Tumeric

1. Introduction

Turmeric *(Curcuma longa L)*, the ancient and sacred spice of India known as 'Indian saffron' is an important commercial spice crop grown in India. It is used in diversified forms as a condiment, flavouring and colouring agent and as a principal ingredient in Indian culinary as curry powder. It has anti cancer and anti viral activities and hence finds use in the drug industry and cosmetic industry. 'Kum-kum', popular with every house wife, is also a by-product of turmeric. It finds a place in offerings on religious and ceremonial occasions. A type of starch is also being extracted from a particular type of turmeric. The increasing demand for natural products as food additives makes turmeric as ideal produce as a food colourant.

Turmeric is the dried rhizome of *Curcuma longa L*., a herbaceous perennial belonging to the family Zingiberaceae and a native of South Asia particularly India. The plant is propagated from rhizomes. The leaves are long, broad, lanceolate and bright green. The flowers are pale yellow and borne on dense spikes. The pseudostems are shorter than leaves. The rhizomes are ready for harvesting in about 7 to 9 months after planting.

2. International scenario

India is the largest producer, consumer and exporter of turmeric in the world. Other major producers are Thailand, other Southeast Asian countries, Central and Latin America and Taiwan. The global production of turmeric is around 11 lakh tonnes per annum. India dominates the world production scenario contributing 78 % followed by China(8%), Myanamr(4%) and Nigeria and Bangala Desh together contributing to 6% of the global production.

India is the global leader in value added products of turmeric and exports. Other major exporters are Thailand, other Southeast Asian countries, Central and Latin America and Taiwan. United Arab Emirates(UAE) is the major importer of turmeric from India accounting for 18% of the total exports followed by United States of America(USA)with 8%. The other leading importers are Bangaladesh, Japan, Sri Lanka, United Kingdom, Malaysia, South Africa, Netherland and Saudi Arabia. All these countries together account for 75% of the world imports and Asian

countries are the main suppliers to the entire world. The remaining 25% is met by Europe, North America and Central and Latin American countries. United States of America imports 97% of its turmeric requirement from India and the remaining portion from the Islands of the Pacific and Thailand. Out of the total global production UAE accounts for 18% of the imports, followed by USA(11%), Japan(9%), Srilanka,UK, Malaysia together accounting for 17%.

3. National scenario

The state wise total area and production of turmeric is given in Table 1.

Table 1. Statewise Area, production and productivity of turmeric in India (2005-06)

State	Area (ha)	Production (tonnes)	Productivity (tonnes/ha)
Andhra Pradesh	69,990	518,550	7.41
Tamil Nadu	25,970	143,358	5.52
Orissa	24,020	57,090	2.38
West Bengal	11,844	25,049	2.11
Assam	11,700	8,400	0.72
Maharashtra	6,760	8,427	1.25
Karnataka	5,410	26,380	4.88
Bihar	3,533	3,383	0.96
Kerala	3,384	8,237	2.43
Himachal Pradesh	1,640	1,140	0.70
Gujarat	1,400	16,510	11.79
Tripura	1,108	3,750	3.38
Uttar Pradesh	979	4,364	4.46
Meghalaya	850	9,000	10.59
Nagaland	850	9,000	10.59
Chhattisgarh	740	640	0.86
Madhya Pradesh	670	610	0.91
Sikkim	670	3,600	5.37
Uttarakhand	466	3,970	8.52
Arunachal Pradesh	427	1,631	3.82
Manipur	200	140	0.70
Mizoram	200	1,650	8.25
Andaman & Nicobar	92	642	6.98
Rajasthan	90	230	2.56
Jammu & Kashmir	12	12	1.00
TOTAL	173,005	855,763	4.95

Source : Spices Board

Indian turmeric is considered the best in the world market because of its high curcumin content. India exported 5150 tonnes of turmeric valued at Rs.164.80 crores during 2006-07. From India's total turmeric exports, 65% exported to UAE, USA, Japan, Srilanka, UK, and Malaysia. The institutional sector in the West buys ground turmeric and oleoresins, while dry turmeric is preferred by the industrial sector.

Turmeric is available in two seasons in India *i.e.*,February to May and August to October. The various varieties of turmeric that are traded in India are Allepey Finger (Kerala), Erode Turmeric (Tamil Nadu), Salem Turmeric (Tamil Nadu), Rajapore Turmeric (Maharashtra), Sangli Turmeric (Maharashtra), Nizamabad Bulb (Andhra Pradesh) *etc.* The major trading centers of turmeric are Nizamabad, Dugirala in Andhra Pradesn, Sangli in Maharshtra and Salem, Erode, Dharmapuri and Coimbatore in Tamil Nadu.

4. Organic farming :

Organic farming is a crop production method which encourages sustainable agriculture by enhancing the biological cycles in nature. It is targeted at producing healthy, nutritive, pollution free food maximising the use of on farm resources and minimising the use of off-farm resources. It seeks to avoid the use of chemical nutrients and pesticides. The guidelines for organic farming of spice crops is enclosed in Annexure I.

5. Organic production :

5.1 Climate and soil

Turmeric requires a warm and humid climate. It can be grown in diverse tropical conditions from sea level to 1500mm above MSL within a temperature range of 20-30°C with a rainfall of 1500 mm or more per annum or under irrigated conditions. Though turmeric thrives in different types of soil ranging from light black loam, red soils to clayey loams, rich loamy soils having natural drainage and irrigation facilities are the best. Turmeric cannot stand water stagnation or alkalinity.

Turmeric can be cultivated organically as an intercrop along with other crops provided that all the companion crops are also organically grown. In some areas, turmeric is grown as an intercrop with mango, jack and litchi and on the west coast with coconut and arecanut.

Often castor and pigeon pea are planted on the borders and on irrigation channels to provide shade

5.2 Rotation

Turmeric is grown in rotation with sugarcane, chilli, onion, garlic, elephant foot yam, vegetables, pulses, wheat, ragi and maize. It is cultivated as a subsidiary crop to ginger in some areas and in other areas with chilli and quick-growing vegetables.

5.3 Buffer zone

In order to cultivate turmeric organically a buffer zone of 25 to 50 feet shall be maintained if the neighbouing farms are non-organic. The produce from this zone shall not be treated as organic. Being an annual crop, turmeric requires a conversion period of two years.

5.4 Land preparation

While preparing the land, minimum tillage operations may be adopted. Beds of 15 cm height,1 m width and of convenient length may be prepared giving at least 50 cm spacing between beds. In the case of the irrigated crop, ridges and furrows are prepared and the rhizomes are planted in shallow pits on the top of the ridges. Spacing generally adopted is 45-60 cm between the ridges and 15-20 cm between the plants. Solarisation of beds is beneficial in checking the multiplication of pests and diseases causing organisms. The polythene sheets used for soil solarisation should be kept away safely after the work is completed.

5.5 Planting material

Carefully preserved seed rhizomes free from pests and diseases which are collected from organically cultivated farms should be used for planting. However, to begin with seed material from high yielding local varieties may be used in the absence of organically produced seeds. For sowing, both the mother - rhizomes and fingers are used. The fingers are cut into 4 - 5 cm long pieces, and the mother rhizomes are planted as such or split into two; each having at least one sound bud. The seed is sometimes sprouted under moist straw before sowing.

5.6 Varieties

A number of cultivars are available in the country and are known mostly by the name of the locality where they are cultivated. The cultivated varieties show considerable variation in size and colour of the rhizomes and curcumin content. More than 5 per cent curcumin content and lemon yellow, orange or orange yellow coloured turmeric powder are preferred in the international market. There are two dominant types of turmeric found on the world market: 'Madras', and 'Alleppey', both named after the regions of production in India. The orange-yellow flesh Alleppey turmeric is predominantly imported by the United States, where users prefer it as a spice and a food colorant. Alleppey turmeric contains about 3.5% to 5.5% volatile oils, and 4.0% to 7.0% curcumin. In contrast, the Madras type contains only 2% of volatile oils and 2% of curcumin. The Madras turmeric is preferred by the British and Middle Eastern markets for its more intense, brighter and lighter yellow color.

The Patna variety is noted for its deep colour. Of the two types cultivated in Maharashtra, 'Lokhandi' has bright coloured hard rhizomes and the other has light-coloured soft rhizomes. The

popular commercial varieties in Andhra Pradesh are 'Duggirala' of Guntur and 'Tekurpeta' which has long, stout, smooth and hard fingers. 'Kasturi Pasupa' of the Godavari Delta, the 'Armoor' type of the Nizamabad area and the 'Chaya Pasupa' are the other important varieties of Andhra Pradesh. In Orissa important varieties cultivated are Roma, Suroma, Ranga and Rasmi. Lakadong variety of ginger is grown in Meghalaya and this variety is popular for high curcumin content of 5 to 5.05%.

5.7 Planting

At the time of planting 25 g powdered neem cake mix well with soil is applied in each pit taken at a spacing of 20-25 cm within and between rows. Seed rhizomes may be put in shallow pits and covered with well rotten cattle manure or compost mixed with *Trichoderma* (10 gm compost inoculated with *Tricoderma*). A seed rate of 1000 kg rhizomes is required for planting one acre of land. As an intercrop in a fruit-garden seed rate may be as low as 125 - 200 kg per acre. Turmeric can be planted during April-July with the receipt of pre monsoon showers.

5.8 Cultural practices

Mulching the beds with green leaves is an important practice beneficial to this crop when planting is done on raised beds. This helps to enhance germination of seed rhizomes, prevents wash off of soil due to heavy rains, adds organic matter to the soil and conserves moisture during the dry period. Care may be taken to include a mix of leguminous crops with leaves rich in nitrogen content, phosphorus content like Acalypha weed and potassium content like Calotropis as mulch. The first mulching is to be done at the time of planting with green leaves @ 4-5 tonnes per acre. It is to be repeated again @ 2 tonnes / acre at 50th day after planting. Cow dung slurry may be poured on the bed after each mulching to enhance microbial activity and nutrient availability. Weeding may be carried out depending on the intensity of weed growth. Such materials may be used for mulching. Proper drainage channels are to be provided in the inter rows to drain off stagnant water.

5.9 Manuring

Turmeric needs heavy manuring. Application of well rotten cow dung or compost from own farm @2-3 tonne /acre may be given as basal dose while planting rhizomes in the pits. In addition, application of neem cake @ 0.8 tonnes/ acre is also desirable.

5.10 Plant protection

The underlying approach for pest and disease management under organic production is based on a range of preventive and other management strategies to minimize the incidence of pests and diseases. Regular field surveillance, adoption of phyto sanitary measures combined with understanding the life cycles of both pest and its predators will allow decisions to be made

regarding the need to intervene for managing the pest population.

5.10.1 Pests

If shoot borer incidence is noticed, such shoots may be cut open and larve picked out and destroyed. If necessary neem oil 0.5% may be sprayed at fortnightly intervals.

5.10.2 Diseases

No major disease is noticed in turmeric. Leaf spot and leaf blotch can be controlled by restricted use of Bordeaux mixture 1%. Application of Trichoderma at the time of planting can check the incidence of rhizome rot.

5.11 Harvesting and curing

The crop has to be harvested at the right maturity and is ready for harvesting in about 7 to 9 months after sowing depending upon the variety. The aromatic types mature in about 7 months, the intermediate types in about 8 months and the late types in about 9 months.

Usually the land is ploughed and the rhizomes are gathered by hand picking or the clumps are carefully lifted with a spade. Harvested rhizomes are cleaned of mud and other extraneous matter adhering to them. The average yield per acre is 8 -10 tonnes of green turmeric.

Fingers are separated from mother rhizomes. Mother rhizomes are usually kept as seed material. The green turmeric is cured for obtaining dry turmeric. Curing involves boiling of rhizomes in fresh water and drying it in the sun. No chemical should be used for processing. The cleaned rhizomes are boiled in copper or galvanized iron or earthen vessels, with water just enough to soak them. Boil till the fingers/mother rhizomes become soft. The cooked turmeric is taken out of the pan by lifting the troughs and draining the water into the pan itself. The same hot water in the pan can be used for boiling the next lot of raw turmeric which is already filled in the troughs. Alternatively, rhizomes may also be cooked using baskets with perforated bottom and sides. The mother rhizomes and the fingers are cured separately. The cooking of turmeric is to be done within 2-3 days after harvest.

The cooked fingers/mother rhizomes are spread on bamboo mats or cement floor under the sun for drying. The rhizomes are spread in 5-7 cm thick layers for desirable colour of the dried product. During night time the material should be heaped or covered. It may take 10-15 days for the rhizomes to become completely dry. Artificial drying using cross-flow hot air at a maximum temperature of 60°C is also found to give a satisfactory product. In the case of sliced turmeric, artificial drying has a clear advantage giving brighter coloured product than sun drying which

tends to suffer from surface bleaching. The recovery of dry product varies from 20-25% depending upon the variety and the location where the crop is grown. Dried turmeric has a poor appearance and rough dull colour outside the surface with scales and root bits. Smoothening and polishing the outer surface by manual or mechanical rubbing improves the appearance.

Manual polishing consists of rubbing the dried turmeric fingers on a hard surface. The improved method is by using hand-operated barrel or drum mounted on a central axis, the sides of which are made of expanded metal mesh. When the drum filled with turmeric is rotated, polishing is effected by abrasion of the surface against the mesh as well as by mutual rubbing against each other as they roll inside the drum. The turmeric is also polished in power-operated drums. The colour of the turmeric always attracts the buyers. In order to impart attractive yellow colour, turmeric suspension in water is added to the polishing drum in the last 10 minutes. When the rhizomes are uniformly coated with suspension they may be dried in the sun.

5.12 Preservation of seed

Rhizomes for seed are generally heaped under the shade of trees or in well-ventilated sheds and covered with turmeric leaves. Sometimes, the heap is plastered over with earth mixed with cow dung. The seed rhizomes can also be stored in pits with sawdust. The pits can be covered with wooden planks with one or two holes for aeration.

5.13 Yield

The yield of pure crop varies from 8000 to 10000 kg per acre. Under exceptionally favourable conditions, viz. abundant manuring and copious irrigation it may be as high as 12000 kg per acre.

6. Linkages :

Spices Board supports production, processing, certification and marketing of organic spices. Assistance is provided for organic cultivation of turmeric in select states. Spices Board has also programmes to encourage production of Lakadong turmeric in the North Eastern States. Spices Board has been designated as one of the agencies empowered to accredit certification agencies. Spices Board is also implementing the scheme for Export Oriented Production during the XI Plan where in assistance is being provided for promotion of organic turmeric under various programmes as indicated in **Annexure II**

7. Financial aspects :

7.1 Sale price

The farm gate price of cured turmeric has been considered at Rs.25/kg.

7.2 Cost of cultivation

The cost of cultivation for 1.0 acre organic turmeric cultivation is Rs 34800/- per acre. The detailed cost of cultivation is given in **Annexure -III.**

7.3 Margin

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

7.4 Bank loan

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

7.5 Rate of interest

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

7.6 Security

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

8. Conclusion

The net income from organic cultivation and curing of turmeric is Rs. 23900/-. The activity is technically feasible, financially viable and bankable.