

## An Economic Analysis of Production and Marketing of Tamarind in Srinivasapura Taluk of Kolar District, Karnataka

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### ABSTRACT

The present study was carried out in Srinivasapura taluk which has the highest area under tamarind in Kolar district of Karnataka. The study focused on assessment of costs and returns of tamarind production, documentation of harvesting and post-harvest practices, and analysis of marketing of tamarind in Srinivasapura taluk. The primary data related to tamarind production, harvesting, post-harvest practices and marketing of tamarind was collected from 50 sample farmers in Srinivasapura taluk. To achieve the specific objectives of the study, descriptive statistics including simple averages and percentages was adopted. The study found that the total cost of tamarind cultivation per acre was Rs.47,881/-, the average gross returns realized was Rs.89,744/- and the average net returns amounted to Rs.41,863/-. The benefit-cost ratio of Rs.1.87 indicates that tamarind production generated reasonably good returns under rainfed conditions. In the study area, traditional method of harvesting and post-harvest handling was followed which involved manual labour at all stages of harvesting, drying, deseeding, bagging, and preparing the tamarind for the market. Majority (62 %) of the farmers sold their produce to pre-harvest contractors. Immediate cash payment by the pre-harvest contractors, farm gate sales, and easy disposal of small quantities of produce were the major reasons for farmers to choose pre-harvest contractors for selling tamarind. Based on the findings of the study, it can be concluded that adoption of new technology in production and management practices of tamarind results in more yield and would fetch additional income to farmers. The farmers skilled in processing and retailing can opt for value addition by adopting hygienic process at all stages of harvesting and marketing, and can also indulge in selling branded packages of tamarind to realize higher prices in potential markets.

**Keywords :** Tamarind, Pre-harvest contractors, Value-addition, Potential markets

INDIA known as the 'home of spices' produces about 175 of the 109 varieties listed by the International Organisation for Standardisation and accounts for half of the global trade in spices (www.ibef.org). Tamarind (*Tamarindus indica*) is a leguminous tree in the family fabaceae. Indigenous to Tropical Africa with its origin in Madagascar, it is now cultivated in India, Thailand, Mexico, the Middle East, Africa, Asia, Australia and America. Ancient Arabic traders found tamarind in India and gave the name *tamar-hind* that meant 'dry date of India'. India is the world's largest producer of

tamarind followed by Thailand. The total tamarind production in India stood at 163.31 thousand metric tonnes from an area of 44.10 thousand hectares with productivity of 3,703 kgs per hectare in the year 2019-20 (Anonymous, 2020a). Tamarind is an important cash crop of India for export earnings. Tamarind exports from India stood at 96,652 tonnes valued at US \$ 1,14,529 in the year 2019 (Anonymous, 2020b). India exports tamarind to Iraq, Saudi Arabia, Bangladesh, Vietnam, Turkey, Egypt, USA and other countries of the world (El-Siddiq *et al.*, 2006).

For growers, tamarind is termed as 'black gold' fetching a good price ranging from Rs.25,000 to Rs.30,000 per tonne. Tamarind is a must in Indian kitchens as an important condiment / adjunct used as an acidic / flavouring agent in cookery consisting of juices, chutneys, sauces, etc. Tamarind pulp has an excellent keeping quality when dried and cured with salt. Sudharani and Umadevi (2019) also reported about *Garcinia cambogia* commonly known as Malabar tamarind *vis-a-vis* tamarind that the Malabar tamarind fruits, bark, leaves and stem are used as anti-obesity, anti-cancerous, anti-inflammation, anti-oxidant and anti-microbial agents. The Malabar fruit rind is commonly used as food preservative agent or tendering agent or flavouring agent or foodbulking agent for culinary purpose. In India, tamarind is primarily consumed in southern region. The per capita annual consumption of tamarind in southern region of India is 1,014 grams which is four times higher than the average consumption in the country (Srivastava, 2017).

The tamarind tree produces pods consisting of the fruit, while the outer shell is brittle encapsulating the pulp and embedded seeds. There are two varieties of tamarind: sweet and sour. Sweet tamarind is harvested ripe and consumed fresh while the sour variety is processed into a range of value added products - tamarind pulp, juice, powder, chutney, pickles, sauces, sugar coated candies and tamarind kernel powder (Josua and Dudhade, 2006). Similar observations were reported by Shyamamma *et al.* (2017) regarding jack fruit as the one of the largest edible fruit in the world, rich in carbohydrates, protein and minerals and the ripe jack fruits being used in the preparation of canned products such as nectar, jam, jelly, fruit bar, candy, etc.

The tamarind seed is also used in industrial application and the fruit pulp is used as fixative with turmeric in dyeing. Tamarind seeds yield a cheap substitute for cereal starch which is used in textile industry. The leaves form an important source of food and herbal medicine and are also eaten by cattle, goats, and silkworms. The flowers are rated as a good source of nectar for honeybees. The sapwood is highly priced

for furniture, paneling, wheels, axles, gears for mills, ploughs, planking for sides of boats and wells. Tamarind twigs are sometimes used as chew sticks and the bark of tree as masticator alone or in place of lime with betel nut.

Tamarind is an important fruit tree found grown in parts of India under rainfed conditions, especially in Karnataka, Tamil Nadu, Maharashtra, Andhra Pradesh, Madhya Pradesh and Odisha. India produces about 2.50 lakh tonnes of tamarind pulp annually. A well-managed tree yields 300-500 kg ripe pods. Many-a-times, trees or entire plantation is auctioned to the traders who manage harvesting as well as marketing. Karnataka stood second accounting for 24.50 per cent of tamarind production in 2019-20 with 40.03 thousand tonnes next to Tamil Nadu with 44.67 thousand metric tonnes (www.indiastat.com).

In Karnataka state, Kolar district stood first in production of tamarind with an area of 3,489 hectares and production of 14,656 tonnes in the year 2016-17. The major tamarind growing taluks in Kolar district are Srinivaspura, Mulbagal and Bangarpet. These three taluks account for 85.06 per cent of total area under tamarind in Kolar district (<http://horticulture.kar.nic.in>). The production of tamarind is a subsidiary occupation for the dryland farmers in Kolar district which is the major production region in Karnataka state. There are no scientific studies on production and marketing of tamarind and there is a huge gap in the availability of research findings. Keeping these facts in view, the present study was carried out in Srinivaspura taluk of Kolar district of Karnataka to estimate the costs and returns of tamarind production, to document the harvest and post-harvest practices in tamarind and to analyse the marketing of tamarind.

## METHODOLOGY

The present study was carried out in Srinivaspura taluk of Kolar district of Karnataka state. Tamarind occupied an area of 3,489 hectares in Kolar district during the year 2017. Out of the five taluks in Kolar, Srinivaspura taluk was selected for the study since

this taluk recorded highest area, *i.e.*, 1,182 hectares (33.88 %) under tamarind cultivation.

Srinivaspura taluk consists of five hoblis, *viz.*, Ronur, Nelavanki, Kasaba, Yeldur and Rayalpadu. Out of these five hoblis, Ronur hobli that recorded higher area under tamarind cultivation (as per interaction with local progressive farmers and the officials of the Department of Forestry and Horticulture, Kolar district) was selected for the study. Ten villages with substantial acreage under tamarind (based on interaction with Village Panchayath Officials and local progressive farmers), *viz.*, Ronur, Doddapalli, Naramakalapalli, Dimbala, Reddampalli, Kotapalli, Kurumakalahalli, Kaniganipalli, Thadigol and Chikkadevanapalli in Ronur hobli of Srinivaspura taluk were purposively selected for collection of primary data. Five tamarind farmers from each village were selected randomly, thus forming a sample size of 50. Five traders from Chintamani Agricultural Produce Market Committee (APMC) in Kolar district were also selected to elicit information on marketing of tamarind.

The primary data from farmers pertaining to tamarind crop was collected during March-April 2019 by using a well-structured and pre-tested schedule through a survey of sample respondents. The specific information regarding various inputs used, details on the cost of cultivation, yield, returns and marketing of tamarind was collected from farmers. The information on harvest and post-harvest practices were also elicited from farmers and market intermediaries.

To fulfill the specific objectives of the study, descriptive statistics including simple averages and percentages was adopted.

## RESULTS AND DISCUSSION

### Cost of Cultivation of Tamarind

The details of different inputs used and their values per acre of tamarind cultivation by sample farmers are presented in Table 1. The total cost of tamarind cultivation per acre was Rs.47,881/-. Out of this, the total variable cost amounted to Rs.23,868/- (49.85 % of the total cost). The cost of hired human labour

including man and woman labour being Rs.13,200/- (27.57 % of the total cost) was the major item among variable costs. The cost of farm yard manure at Rs.6,000/- formed the second highest cost (12.53 %) followed by interest on working capital (Rs.1,768/-), machine labour (Rs.1,500/-) and marketing expenses (Rs.1,400/-).

It was found that there was no income in the first six years of planting of tamarind in the study area. However, intercropping with field bean, cowpea, horse gram and ragi crops compensated for the labour and other costs. Tamarind trees bear fruits from the seventh year of planting. Information from the Periyakulam Research Station, Tamil Nadu, India by Ramana *et al.*, 2006 indicate that the cost involved in production is mostly for field labour and the purchase of seedlings or grafts. As there is no income in the initial years of tamarind plantation, intercropping with annual crops compensate for the labour and other costs.

The total fixed cost per acre of tamarind was Rs.21,013/- accounting for 43.89 per cent of the total cost. Out of this, the rental value of land was the major item accounting for 24.76 per cent (Rs.11,857/-) followed by amortized cost with 9.52 per cent (Rs.4,556/-), managerial cost (Rs.4,080/-), the cost towards depreciation (Rs.500/-) and land revenue (Rs.20/-). Since tamarind is a tree spice crop, the rental value of land acquired the highest cost among the fixed costs.

### Yield and Returns from Tamarind Cultivation

The average yield per acre was 31.50 quintals among the sample farmers. On an average, 15 tamarind trees were planted in one acre of land. The yield per tree as revealed by the farmers was 2.10 quintals. A full-grown tree is reported to yield about 180-225 kgs of fruits per season (Anonymous, 1988). In India, the average production of tamarind pods per tree is 175 kgs and of processed pulp is 70 kgs per tree. The best yielding elite trees in Bangalore have pod yields ranging from 250-350 kgs / tree and pulp yields of 100-175 kgs / tree (Kulkarni *et al.*, 1993). The tamarind yield grown in rainfed conditions in the study

TABLE 1  
Cost of cultivation and returns from tamarind production in Srinivasapura taluk

Particulars	Quantity	Cost / Return (Rs. / acre)	Per cent to total
Hired human labour - Mandays (no.)	14.00	8,400	17.54
Womandays (no.)	12.00	4,800	10.03
Machine labour (hrs.)	2.00	1,500	3.13
Farm yard manure (tractor loads)	2.00	6,000	12.53
Marketing Expenses		1,400	2.93
Interest on working capital (@ 8 %)		1,768	3.69
Total Variable Cost (Cost A)		23,868	49.85
Land revenue		20	0.04
Rental value of land		11,857	24.76
Amortized establishment cost		4,556	9.52
Depreciation on farm machinery and farm buildings		500	1.04
Managerial cost (10 % of all costs)		4,080	8.52
Total Fixed Cost		21,013	43.89
Cost B (Cost A + Fixed cost)		44,881	93.73
Imputed value of family labour (mandays)	5.00	3,000	6.27
Total Cost / Cost C (Cost C = Cost B + imputed value of family labour)		47,881	100.00
Output (quintals)	31.50		
Price per quintal (Rs.)	2,849		
Gross Returns		89,744	
Net Returns (Gross returns – Total cost)		41,863	
Net Returns per quintal		1,329	
Benefit-cost Ratio		1.87	

Note : 1. Wage rate: Rs. 600 / day for male and Rs. 400 / day for female; 2. Tractor hiring charges: Rs. 750 / hour; 3. FYM: Rs. 3,000 / tractor load

area, *i.e.*, Srinivasapura taluk with 210 kgs per tree is comparable with yield in Bengaluru elite trees.

Tamarind trees begin to bear from the fourth year if they are vegetatively propagated with a pod yield of 40 kgs / tree giving a net profit of Rs.14,000/- per hectare. When the trees reach maximum bearing at 10 years, a yield of about 100 kgs / tree could be harvested with a profit of Rs.38,000/- (Ramana *et al.*, 2006).

With regard to the average yield, gross and net returns per acre of tamarind among the selected farmers in the study area, it can be observed from the Table 1 that the average total cost of cultivation per acre with fifteen trees was Rs.47,881/-. The average price that

prevailed in the study area during harvest season of tamarind (Jan-April) was Rs.2,849/- per quintal. Accordingly, the average gross returns realized from the sale of 31.50 quintals of tamarind was Rs.89,744/- per acre. The average net returns per acre of tamarind after deducting the total cost from the gross returns amounted to Rs.41,863/-. The net returns per quintal amounted to Rs.361.96/-. Based on these returns, it can be concluded that latest technology in production and management practices of tamarind to yield more will generate additional income to farmers. The benefit-cost ratio of 1.87 indicates that tamarind production yielded reasonably good returns. Every rupee invested in tamarind production yielded a return of Rs.1.87 under rainfed conditions.

## Harvesting of Tamarind

Harvesting of tamarind fruits commences when the pods become brittle on pressing. The methods of harvesting include hitting the fruit with long sticks after climbing the tree or plucking it off from the low hanging branches or by shaking the tree. Generally, the mode of drying is done by the way of leaving the fruit in shell and allowing it to dry on ground. In the area under study, harvesting of tamarind included climbing the tree to beat the fruits and shaking the branches or hitting the fruit with long bamboo ladders and also by pulling the pods away from the stalks by using sickle.

Tamarind trees grown from seed take more than seven years to start bearing and go on up to 10 or 12 years before an appreciable crop is produced. Unselected trees in India are late bearers and may take 10-14 years before fruiting. Well-tended trees grown in open areas will come into bearing early, in about seven years or less while grafted trees will however come into bearing several years earlier, and usually start fruiting after 4-5 years of planting (El-Siddiq *et al.*, 2006).

The tamarind fruit yields are influenced by genetic and environmental factors, but the age of the tree is not correlated with fruit yield. The size of the tree is obviously a factor however, and older trees which have had many years to mature, would be expected to be larger and so produce a greater yield. The age of bearing is important in relation to profits (Feungchan *et al.*, 1996).

Tamarind fruits mature in late spring to early summer. The fruits are left on the tree as long as six months after maturity so that the moisture content will be reduced by 20 per cent. Fruits for immediate processing are often harvested by pulling the pod away from the stalk or clipping with a hook mounted on a stick. The fruits are harvested during January-April months and the yield varies with soil type, climate, propagation method, and management practices.

In the study area, after harvest, pods were spread on the ground for 7-8 days. The shell and seeds as well as the fibrous material was removed by beating the

harvested fruit with wooden mallet or hammer, or by beating with stone for deseeding. After deseeding, the pulp was sundried and stored before marketing. The farmers generally processed the tamarind fruit by using traditional methods of seed expulsion such as beating with wooden mallet, stone or hammer. The post-harvest operations such as dehulling, de-fibring and deseeding were carried out simultaneously by engaging the labourers. The efficiency of these operations depended on labour availability and favourable weather conditions. The steps in preliminary processing of tamarind followed in the study area is presented in Fig. 1.

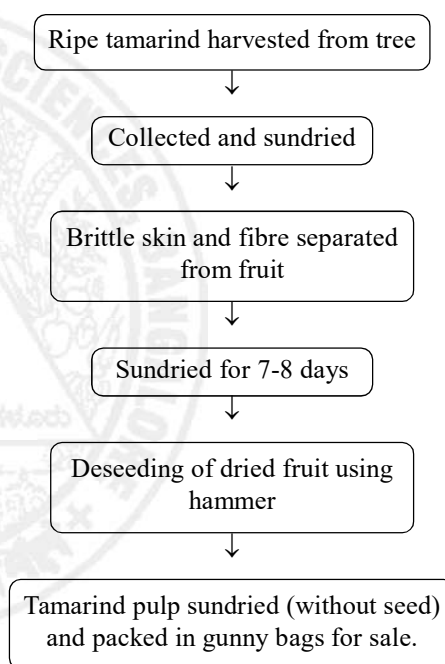


Fig. 1 : Steps in preliminary processing of tamarind followed in the study area

The results proved that tamarind cultivation, post-harvest processing, and marketing is labour-intensive and was able to provide employment for wage earners in the study area, *i.e.*, Srinivaspura taluk. Harvesting and processing of tamarind provides sufficient labour employment as most of these activities are done manually. Tamarind harvest in Karnataka attracts labourers from neighbouring Andhra Pradesh state, who either clean the pod or cultivate tamarind on leased land (Kundapura, 2016).

### Post-Harvest Practices of Tamarind

In the study area, majority (90 %) of the sample farmers sold de-husked tamarind, six per cent of the farmers sold de-fibered tamarind and only four per cent of farmers sold without seed in small quantities to retailers and consumers (Table 2).

TABLE 2

Type of the tamarind sold by the sample farmers

Tamarind type	No. of farmers	Quantity sold (kg)	Per cent
De-husked	45	2,700	90.00
De-fibered	3	180	6.00
De-seeded	2	120	4.00
Total	50	3,000	100.00

The commonly available market samples of tamarind pulp usually contain extraneous matter such as seed, dust, fibre, etc. and hence can be unfit for various culinary preparations. Usually, the farmers clean the fruit after harvest by removing the husk, fibre, and other impurities. Value addition is of immense benefit for traders and consumers. The processed products of tamarind can meet the requirements of consumers such as convenience and ready-to-use. Tamarind is used for the preparation of various processed products such as used in soups, jams, chutneys, sauces, tamarind juice, concentrate, powder, pickles and paste etc.

Tamarind processing technology followed at the producer level was found to be primitive and no scientific method of processing was followed by farmers. The details of expenses involved in marketing of tamarind is presented in Table 3. Since the labourers themselves did the grading along with weighing, loading and unloading, the charges are included in the wages paid to them and considered in the cost of cultivation presented in Table 1. However, the farmers incurred transportation cost of Rs.331/- per tonne and it costed them Rs.1043/- per acre for transporting the tamarind (31.50 qtls.) to markets located about 20 kilometers away from their field. The farmers paid Rs.357/- to commission agents for selling 31.50 qtls.

TABLE 3

Marketing expenses of tamarind farmers

Particulars	Rs./ton	Rs./acre
Grading, weighing, loading and unloading*	-	-
Transportation charges	331	1043
Commission charges	113.5	357
Total	444	1400

of the tamarind to traders in the market. Although, a number of processing technologies are available, they are not widely disseminated among growers in the study area. Simple methods for processing, storage, and value addition need to be deployed to farmers which emphasizes the need for extension programmes.

### Marketed Surplus of Tamarind

The marketed surplus accounted for about 95 per cent (Table 4) followed by a paltry home consumption of around five per cent in the study area. Tamarind is used as traditional flavouring agent for porridge in every household. Generally, almost all the sample farmers retained a small portion of tamarind harvest for household consumption and medicinal purposes specifically in the treatment of digestive disorders.

TABLE 4

Marketed surplus of tamarind among sample farmers

Particulars	Kgs (per acre)
Quantity harvested	3,150
Quantity consumed	150
Quantity sold	3,000
Marketed surplus (as % of total harvest)	95.23

### Marketing of Tamarind

Four marketing channels for tamarind were prevalent in the study area.

Channel 1 : Farmer → Pre-harvest contractor  
→ Trader → Retailer → Consumer

Channel 2 : Farmer → APMC (Commission Agent /  
Trader) → Retailer → Consumer

Channel 3 : Farmer → Retailer → Consumer

Channel 4 : Farmer → Consumer (Village level)

In Channel 1, the farmers sold tamarind directly to pre-harvest contractors (Table 5). Majority (62 %) of the farmers sold their produce to pre-harvest contractors, followed by APMC (28 %), retailers (6 %), and directly to consumers (4 %). The pre-harvest contractors were the major players in marketing of tamarind in the study area.

Although, the harvested tamarind fruits contributed to the households' income either directly or indirectly, there was some quantity which was not harvested from the trees by the farmers and hence, was not accounted / neglected in the returns / income of sample households.

Majority of the farmers directly sold their produce to pre-harvest contractors, due to high labour cost involved in harvesting and preparing the product for marketing. Besides, immediate cash payment by the pre-harvest contractors, farm gate sales, and easy disposal of the produce were the major reasons to choose Channel 1. Many-a-times, trees or entire plantation is auctioned to the contractors / traders who manage harvesting as well as marketing in the study area.

Farmers also sold their produce to traders / commission agents at Agriculture Produce Market Committee (APMC) of Chintamani taluk and realised higher prices (Rs. 39.50 / kg) (Channel 2) compared to other channels. In Chinthamani APMC, the traders sold the tamarind to other traders and processors. Other traders from Punganuru, Chilamathur, Mysuru and Hindupura markets purchase tamarind from Chinthamani APMC. In Chinthamani APMC, traders did not keep any stock and did not involve in any processing activities due lack of storage and processing facilities. Besides, labour cost is high for manual processing of tamarind. In the selected market, *i.e.*, Chintamani APMC, traders fixed price based on the parameters such as number of the seeds contained in the fruit, purity, colour of fruit, and freshness in that order. Traders preferred good quality of tamarind which in-turn brought good revenue to farmers also. Farmers sold small quantities of their produce directly to retailers and consumers in the event of meeting their immediate cash requirements and to avoid transportation, loading and unloading charges, and other associated costs. (Channel 3 & Channel 4). The farmers sold tamarind at lower prices (Rs. 28.58 / kg.) to relatives, friends and nearby retail shops due to less bargaining power.

The choice of the marketing channels becomes more important for the farmers since they realize higher profits with the lower marketing cost. Majority of the sample farmers directly sold their produce to pre-harvest contractors, and also through commission agents, traders, retailers and consumers. The prices

TABLE 5  
Marketing channels of tamarind in Srinivaspura taluk, Kolar district  
(n = 50)

Marketing channels	No. of farmers	Quantity sold (kgs.)	Price (Rs. / kg.)
Farmer → Pre-harvest contractor → Trader → Retailer → Consumer	31 (62.00)	1,412.10 (47.07)	18.22
Farmer → APMC* (Commission Agent / Trader) → Retailer → Consumer	14 (28.00)	676.50 (22.55)	39.50
Farmer → Retailer → Consumer	3 (6.00)	580.50 (19.35)	27.66
Farmer → Consumer (Village level)	2 (4.00)	330.90 (11.03)	28.58
Total	50 (100.00)	3,000 (100.00)	-

Note : \* Agriculture Produce Market Committee ; Figures in the parentheses indicate percentage to total

received by farmers were low. Hence, organized marketing channels, such as village level co-operatives, fair price shops or similar marketing institutions can help farmers to realise greater share in final consumer rupee. Besides, local market surveys will be useful to identify potential markets for various products of tamarind.

Vivekananda Girijana Kalyana Kendra (VGKK), a NGO in Biligiri Rangana Hills region of Karnataka, is involved in helping the tribals who collect the tamarind from the nearby forest. The NGO helps in production and marketing of deseeded tamarind in the form of tamarind blocks (0.5-1 kg) wrapped with polythene film. Such initiatives could strengthen the tamarind marketability in Srinivasapura taluk also. Small scale collection centres like Self-Help Groups or NGOs can be established to strengthen the local tamarind markets as there is domestic demand for tamarind. Since tamarind production areas located near potential consumer markets, public, private, and co-operative units may also be established to create a strong platform for exploiting the domestic demand.

The results of the study indicated that tamarind production is a profitable venture. The farmers as well as traders of tamarind fruits can form associations to identify the markets for expanding both domestic and export markets. The available market opportunities need to be identified, assessed and the potential markets need to be promoted so that farmers can earn higher income through better marketing opportunities. Farmers can go for value addition of tamarind by adopting hygienic process at all stages of harvesting and marketing and can indulge in selling branded packages of tamarind to realize high prices in potential markets. Since, the supply of tamarind fruit is higher in the study area, Government, NGOs and other stakeholders can initiate the establishment of processing units of tamarind to produce value added consumable goods such as tamarind juice, tamarind jam, tamarind syrup, and candy to exploit the high consumption of tamarind in southern region of India. This will increase the utilization of economic potential of tamarind fruits as well as create employment opportunities for youth in rural area. The Government

and NGOs need to facilitate farmers by providing training on knowledge such as processing, storage, etc., and link them to markets in order to promote marketing of tamarind.

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