Original Research Article

Moringa oleifera: Production and Marketing in Tiruppur District

ABSTRACT

Aim: The study aimed at analyzing both the production and marketing aspects of *Moringa oleifera*. The main objective of this study was to analyze price and cost along the existing marketing channels of Moringa, and identify the most efficient channel. The study also sheds light on factors that affect the choice of market channel for Moringa marketing.

Methodology: Tiruppur district of Tamil Nadu was selected for the study based on Moringa area and production statistics. Non- probability sampling technique was used to select the sample respondents. The sample consisted of 40 Moringa farmers and 35 market intermediaries (10 Local traders / Commission agents, 10 Wholesalers, 5 Processors and 10 Retailers). Conventional analysis using percentage; price spread along the chain was estimated by calculating farmer's net price, marketing margin and farmer's share in consumer's rupee; technical efficiency of the farmers were measured using Data Envelopment Analysis (DEAP software version 2.1).

Results: Moringa was the most cultivated crop as it was drought tolerantand generated higher profits.About 50 percent of farmers operated in a technical efficiency range greater than 0.90 and, technical efficiency varied substantially between 0.67 and 1.00, with a mean technical efficiency of 0.89. Majority of the farmers preferred selling their produce to local traders and the reason for preferring that channel was it saved their time. Marketing Margin of processors were the highest.

Conclusion: Farmers can sell their produce directly to the retailers, as it was found to be the most efficient channel. Farmers could be better educated through government aided consultancy services and these consultancy firms and farmers associations, could work together. Price fluctuation presents a favorable climate for value addition processes in the study area and processors can expand the existing small-scale activities to meet out the demand.

Keywords: Intermediaries, Moringa, Marketing, Price spread, Production, Technical efficiency.

1. INTRODUCTION

Among agricultural enterprises, horticulture contributes a major share to the growth of economy. There has been a technology driven, steady expansion in cultivation area, total production and consumer utilization of horticultural crops in India, facilitated by enhanced scientific support through concerted research activities. Its role in the country's nutritional security and poverty alleviation is becoming increasingly important. India is a country with diverse agro climatic zones,favoring production of horticultural crops.

*Moringa oleifera*is grown for its leaves, flower buds, and fruit pods(Taher *et al.*, 2017)[18]. It has its origin in North West India and now has become a popular vegetable in South Indian states. In India, both area and production of Moringa is highest in Andhra Pradesh, followed by Karnataka and Tamil Nadu. Production and processing of thisplant can generate employment and boost the economy. Moringa Fund, Trees for Life and Global Moringa Network are some of the international initiatives taken to improve production and develop marketing processes. Many countries have National Association of Moringa, which organize producers, consumers, processors and researchers; and discuss issues related to Moringa. Despite great economic importance, *Moringa oleifera* is still an under exploited and an underutilized crop(Pandey et al., 2011)[12].

Choosing markets and marketing channels are important, as they decide the price of the product. Marketing channels are a set of interdependent organizations involved in the process of making a product or service available for consumption (Coughlan *et al*., 2005)[6].Age of farmers, distance to market, membership in farmer organizations, and quantity produced are some of the determinants of market channel. Farmers become price takers due to lack of bargaining power and thereby, do not receive fair price during transaction. Traditional supply chain consists of large number of intermediaries, who add up to the marketing margin (Xaba, 2012)[19]. It was pointed out that producer's share in consumers' rupee for horticultural crops range between 30% - 60% and marketing efficiency was low (Sidhu, 2011)[16]. Studies on agricultural marketing revealed that the efficiency of

marketing channels was low and also, producer's share of consumer price was low. Length of the channel determines the efficiency and marketing cost of the channel. Longer channels are often inefficient and high in marketing cost. Reducing the producer-consumer distance through direct marketing, increased both producer and consumer welfare. (Ghorbani, 2008; Sarode, 2009)[9,13]. Price spread varied from one channel to other for agricultural commodities (Suryapraksh *et al.,* 1979)[17] and marketing efficiency can be increased only by reducing marketing costs (Emam, 2011)[7]. Producer's share in consumers' rupee was more in certain channels due to direct selling of the produce by farmers (Sidhu, 2011)[16]. Zeb *et al.,* (2007)[21] identified thatdistance between production and consumption markets, road conditions, season, packaging, storage and processing to be the factors that influence marketing costs.In this study, marketing cost is referred to the cost incurred by Moringa farmers and intermediaries in the movement of Moringa from producer to consumer. It included transportation costs, processing costs and labour wages incurred by the producers and the intermediaries along the chain.

The main objective of this study was to analyze price and cost along the existing marketing channels of Moringa and,identify the most efficient channel. The study also sheds light on factors that affect the choice of market channel for Moringa marketing.

2. METHODOLOGY

2.1 Data sampling plan: Tiruppur district of Tamil Nadu was selected for the study based on Moringa area and production statistics.Non- probability sampling technique was used to select the sample respondents. The sample consisted of 40 Moringa farmers and 35 market intermediaries (10 Local traders / Commission agents, 10 Wholesalers, 5 Processors and 10 Retailers). Primary data were collected from the sample respondents using a detailed structured questionnaire. Secondary data related to the study were collected from the records available in the Department of Economics and Statistics at Tiruppur, from the Government Departments of Agriculture and Horticulture at Tiruppur district, and also from official websites of the district.

2.2 Tools for analysis: Conventional analysis using percentage; Price Spread along the chain was estimated by calculating Farmer's Net Price, Marketing Margin and Farmer's Share in Consumer's Rupee; Technical efficiency of the farmers were measured using Data Envelopment Analysis (DEAP software version 2.1).

2.2.1 Farmers' Net Price

$$NP_F = GP_F - \{C_F + (L_F * GP_F)\} \quad (2.1)$$

In (2.1), NP_F is the net price received by the farmers (Rs/kg), GP_F is the gross price received by farmers or wholesale price received by the farmer (Rs/kg), C_F is the cost incurred by the farmers during marketing (Rs/kg), and L_F is the physical loss in produce from harvest till it reaches the market (in kg).

2.2.2 Marketing Margin:

$$\text{Intermediary's margin} = \{GP - PP - MC - L\} \quad (2.2)$$

In (2.2), GP is gross price, PP is Purchase price, MC is cost of marketing and L is the loss in value during wholesaling.

2.2.3 Farmer's Share in Consumer's Rupee

$$F_S = (F_P / C_P) * 100 \quad (2.3)$$

In (2.3), F_S is farmer's share in consumer's rupee (in percentage), F_P is the price received by the farmer (Rs/unit) and C_P is the price paid by the consumer (Rs/unit).

2.2.4 Data Envelopment Analysis (DEA)

In this study, DEA- CRS model (*Constant Returns to Scale*) was used to measure to the production efficiency of the Moringa farmers by comparing the input- output transformation with the help of DEAP software version 2.1. Calculating technical efficiency helped in identifying the efficient Moringa farmers among the sample farmers. Input oriented DEA (i.e. minimizing input use to obtain a particular output level) was used to estimate CRS, following the input

oriented linear programming model in order to measure the overall technical efficiency of Moringa farms (Coelli, 1998)[5].

$$\text{Min}_{\theta, \lambda}\ \theta$$

$$\text{Subject to} \quad -y_i + Y\lambda \geq 0$$

$$\theta x_i - X\lambda \geq 0 \qquad (2.4)$$

$$\lambda \geq 0$$

where,

y_i is a vector (m x 1) of Moringa output for i^{th} Moringa producing farms (MPF),

x_i is a vector (k x 1) of inputs for i^{th} MPF,

Y is a Moringa output matrix (n x m) for 'n' number of farms,

X is the Moringa input matrix (n x k) for 'n' number of farms,

θ is efficiency score, a scalar whose value will be efficiency measure for each 'i' farm. If θ=1, then MPF will be efficient; otherwise inefficient.

λ is a n x 1 vector which gives the optimal solution. For an inefficient MPF, the λ values will be the weights used in the linear combination of other, efficient, MPFs, which influence the projection of the inefficient TPF on the calculated frontier.

Regression model for this study is given in the equation below:

$$Y = a\, x_1^{b1}\, x_2^{b2}\, x_3^{b3}\, x_4^{b4}\, x_5^{b5} \qquad (2.5)$$

where,

Y = Technical efficiency scores, x_1 =Yield of Moringa expressed in kilograms per farm, x_2 = seeds used for planting (kgs), x_3 = fertilizer (kgs), x_4 = human labour (man days), x_5 = plant protection chemicals (litres) and, 'a' and 'b' are the constant and co-efficient respectively.

3. RESULTS AND DISCUSSION

Data pertaining to production and marketing aspects of Moringa were collected, analyzed, presented and discussed in the following section.

3.1 Moringa production

Three different varieties of Moringa were majorly cultivated in the selected study area, of which Chedi Murungai was the local annual Moringa; Maram Murungai was perennial Moringa and PKM 1 was an annual Moringa variety.Chedi and Maram Murungai varieties were planted during the months November-December and PKM 1 was planted during the months of July-October and November-December. Among the three varieties, PKM 1 had the highest yield.

Table 1. Planting and harvesting period of Moringa

Varieties	Planting season	Average yield	Harvesting period
Chedi Murungai	Nov-Dec	180 Pods /Tree/Year	Every 45th day from planting
Maram Murungai	Nov-Dec	80Pods/Tree/Year	
PKM 1	Jul-Oct, Nov-Dec	200 Pods /Tree/Year	

It was important to trace each and every actor along the chain right from the input suppliers. The results revealed that majority of the sample farmers used their own seeds for cultivation (77.50 percent) and Chedi Murungai was the most cultivated variety (52.20 percent). Also, around 10 percentof the sample farmers cultivated a combination of both Chedi and Maram Murungai.Apart from climate and soil suitability, majority of the farmers cultivated Moringa as it generated regular income, wasdrought tolerant and less labour intensive.

Advisory services provideinformation to farmers like crops on demand, prices offered, right production methods for the crop, where exactly the crop is to be sold and other such information. Farmers can get information from various sources, including agriculture

extension offices, research institutions, universities, farmer associations, non-governmental organizations and input supply companies. Similarly, farmer associations ensure participation of farmers in formulating and implementing policies, and in other agricultural development actions.It was observed that majority of the farmers (97.50 percent) did not receive any advisory services and did not hold membership in any associations.

Agricultural produce is bound to pre-harvest loss and hence,the factors responsible for pre harvest losses in Moringa were studied. Relevant data collected from the sample farmers was analyzed and the results are furnished in Table 2.

Table 2. Moringa cultivation

Particulars	Number of Farmers	Percentage to Total
(i) Source of seeds		
Own	31	77.50
Retail outlets	01	2.50
Agricultural Universities	05	12.50
Neighbours and Friends	03	7.50
(ii) Varieties of Moringa cultivated		
Chedi Murungai	21	52.50
Maram Murungai	10	25.00
PKM 1	5	12.50
Both Chedi and Maram	4	10.00
(iii) Reasons for cultivation of Moringa		
Drought tolerant	06	15.00
Regular income	02	5.00
Less labour	02	5.00
Drought tolerant and Regular income	09	22.50
Higher profit and Drought tolerant	07	17.50

Drought tolerant and Less labour	09	22.50
Less labour and Regular income	05	12.50
(iv) Pre harvest losses in Moringa		
Flower drop	12	30.00
Pod fly infestation*(Gitonia distigma)*	07	17.50
Bud worms*(Noorda moringae)*	04	10.00
Leaf cutter bees*(Megachile sp.)*	03	7.50
Flower drop and Pod fly infestation	03	7.50
Flower drop and Bud worms	05	12.50
Pod fly infestation and Bud worms	05	12.50
Pod fly infestation and Leaf cutter bees	01	2.50

**Total number of farmers, n=40.*

3.1.1 Technical efficiency of Moringa production

The results showed that in CRS assumption, about 50 percent of farmers operated in a technical efficiency range greater than 0.90, about 2.50 percent were below the efficiency level of 0.70, 12.50 percent were between the levels 0.70 - 0.80 and 35 percent between 0.81 - 0.90. Furthermore, technical efficiency varied substantially between 0.67 and 1.00, with a mean technical efficiency of 0.89(Table 3).

Table 3. Technical efficiency in Moringa production

Particulars	**Values**	
Efficiency levels	**Frequency (CRS)**	**Percentage**
< 0.70	1	2.50
0.70 - 0.80	5	12.50
0.81 - 0.90	14	35.00
> 0.90	20	50.00
Mean	0.89	

Minimum efficiency	0.67
Maximum efficiency	1.00

3.2 Marketing channel preferred by farmers

Most of theproducers used market intermediaries to sell their produce in the market and these intermediaries made up the marketing channel (Figure 1). The results revealed that 65percent, 25 percent, 2.50 percent and 7.50 percentof the sample farmers sold their produce through channel- I, II,III and IV respectively.

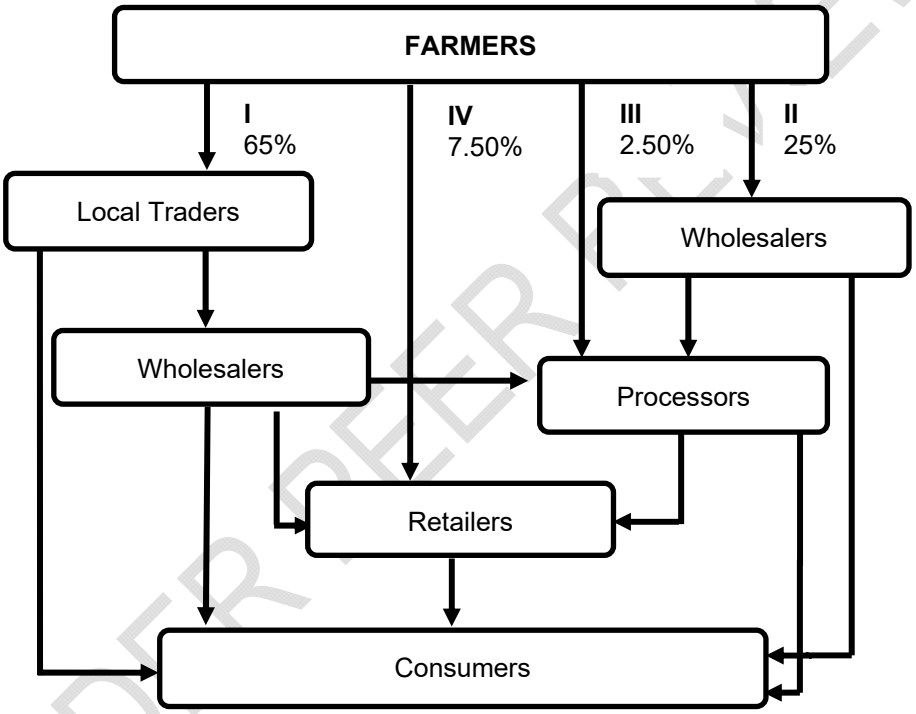

Figure 1. Marketing channel preferred by sample farmers

Choosinga particular market channel (Figure 2) was dependent upon various factors likesaving time (35%of the sample farmers), transportation charges being comparatively less(30%),quantity variations and transportation difficulties (15%), and scarcity of labour for loading and unloading (5%).

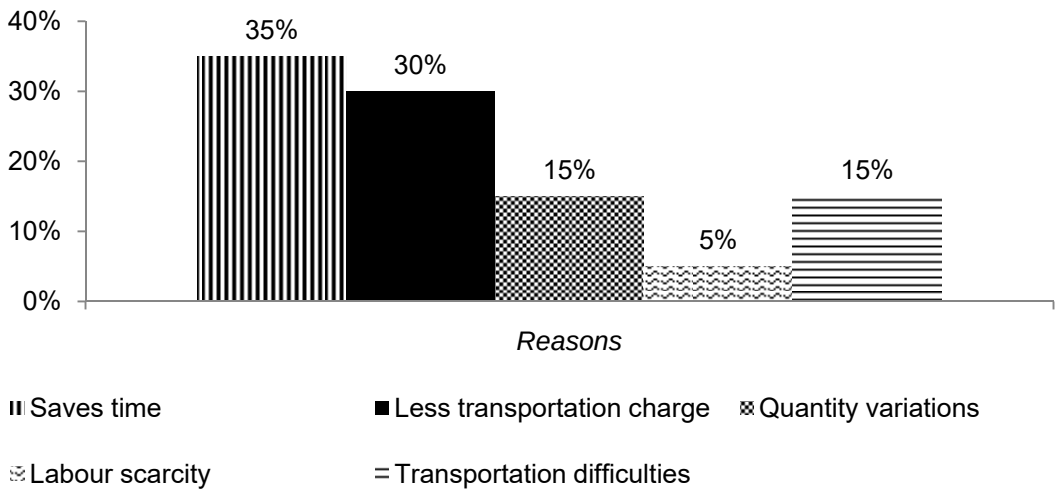

Figure 2. Reasons for a particular preferring marketing channel

Marketing plays an important role in all enterprises, regardless of size. When it comes to selling farm produce,it is always immediacy and transparency that is being considered in selling. In this study, the produce was sold in the nearby markets as it reduced transportation difficulties, saved their time and the rapport they had with traders and consumers in those markets. About 42.50 percent of the produce was marketed at Oddanchathiram vegetable market, followed by 25 percent at Mulanur local market, 22.50 percent at Vadugapatti market and 4 percent at daily markets in Paramathi, Vellakovil, Koodalur and Kannivaadi.

As the chain involved various intermediaries, it was important to cognize to whom the individual intermediary sold the procured produce further (Figure 3). It wasobservedthat, majority (60 percent) of the local traders sold the commodity to wholesalers.About 40 percent of the sample wholesalers directly sold the commodity in other states, 30 percent to the processors, 20 percent to the retailers and only 10 percent of the wholesalers sold it to consumers.60 percent of the sample processors exported their commodity, 20 percent sold it to retailers and 20 percent sold to consumers.

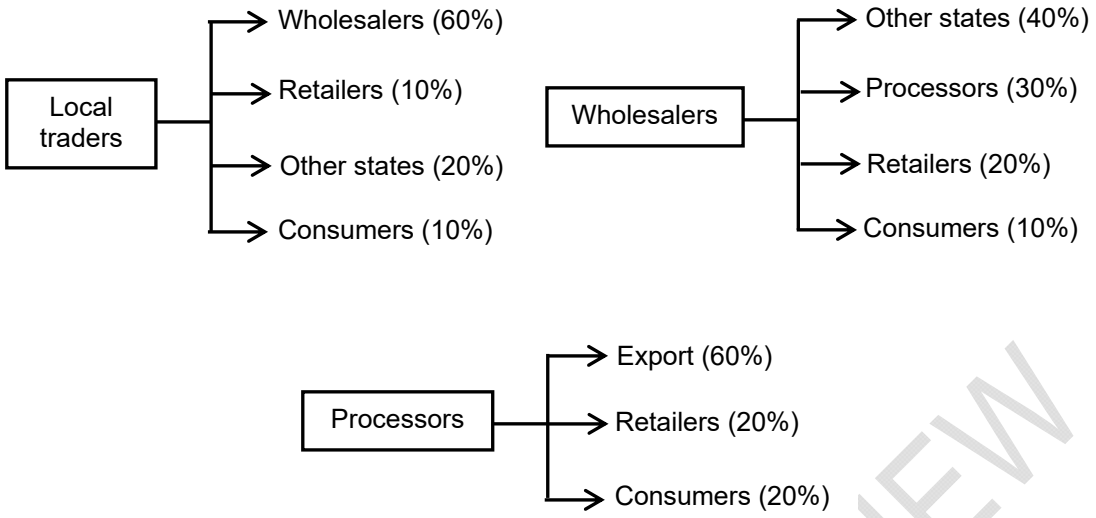

Figure 3. Selling pattern of the intermediaries

The sample market intermediaries were asked to rank their procurement preferences of the produce from I to V, where the most important criteria was ranked I and the least was ranked V (Table 4).

Table 4. Procurement preferences of market intermediaries

Factors	Mean Score	Rank
Bulk quantity in single place	52.63	I
Colour (Light / Dark green)	51.29	II
Freshness	50.06	III
Thickness	50.03	IV
Variety	44.00	V

Availability of storage facility with the market intermediaries was studied (Table 5). It was observed that majority (56%) of the sample intermediaries did not own or hire any storage facility, whereas 36 percent of them owned storage facilities and 8 percent of the sample intermediaries hired storage facilities.

Table 5. Availability of storage facility with market intermediaries

Storage facility	Market intermediaries			Overall
	Local traders	Wholesalers	Processors	
Owned	0	5	4	9 (36.00)
Hired	0	1	1	2 (8.00)
No storage facility	10	4	0	14 (56.00)
Total	10	10	5	25 (100.00)

**Figures in parentheses indicate percentage to total*

3.3 Price spread along the chain of Moringa Pods

Price-spread explains in detail the actual price received by producers, price paid by consumers, costs incurred and margins earned by market intermediaries in the process of marketing Moringa.

3.3.1 Marketing Margin

Market intermediaries incurred expenses for the services rendered by them in the process of moving fresh produce from the farmers to ultimate consumers. While doing so, they made profits to sustain in the business. Marketing margin was calculated with the help of sale price, purchase price, cost incurred during marketing and loss. The margins threw light on efficiency with which Moringa market was functioning in the study area. The details of marketing margin of each intermediary are furnished in Table 6. Local traders purchased the produce at Rs. 22.70 per kg, whereas wholesalers purchased at Rs. 24 per kg. Processors and retailers purchased the produce at Rs. 25.50 and Rs. 27 per kg on an average. The sale price of the produce ranged between Rs. 26.80 to Rs. 35.50 per kg. Cost of Marketing incurred by the local traders, wholesalers, processors and retailers were Rs.

2.25 per kg, Re. 1 per kg, Rs. 3 per kg and Rs. 2 per kg respectively. Loss of the produce ranged between Rs. 0.17 to Rs. 2.50perkg. Marketing Margin of the Processors was the highest, followed by wholesalers, retailers and local traders.

Table 6. Marketing margin of the intermediaries

Market Intermediary	Average Price (Rs./ kg)				
	Sale price	Purchase Price	Cost of Marketing	Loss	Marketing Margin
Local traders	26.80	22.70	2.25	0.56	1.29
Wholesalers	29.20	24.00	1.00	1.50	2.70
Processors	35.50	25.50	3.00	2.50	4.50
Retailers	31.00	27.00	2.00	0.17	1.83

3.3.2 Farmer's share in Consumer's rupee

Farmer's share in consumer's rupee does not remain constant. Higher the grower's share, higher is the marketing efficiency and vice versa. It refers to the price received by the Moringa farmer and is expressed as percentage of the ultimate consumer's price. In this study, farmer's share in consumer rupee was estimated as 66.12% (Table 7). This is because, when the produce reached the final consumer, farmer's share in consumer's rupee was very minimal as it involved a number of intermediaries and high marketing costs.

Table 7.Farmer's share in Consumer's rupee

Particulars	Price (Rs)
Farmer's price (Selling price/ kg)	20.50
Consumer's price (Purchase price/ kg)	31.00
Farmer's share in Consumer's rupee (Percentage)	66.12

3.3.3 Farmer's Net Price

Net price received by the farmers were calculated and was estimated as Rs. 17.45 per kg, where the gross price received by the farmers by selling the produce was Rs. 18.05 per kg, Cost of Marketing was Re. 1 per kg and physical loss of the produce was 0.49 kg on an average.

4. CONCLUSION

Most of the farmers preferred selling their produce through longer channelswhich did not yield much gain to them. Instead, they can sell their produce directly to the retailer, which was found to be the most efficient channel. Creating awareness amongfarmers and farmer associations, for effective exchange of information on price, technology and other advancements would enhance their profitability and livelihood. Price fluctuation presents a favorable climate for value addition processes in the study area and processors can expand the existing small-scale activities to meet out the demand.

This study attempted to examine the marketing channels of Moringa in Tiruppur district of Tamil Nadu. The sample was limited to four villages in the districts and hence the results cannot be generalized to other regions. The total sample size was restricted taking into account the lack of time and other resources. The data also pertained to one single year and care must be taken to extrapolate the results of the study for future years even for the same region. Futures studies can explore the export potential of Moringa, which will boost the production and economics of the commodity. Issues in production, processing and marketing of Moringa can be identified and addressed in future studies.

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