ensure that a farm maintains its sustainable productivity. Large-scale use of high analysis fertilizers and pesticides pose a number of environmental hazards and imbalances in soil nutrient levels. An unfavourable ratio of fertilizer consumption and losses of nutrients resulting from excessive erosion and heavy leaching under heavy rainfall

in spice growing areas threaten the environment also. Excessive and indiscriminate use of fungicides/pesticides could result in pesticide residues in the produce, harm non-target organisms, develop resistance and environmental pollution. Negligence of the biological aspect of soil has led to depleted population of soil organisms such as earthworms and their allies responsible for healthy plant growth. Moreover, since spices are high-value and export-oriented in nature, it is also imperative to keep the levels of pesticide residues below tolerance limits in view of the stringent standards set by the importing countries.

Mixed Cropping Systems

Multiple cropping or farming systems helps efficient use of natural resources, buffer against price fluctuations, generates more employment opportunities and production of commodities for varied end uses and thus ensures crop diversity. Unlike other field crops, spices are highly amenable for inter-cropping owing to their ecological niche. As the pressure on land under cropping is increasing, area expansion for spice cultivation is questioned. The best alternative would be cultivation of spices as a component crop in the existing coffee, tea, coconut and arecanut plantations. Mixed cropping of black pepper with rubber, cocoa, orange, etc., are common in other countries like Brazil.

Vines like black pepper and vanilla and rhizomatous crops like ginger, turmeric, cardamom and galangal are ideally suited for mixed/ inter cropping under tree plantations with partial light. In West Bengal, ginger was found to be highly remunerative as inter-crop in coconut. The profit was Rs. 40,250/ha whereas, it was Rs. 23,450/ha from turmeric. An increase in net returns to the tune of Rs.13, 300/ha can be obtained in mixed cropping black pepper in coconut gardens (Sarma *et al.*, 2003). In a cropping system the addition of organics due to litter fall would also result in organic matter build up and enhanced nutrient availability in soils (Khan *et al.*, 2002). The minimum tillage practice would ensure no or minimum damage to root systems and the associated microbial load would be ideal. It is reported that there is great scope of bringing tea and coffee estates under black pepper production by covering all the shade trees with pepper. Area under coffee and tea in South India can accommodate about 3.8 and 2 million standards for pepper, respectively and can result in additional pepper yield up to 20,500 t/year.

Plantation crops including black pepper and cardamom, being perennial in nature contribute large quantities of waste by-products, which by composting and recycling will meet the nitrogen requirement of crop and partly other nutrients. The multiple cropping system results in the continuous uptake, addition of biomass and higher level of nutrient recycling that would lead to a positive influence on the physico-chemical and biological properties of soil.

The microbial biomass, the organic content, total N, P and K would be higher in the root region soils of multistoried cropping system when compared to the monocrop. The beneficial effects are reflected through enhanced soil fertility status, enhanced microbial activity and better utilization of natural resources for the benefit of plant growth and sustainable crop productivity.

The organic addition brought through leaf litter recycling and microbial activity would lead to integrated nutrient management for enhanced system productivity. In south India where coconut is a major plantation crop, abundance of waste materials, about 7.5 million tonnes of coir dust annually from coir based industries provides good scope for recycling the organic materials into the system. Composts made out of leaf and sheath wastes and husks of these plantation crops are valuable sources of plant nutrients (Table 6.1).

Although organic farming is better than conventional chemical farming systems, its crop yield is observed to be much lower in the developing countries as compared to that of the latter. Therefore, for enhancing the yield potential technologies like inoculating soils and plants with beneficial micro-organisms for creating a favourable micro-environment for plant growth are being promoted. The presence of *Azospirillum* reported in the spices based cropping is of great relevance and needs to be exploited. So also the P solubilisers present in several perennial cropping systems (Bopaiah and Thomas, 1993). Combination of bio-fertilizers viz., *Azospirillum*, Phosphobacteria and VAM in the nursery mixture has significantly enhanced the root and shoot growth of nursery cuttings. Field application of *Azospirillum* @ 20g/bed along with coir compost and FYM has significantly increased the yield of black pepper, ginger and turmeric.

Several PGPRs (plant growth promoting rhizobacteria) isolated from the rhizosphere of black pepper and other spice crops were found growth productive, disease suppressive and incidentally are efficient P solubilizers. The role of *Pseudomonas fluorescens* mediated nutrient flux in the soil microcosm in plant growth promotion was studied with the higher uptake of nutrients by the bacterized plants (Diby *et al.*, 2003). PGPRs and their effectiveness has been established on foot rot and slow decline of black pepper and rhizome rot of ginger and clump rot of cardamom.

Table 6.1. Nutrient content of different organic farm wastes

| Organic waste | N | P (g/100g) | K | Zn(mg kg ⁻¹) |
|-----------------------|------|---------------|------|--------------------------|
| Composted coffee pulp | 3.20 | 0.16 | 2.3 | 12 |
| Areca nut leaf | 2.13 | 0.12 | 0.88 | 17 |
| Cardamom dried leaves | 1.85 | 0.11 | 1.80 | 18 |
| Shade tree leaves | 1.68 | 0.07 | 1.10 | 19 |
| Leaf compost | 1.10 | 0.84 | 0.78 | 76 |
| Coir compost | 1.20 | 0.60 | 1.20 | 16 |
| Vermi-compost | 2.00 | 0.80 | 1.20 | 44 |

The efficient isolates from black pepper with high rhizosphere competency and adaptability can be used in a cropping system involving black pepper, ginger and cardamom.

The use of EMs (Effective Microorganisms) containing a consortium of beneficial microbes that acts as microbial inoculants and anti-oxidants in soil thus improves soil health and promotes healthy environment for plant growth. The benefits of using EMs in agriculture are (Unnikrishnan Nair, 2006).

- Promotes germination, flowering, fruiting and ripening.
- Improves physical, chemical and biological environments of the soil and suppresses soil borne pathogens.
- Enhances photosynthetic capacity of crops.
- Increases the efficacy of organic matter as fertilizers.

Organic Farming Strategies

Definite principles, basic standards of production, documentation, inspection and certification guidelines are approved by the National Standards Committee constituted by the members of IFOAM in India. Experiments conducted at Indian Institute of Spices Research, Kozhikkode revealed that application of composts *viz.*, leaf and vermi-composts and FYM improved significantly the soil physico-chemical properties, nutrient availability, yield and quality in black pepper and cardamom. Leaf compost and vermi-compost treatments supported significantly higher population of free-living N-fixing bacteria, phosphate solubilizing bacteria populations.

Converting coir dust to enriched coir pith compost and applying it to the spice basins helped in increasing the production and quality of spices and also reduced the amount of chemical fertilizer need in to half. Trials conducted through AICRP on Spices at various locations revealed that sustainable yield up to 6.5 kg vine⁻¹ could be achieved in black pepper by application of FYM (10 kg) + rock phosphate (40g) + wood ash (2 kg) per vine along with *Azospirillum* on par to the conventional practice in nutrient supplementation.

Similarly in ginger and turmeric, combined application of different organic sources like FYM + pongamia oil cake + neem oil cake + stera meal + rock phosphate + wood ash has yielded on par to the conventional practice in addition to high quality. The quality parameters of ginger (high oleoresin and low fibre) and turmeric (curcumin and starch) are found to be high under organic farming (IISR Annual report, 2004-05).

Eco-friendly management schedules have been developed at IISR, Kozhikkode using biological control of pathogens and pests of black pepper that have great significance especially in the concept of organic farming. Soil solarization and fortifying the nursery mixture with *Trichoderma harzianum* and VAM to raise the nursery rooted cuttings of black pepper and cardamom gives protection from foot rot pathogen, *P. capsici* and nematodes, *R. similis* and *M. incognita*. Organic manures such as a neem cake, coffee husk, FYM and tea waste can be effectively used to mass multiply biocontrol agents for better field establishment and serve as nutrient supplement. Effective control of the foot

rot disease of black pepper under field condition can be achieved by adopting cultural practices like phytosanitation, minimum tillage and better drainage and application of biocontrol agent *T. harzianum* @ 50 g/ vine mixed with 1 kg of neem cake or 5 kg of FYM in the basin.

Other biocontrol agents namely *Paecilomyces lilacinus* and *Verticillium chlamyosporium* are also found to be effective in suppressing nematode infestation in black pepper. Various plant products like leaf extracts of *Chromolaena odorata* and *Strychnos nux-vomica* and seed extracts of *Azadirachta indica* and *Anona squamosa* are promising against pollu beetle. The biocontrol agents of major insect pests of black pepper, ginger and turmeric were documented to develop biocontrol strategies for the management of these insect pests.

Certification

The most significant factor distinguishing organic farming from eco-farming or perma culture is the existence of production standards and certification procedures. Quality of the produce is of the prime importance. Quality parameters follow stringent standards like micro-biologically clean, absolutely residue free with authentic analytical data from approved laboratory.

Any grower who has inclination for organic farming can apply for organic certification. The tariff on inspection and certification varies between agencies and between the types of farmers. The farmer has to keep all the details with respect to cultivation like input-output details, farm map and organic system plan and reports etc. documented. Similarly, processing/packing and exporting units are also needs to be certified before it deals with organically certified exports. Group certification programmes are also in vogue for organized group of producers, processors and exporters with similar production systems located in geographical proximity. The criteria used for group certification is (Kithu, 2005),

| | |
|---------------------|-------------------------|
| Marginal farmers | - below one hectare |
| Small farmers | - between 1 and 1.99 ha |
| Semi medium farmers | - between 2 and 3.99 ha |
| Medium farmers | - between 4 and 9.99 ha |
| Large farmers | - above 10 ha |

Certification and labeling are usually done by an independent body to provide a guarantee that the production standards are met. The certification bodies existing globally under the guidance of IFOAM, Germany charge exorbitantly for certification. In this connection Govt. of India has taken steps to have indigenous certification system to help small and marginal growers and to issue valid organic certificates through certifying agencies accredited by APEDA/Coffee Board/Tea Board/Spices Board. Guidelines for organic production of export oriented spices have also been developed and published by Spices Board, Cochin. A number of farmer's organizations representing organic growers have

already entered into the export of spices with the help of Spices Board. Among them are the PDS, WSS (Kerala), SAMANVITA (Orissa) DWUS (Manipur) to name a few.

Spices Board also launched a brand *Flavourit* for commercially marketing a range of high quality premium spices. National Programme for Organic Production (NPOP) having standards for products and labeling as '**India Organic**' was started in May 2000 and Spices Board has accredited the following certifying agencies.

- M/s. Indian Organic Certification Agency (INDOCERT), Thottumugham, Alwaye, Kochi, Kerala – 683 105. (info@indocert.org).
- LACON GMBH, Germany C/o Renewable Energy Center, Chunanganveli, Alwaye – 683 105, Kerala (laconindia@indiatimes.com).

FUTURE STRATEGIES

The main strategies for organic farming should be on promoting adoption of biofertilizers, biocontrol agents, cover crops and ecofriendly inputs, adhering to strict phytosanitary measures and upgradation of post-harvest technology, direct and indirect effects of organic farming to be quantified on long term basis, strengthening research base on the, economic viability of the system, creating awareness among the farmers about benefits, market promotion and adequate publicity for increasing the demand for organic spices even in the local market.

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