



RESEARCH ARTICLE

An empirical study on maize value chain in Tamil Nadu

S Aruna Prabha¹, N Venkatesa Palanichamy^{2*}, D Muruganathi³, KM Shivakumar⁴, M Kalpana⁵ & M Balakrishnan⁶

¹Department of Agricultural and Rural Management, Tamil Nadu Agricultural University, Coimbatore 641 003, Tamil Nadu, India

²Agriculture College and Research Institute, Tamil Nadu Agricultural University, Coimbatore 641 003, Tamil Nadu, India

³Directorate of Agribusiness Development, Tamil Nadu Agricultural University, Coimbatore 641 003, Tamil Nadu, India

⁴Department of Agricultural Economics, Tamil Nadu Agricultural University, Coimbatore 641 003, Tamil Nadu, India

⁵Office of the Dean (Agri), Tamil Nadu Agricultural University, Coimbatore 641 003, Tamil Nadu, India

⁶Department of Food Process Engineering, Tamil Nadu Agricultural University, Coimbatore 641 003, Tamil Nadu, India

*Email: nvpchamy@tnau.ac.in

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Abstract

Maize is one of the leading staple cereals in the world in terms of production and it is termed as a most versatile and multipurpose industrial and energy crop. Due to varied number of value-added products evolving in the recent years, maize has a major shift towards indirect consumption in Tamil Nadu. Therefore, the study is selected to analyse market efficiency of different marketing channels in the maize value chain in Tamil Nadu. The primary data on cultivation of maize is collected from 60 maize producers of Perambalur and Salem districts of Tamil Nadu. Value chain analysis of maize includes producers, traders, commission agents, processors (poultry feed units), wholesalers, retailers and the consumers (livestock farmers). Price spread and marketing efficiency of different marketing channels is calculated. Among the three existing marketing channels of maize in Tamil Nadu, Channel III is considered to be the best channel by the maize producers and it is confirmed by the Acharya's approach which have higher marketing efficiency. The farmers share in consumer rupee in the marketing channel III was high compared to other marketing channels. The study is intended to help the maize farmers in adopting a better marketing channel where they can get better profit in maize cultivation by adopting less intervention of market intermediaries.

Keywords

maize; marketing efficiency; marketing channels; price spread

Introduction

Maize has emerged as one of the leading staple cereals in the world in terms of production by surpassing one billion tonnes (1,2). Human diet is dominated by major three staple cereals (rice, wheat and maize) which accounted for 42 per cent and 37 per cent of the calories and protein intake (3). With further investigating the importance of the crop, it is one of the most versatile and a multi-purpose industrial and energy crop (4). This industrial crop would yield 3000 products directly or indirectly which creates wide range of opportunities in value addition (5). Due to rapid urbanization and income growth, the consumption of maize as animal feed is increased especially in Asian countries thereby inducing the indirect consumption Among all the countries, Asia accounted for 25 per cent of the total global poultry production (6, 7).

Considering the area under wheat in the world, it is estimated that maize will overtake wheat in its area and production since its production is tripled from 2 tons/ha in 1961 to 6 tons/ha in 2021(3,8). Since the projected global population is set to increase by 9.7 billion by 2050, an estimate found that the annual world maize consumption would increase by 37 million tonnes (9). The utilization pattern of maize in world and India is tabulated below in Table 1 and 2.

The productivity of maize in India is only about 2.5 Metric tonnes per hectare which is very much lower than the global average of 5.5 Metric tonnes per hectare. Low adoption of Single Cross Hybrids is one of the reasons for low productivity in India (10). Adoption of Single Cross Hybrids would drive India in increasing the productivity of maize which is the major driving force in other countries like USA and China. Investment in research and development would yield better maize hybrids which helps the poultry sector as it is accounted for 47 per cent of the India total maize consumption. However, the consumption of maize is shifted from direct to indirect consumption during the last few decades due to its importance in the poultry sector (11, 12). Maize is one of the major nutrients and a largest component in the cost of production of poultry feed for the broilers and layers. Therefore, increase in production of poultry feed would drastically increases the demand for maize in India (13).

Maize contributed around 60 per cent of the poultry feed which has a greater calorific value and a favoured grain in production of feed for broilers and layers. Since maize has 20 per cent lower cost of production than

wheat, the demand for maize is preferably more. Maize is also used as a starch due to its rise in consumption of food and pharmaceutical industry. It is also used in textile, pharmaceutical and paper industries which is a excellent source of carbohydrate. However, pharmaceutical and food industry is expected to increase by 12-15% and textile and paper industry would increase by 6-7% which acts as major demand driver of maize.

Maize is also used as as substitute of tapioca due to its higher starch content (60-65%). On the other hand, this energy crop turned its direction towards production of fuel alcohol (ethanol) which is anticipated to increase within the next 10 years. Due to its higher shelf life compared to other biomass sources like sugarcane and sorghum, demand for maize in ethanol industry is picking up in the recent years. Higher the usage of maize as a fuel alcohol higher will the production of ethanol industry (12).

Besides all these strengths in maize cultivation, some of the challenges is also identified in the maize value chain. Intervention of market intermediaries like local traders, commission agents which results in high marketing margin, less profit received by the farmers, lack of infrastructure facilities and change in weather conditions resulting in low production (14). Therefore, the study is selected to analyse market efficiency of different marketing channels in the maize value chain. The study will help the maize farmers to adopt a better marketing channel where they can get better profit in maize cultivation by adopting less intervention of market intermediaries.

Table 1. Utilization of maize by region

Region	Food (%)	Feed (%)	Seed (%)	Post-harvest losses (%)	Processing (%)	Other uses (non-food) (%)
Africa	54.3	30.3	1.1	8.3	1.6	3.5
Eastern & Southern	65.8	19.8	1.2	6.7	1.4	5.2
West & Central	53.3	27.1	1.7	11.7	2.6	0.4
Northern	34.6	53.2	0.2	7.4	0.7	3.8
Asia	11.6	64.2	1.0	4.9	2.7	15.6
South	35.6	50.9	2.6	8.7	0.8	2.1
East Asia	5.3	69.9	0.9	4.8	3.6	15.6
South-East Asia	20.1	47.0	0.4	3.6	0.5	28.3
West & Central	21.7	66.7	0.6	2.5	1.7	6.6
Americas	7.5	50.5	0.5	6.9	5.9	28.7
Northern	1.4	44.6	0.3	5.6	7.5	40.6
Central & South	21.1	63.6	1.0	9.6	2.5	2.2
Europe	5.6	75.7	0.9	2.6	9.0	6.4
Oceania	18.5	66.8	0.2	1.5	3.1	10.0
Lower income countries	43.1	41.0	1.7	7.9	1.6	4.9
Higher income countries	7.6	59.0	0.6	5.5	5.2	22.1
World	12.8	56.3	0.7	5.8	4.7	19.6

Source: FAOStat (2021)

Table 2. Supply and demand of maize in world and India

Elements	Unit in Million Tonnes			
	World		India	
	2022/23	2023/24 estimate	2022/23	2023/24 estimate
Total Supply	1,479.43	1,527.68	39.21	37.58
Production	1,173.46	1,240.24	38.09	35.67
Total utilization	1,479.43	1,527.68	39.21	37.58
Domestic Utilization	1,189.39	1,219.21	34.1	35.2
Feed Use	705.85	725.13	19.8	20.5
Food Use	146.91	149	8.3	8.5
Other Uses	336.64	345.08	6	6.2

Source: Agriculture Market Information System, FAO, 2024

Materials and Methods

The primary data on cultivation of maize is collected from the maize producers of Perambalur and Salem districts of Tamil Nadu where the maize cultivation is highly concentrated in these districts. Value chain analysis of maize includes producers, traders, commission agents, processors (poultry feed units), wholesalers, retailers and the consumers (livestock farmers). Data on intermediaries of the maize value chain were collected by using well-structured questionnaire. Movement of maize from the producer to the end user is surveyed and validated by using snowball sampling method. The information on processing of maize as a poultry feed is collected from the processors (poultry feed units) of Tirupur district which is identified as ODOP district by the Ministry of Food Processing Industries, Government of India. The details on numbers of stakeholders surveyed for the value chain analysis is tabulated in the table 3. Secondary data on area, production and productivity and utilization pattern of maize is collected from various sources like Directorate of Economics and Statistics by Government of India, Agriculture Market Information System by Food and Agriculture Organization.

Table 3. Number of stakeholders selected for the study

S. No	Stakeholders	Numbers
1.	Maize Producers/Farmers	60
2.	Local traders	10
3.	Commission agents/Wholesalers	10
4.	Processors/Poultry feed units	6

Compound Annual Growth Rate (CAGR) is worked out to examine whether the area, production and productivity of maize is increased or decreased during the period of time. Value chain analysis of maize is studied by involving all stakeholders considering their individual cost and returns from the producer to the consumer. To estimate the maximum share attained by the stakeholders of the existing value chain, price spread analysis is used in the present study. Price spread of maize is defined as the price paid by the livestock farmers (consumers) and the price received by the producer of maize by concurrent margin method (15). Marketing costs and returns of each stakeholder is tracked and estimated which is expressed as a percentage of consumer rupee for analyzing the price spread. Farmers share in consumer price is the ratio of farmers net selling price and consumer price and it is expressed in Equation 1.

$$FS = FP/CP \times 100 \quad \text{Eqn. 1}$$

Where,

FS- Farmer share in consumer rupee

FP- Farmer selling price

CP- Consumer purchase price

With the continuation of price spread analysis, marketing efficiency of each marketing channels is tracked and calculated. The intensity on market performance of a value chain is explained by its market efficiency. If the commodities or the products in the value chain is

transferred the producer to the consumer by incurring minimum cost in addition fulfilling the consumer's demand (16). The efficient marketing channel is identified by using two approaches namely Acharya's approach and Shepard's approach.

According to Acharya's approach, the attributes considered are total margin cost, margin, price gained by the producer and the price paid by the consumer. Marketing channel is said to be less efficient if it incurs higher marketing cost and margin by the intermediaries and higher price paid by the consumer (17). Similarly, the marketing channel is said to be highly efficient if the price received by the farmer is higher compared to other intermediaries in the marketing channel.

$$ME = FP/(MC+MM) \quad \text{Eqn. 2}$$

Where,

ME- Marketing efficiency

FP- Farmer selling price

MC- Total marketing cost of intermediaries

MM-Total marketing margin of the intermediaries

Results and Discussion

To study the maize value chain in Tamil Nadu, Compound Annual Growth Rate analysis, Price Spread and Marketing channels of maize is analyzed and discussed below in this section.

Compound Annual Growth Rate (CAGR) analysis of maize

Compound Annual Growth Rate (CAGR) is worked out to examine whether the area, production and productivity of maize is increased or decreased during the period of time. Trend on area, production and productivity of maize is tabulated in Table 4.

At global level, the area under maize cultivation is increased at 0.87 per cent per annum, production has positively increased at 2.78 per cent per annum and productivity has increased 3 per cent per annum at 5 per cent level of significance. At national level, the area, production and productivity are increased at 1.43 per cent, 4.44 per cent and 2.98 per cent per annum at 5 per cent level of significance.

Comparing the maize production in India and World, production of India is increased two-fold. At Tamil Nadu level, the area, production and productivity of maize is increased at 4.11 per cent, 8.59 per cent, 4.31 per cent per annum respectively. Increase in area, production and productivity of maize in Tamil Nadu is due to shift in

Table 4. Trend in area, production and productivity in world, India and Tamil Nadu (2005-2022)

S. No	Variables	World	India	Tamil Nadu
1.	Area	0.87*	1.43*	4.11**
2.	Production	2.78*	4.44***	8.59***
3.	Productivity	3.00**	2.98**	4.31**

(Note - *** 1% per cent, ** 5 per cent and * 10 per cent level of significance)

cultivation from other dominant cereals like rice and wheat due to its low cost of production and better returns to farmers through value addition and increase in demand for poultry feed (12).

In the developing countries like India, maize is majorly cultivated and produced in the states of Karnataka, Bihar, Madhya Pradesh, Maharashtra, Telangana and Tamil Nadu. Among the above-mentioned states of India, Karnataka and Bihar were the major cultivators and producers of maize (18). The area and production of maize is graphically presented in the fig. 1 and 2.

During the last few decades, all the major producing states of India have shown significant and positive growth in the area and production of maize. This is due to technological advancements in producing high-quality seeds and diverse use of maize products. According to the Indian Maize Development Association, if the output increases 6-7 per cent annually, the maize production will increase by 42 million tonnes by 2025. Tamil Nadu has a remarkable increase in maize area and production due to its increased demand for poultry-based products. In Tamil Nadu, the major maize-producing districts are Perambalur, Salem, Dindigul, Villupuram and Tiruppur.

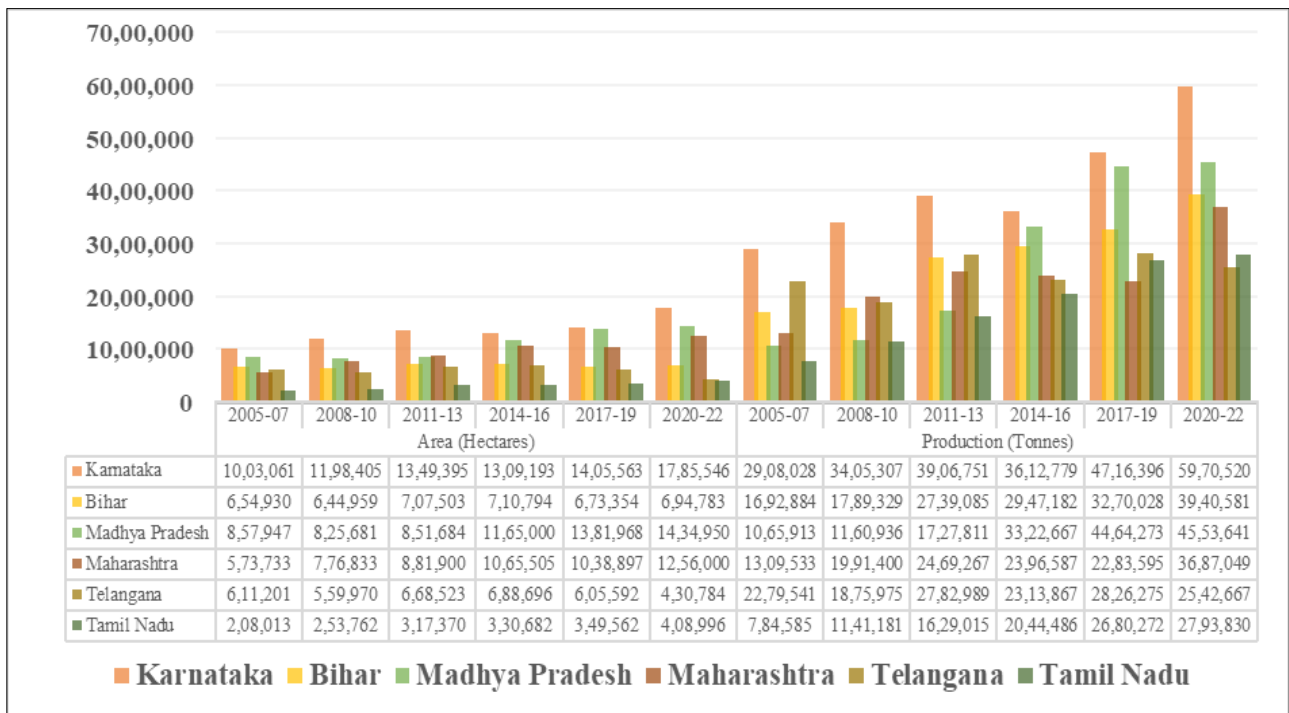


Fig. 1. Area and production of maize in India (2005-2022)

Source: Directorate of Economics and Statistics, Government of India, 2024

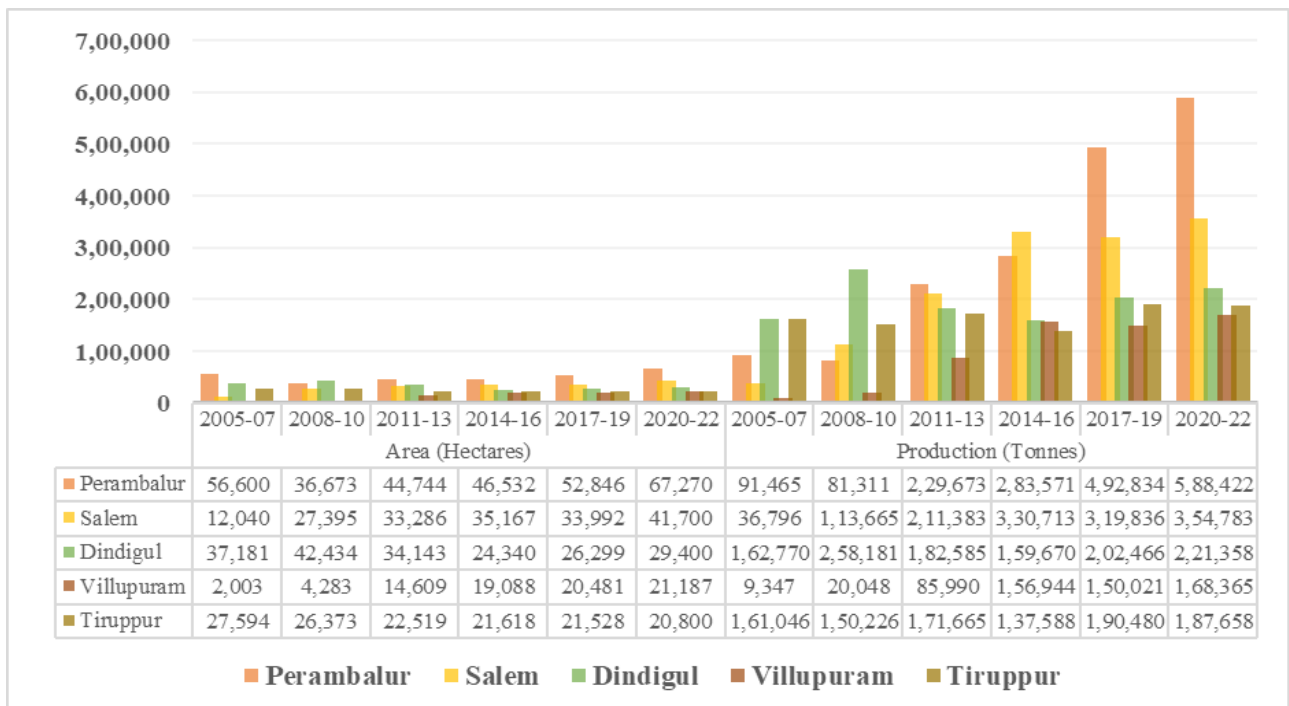


Fig. 2. Area and production of maize in Tamil Nadu (2005-2022)

Source: Directorate of Economics and Statistics, Government of India, 2022

Tamil Nadu ranks fourth in maize area and fifth in maize production. Since maize is a non-traditional crop, farmers have shifted their cultivation towards maize for several reasons. Price instability in sugarcane and turmeric is one of the major reasons for shifting the cultivation towards maize (19). Comparatively, the increase in maize production is due to shelf life, rapid liquidity, less water requirement and the demand for animal feed industries.

Demographic details of Maize farmers

The socio-economic characteristics has a significant impact on cultivation of crops. Hence, demographic variables such as age, education, occupation, experience in farm, size of the farm under cultivation and annual income of the maize farmers were collected through primary survey. The socio-economic characters of the maize farmers are tabulated in table 5.

Considering the socio demographic characters of maize farmers collected through primary data, it is clear that, majority of the maize farmers fall under the age category of 40-50 years of age and most of the farmers were educated at primary level. The occupation of majority of the farmers is only on agriculture where it is the only source of income for them. The farmers have 21-30 years of experience under maize cultivation and mostly the farmer belongs to the category of small farmers. On an average, their source of income from agriculture is about 1-2 lakhs per annum.

Table 5. Demographic details of maize farmers in Tamil Nadu

S. No	Particulars	Number of farmers	Percentage to total
1	Age		
	Below 30 years	10	16.67
	30-40 years	16	26.67
	40-50 years	22	36.67
	Above 50 years	12	20.00
	Total	60	100
2	Education		
	Illiterate	12	20.00
	Primary	18	30.00
	Secondary	16	26.67
	Graduate	14	23.33
	Total	60	100
3	Occupation		
	Agriculture	40	66.67
	Agriculture + others	20	33.33
	Total	60	100
4	Farming experience		
	Below 10 years	10	16.67
	11-20 years	15	25.00
	21-30 years	25	41.67
	Above 30 years	10	16.67
	Total	60	100
5	Farm size		
	Marginal farmer	20	33.33
	Small farmer	24	40.00
	Medium farmer	8	13.33
	Large farmer	8	13.33
	Total	60	100
6	Annual income		
	Below 1,00,000	20	33.33
	1,00,000-2,00,000	25	41.67
	Above 2,00,000	15	25.00
	Total	60	100

Source: Primary data (Survey)

Cost and Returns of Maize Cultivation in Tamil Nadu

Economics of production of maize is examined to know the cost incurred in maize production and returns received from the maize production. The cost and returns on maize cultivation are calculated based on the information gathered from maize farmers in the study area (Table 6 and 7).

Table 6. Cost of cultivation of maize in Preambular and Salem districts of Tamil Nadu

Sr. No.	Cost Items	(Rs. /ha)	Percentage
I.	Operational Cost	48408	67.26
	Human Labour & machine labour	27750	38.56
	Seed	6032	8.38
	Fertilizer & Manure	10085	14.01
	Plant protection Charges	1991	2.77
	Irrigation charges	1500	2.08
	Interest on working capital	1050	1.46
II.	Fixed Cost	17020	23.65
	Total (I+II)	65428	90.91
	Managerial cost @ 10%	6542	9.09
III.	Total cost	71970	100.00

Source: Primary data (survey)

Table 7. Returns of maize cultivation in Tamil Nadu

I.	Returns	(Rs. /ha)
	Yield (qtl/ha)	43.44
	Farm gate price (Rs. /qtl)	2400
	Gross Profit	104256
	Total Cost	71970
II.	Net Profit	32286
III.	Benefit-cost ratio	1.44

Source: Primary data (Survey)

It is observed that, a major percentage of cost incurred under operational activities which includes human and machine labour, seed, usage of fertilizer and manures, plant protection chemicals and irrigation charges. Human and machine labour includes Rs. 27750 per hectare and fertilizer and manures include Rs. 10085 per hectare. Fixed cost under maize cultivation includes Rs. 17020 per hectare in the study area. The total cost of maize cultivation is Rs. 71970 per hectare.

The productivity of maize in the Perambalur and Salem districts was about 43.44 quintals per hectare. The price received by the farmer is about Rs. 2400 per quintal. The gross profit received by the maize producer is about Rs. 104256 per hectare under maize cultivation. Considering the cost incurred in maize cultivation, the net profit received by the farmer is about Rs. 32286 per hectare. To realize better returns of the farmers, benefit cost ratio is calculated. The benefit cost ratio of maize cultivation is about 1.44.

Supply chain of Maize in Tamil Nadu

The supply chain of maize includes various intermediaries like local traders and wholesalers. There are three existing marketing channels under maize where Channel I include Producer, Local traders, Wholesalers and Processor/ Consumers. Channel II include Producer and Processor/ Consumers. Channel III include Producer, Regulated market, Wholesalers and Processor/ Consumers. Channel

It comes under contract farming where the processor provides the inputs like seeds, fertilizers, plant protection chemicals, and the farmer produces the output and is processed by the processor (poultry feed units) (Fig 3). However, the actors and activities involved in maize value chain is depicted in fig. 4.

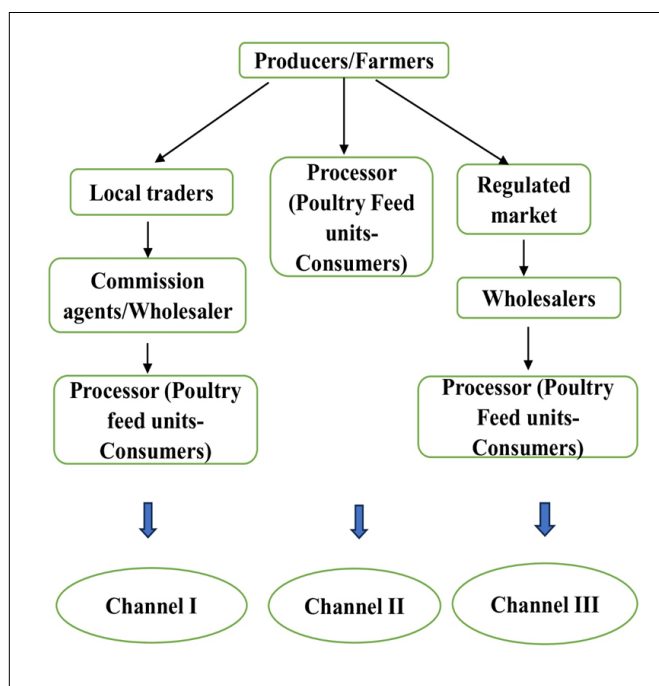
Only 10 per cent of farmers followed channel II, including producer and processor. Due to its high demand on the consumption of poultry feed by livestock, the demand for maize has increased in recent years (20, 21). The immediate and the first link in the marketing of maize are local traders. They assemble the produce immediately after harvest from cultivators. They receive information on the movement of maize in the nearby market either through Commission Agents or Wholesale merchants. Some commission agents act as a wholesaler in their local market and through brokers and direct contact they sell maize in another major assembling market. Wholesale

merchants store some of their produce to realize higher price during the offseason. Wholesale merchants bear transportation cost, market fee and storage cost upon purchasing from cultivators through commission agents. The activities under maize include input supply by the seed, fertilizer and pesticide suppliers, production, assembling the produce by the local traders, commission agents or wholesalers, processing done by the poultry feed units, retailing and final consumption by the livestock farmers (6). However, in the selected study, the processor is termed final consumer since the poultry feed channel differs from the marketing channel of maize and is turned into a value-added product.

Price spread of different marketing channels of maize in Tamil Nadu

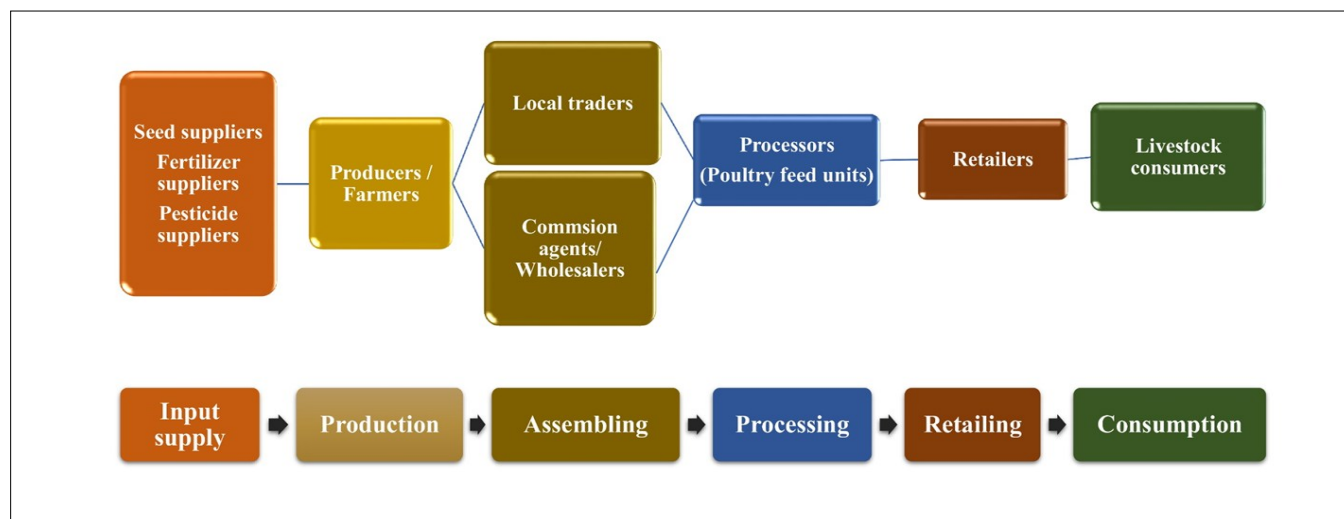
After identifying different marketing channels of maize, price spread is calculated among the various intermediaries. The cost incurred under different market intermediaries, including transport, loading and unloading and packing charges, were calculated and price spread is estimated (Table 8).

In Channel I, the producer received a price of Rs. 2350 per quintal, constituting 72.11 percent of the price paid by the consumers. The total marketing cost of farmers including transport, loading and unloading, packing and wastage costs were Rs. 162 per quintal which constituted about 5 per cent of price paid by the consumers. The gross price received by the producers were Rs. 2512 per quintal. Local traders are intermediaries who connect the farmer and wholesaler in the movement of maize. The purchase price of local trader were Rs. 2512 per quintal where he incurred with packaging, transport, loading and unloading, marketing charges with the total marketing cost of about Rs. 178.50 per quintal and the marketing margin of about Rs. 40.50 per quintal. As a whole, the sale price of the local trader to the wholesaler were Rs. 2721.00 which constituted about 86.96 per cent of the paid by the consumers. Wholesaler incurred the packaging, transport, loading and unloading, marketing charges, CES fee (1 per cent of total price sold) with the total marketing cost of about Rs. 178.00 per quintal and



Source: Primary data (Survey)

Fig. 3. Marketing channels of maize in Tamil Nadu



Source: Primary data (Survey)

Fig. 4. Actors and activities of the maize value chain in Tamil Nadu

Table 8. Price spread of marketing channels of maize in Perambalur and Salem districts in Tamil Nadu

S. No	Particulars	Channel I		Channel II		Channel III	
		Price (Rs/qtl)	Percentage to consumer price	Price (Rs/qtl)	Percentage to consumer price	Price (Rs/qtl)	Percentage to consumer price
1	Farmer						
a.	Producer price	2350.00	72.11	2650.00	87.86	2450.00	80.88
b.	Transport	60.50	1.86	100.50	3.33	60.00	1.98
c.	Loading and unloading charges	40.50	1.24	40.50	1.34	40.50	1.34
d.	Packing	35.00	1.07	35.00	1.16	35.00	1.16
e.	Wastage cost	26.00	0.80	30.00	0.99	26.00	0.86
f.	Total Marketing cost	162.00	4.97	206.00	6.83	161.50	5.33
g.	Gross price received	2512.00	77.08	2856.00	94.69	2611.50	86.22
2	Local traders						
a.	Purchase price	2512.00	77.08				
b.	Packaging cost	40.00	1.23				
c.	Transport cost	65.50	2.01				
d.	Wastage cost	30.00	0.92				
e.	Marketing fee	13.50	0.41				
f.	Miscellaneous	12.50	0.38				
g.	Commission charges	17.00	0.52				
h.	Total Marketing cost	178.50	5.48				
i.	Marketing margin	30.50	0.97				
j.	Sale price	2721.00	86.96				
3.	Wholesalers						
a.	Purchase price	2721.00	86.96			2611.00	86.20
b.	Transport cost	75.50	2.32			65.50	2.16
c.	Packaging cost	30.00	0.92			30.00	0.99
d.	Wastage cost	30.00	0.92			30.00	0.99
e.	CES Fee	30.00	0.92			29.00	0.96
e.	Miscellaneous	12.50	0.38			12.50	0.41
e.	Total Marketing cost	178.00	5.46			167.00	5.51
f.	Marketing margin	40.00	1.27			50.00	1.67
g.	Sale price	2939.00	93.92			2828.00	94.48
4	Processor / Consumer (Poultry feed units)						
a.	Purchase price	2939.00	93.92	2856.00	94.69	2828.00	94.48
b.	Transport cost	110.00	3.07	90.00	2.98	100.00	2.31
c.	Loading and unloading charges	45.00	1.23	40.00	1.33	35.00	1.16
d.	Wastage cost	35.00	0.92	30.00	0.99	30.00	0.86
e.	Marketing cost	190.00	5.22	160.00	5.31	165.00	4.32
f.	Gross price received	3129.00	100.00	3016.00	100.00	2993.00	100.00
5	Farmers Share in consumer rupee	80.28		94.69		87.23	
6.	Price spread	617		160		682	

the marketing margin of about Rs. 40.50 per quintal. The wholesaler's sale and the purchase price of the processor/consumer were Rs. 2939 per quintal, which constituted about 93.92 percent of the price paid by the consumers. The gross received by the processor including their marketing cost were Rs.3129 per quintal. The farmers share in consumer rupee in the channel I were 80.28 per cent and the difference paid by the consumer and the price received the farmer were Rs. 617.

In the Channel II, producer received a price of Rs. 2650 per quintal which constituted about 87.86 per cent of price paid by the consumers. The total marketing cost of the producer, which is included with transport, loading and unloading charges, wastage cost of Rs. 206 per quintal, is higher than channel I. The gross price received by the farmer and the consumer's purchase price were Rs.2856 per quintal. There were no intermediaries in the channel where processor plays a major role in serving inputs to the farmers where produces the product to the processor directly without intermediaries. Only 10 per cent

of the farmers followed the channel II among the sample farmers in the selected area due to quality issues of the product, high marketing cost incurred by the farmers.

In the channel III, the gross price received by the farmer including the marketing cost were Rs. 2611 per quintal. The purchase price of the farmer was Rs. 2450 per quintal which constituted 80.88 per cent of the price paid by the consumers. The farmer sold his product to the regulated market where he incurred with a marketing cost of about Rs. 161.50 per quintal. After reaching the regulated market, the wholesaler purchased the product of Rs, 2611 per quintal. The wholesaler sold his product with all its marketing costs to the consumer of about Rs. 2828 per quintal. The gross price received by the consumer was Rs. 2993 per quintal. The farmers share in consumer rupee and the price spread was 87.23 and 682.

Most of the farmers followed channel I and III, where Channel III was considered the best channel with assured returns by the farmers.

Marketing Efficiency of different marketing channels of maize

As per the Acharya's approach, the marketing efficiency of maize is calculated and tabulated in the table 9. Considering the marketing efficiency of maize, channel II is not under consideration since there is an absence of price spread between farmer and the consumer. The farmer alone shares the benefit obtained due to the absence of intermediaries. Therefore, only two channels were taken into consideration.

The marketing efficiency of channel I was 5.50 and the efficiency of channel III was about 11.29. Presence of high efficiency of channel III due to a smaller number of intermediaries and the majority price is received by the farmers. Channel III is considered as the best channel due to its higher marketing efficiency and also by the maize producers due to its assured returns in the regulated market.

Though channel II has higher returns farmers preferred to adopt alternative channels because of higher marketing cost and quality issues of the product. Among the existing marketing channels of maize in the selected area, Channel III is considered as the best channel confirmed by Acharya's approach.

Table 9. Marketing efficiency of marketing channels of maize

S. No	Particulars	Channel I	Channel II	Channel III
1.	Consumer purchase price	3129.00	3016.00	29933.00
2.	Producer sale price	2512.00	2856.00	2611.50
3.	Total Marketing costs	356.50	0.00	167.00
4.	Total Marketing margin	70.50	0.00	50.00
5.	Net price received by the	2350.00	2650.00	2450.00
	Marketing efficiency	5.50		11.29

Source: Authors calculation

Conclusion

Increase in area, production and productivity of maize in Tamil Nadu is due to shift in cultivation from other dominant cereals like rice and wheat due to its low cost of production and better returns to farmers through value addition and increase in demand for poultry feed. Channel III is considered as the best channel due to its higher marketing efficiency and also by the maize producers due to its assured returns in the regulated market. Due to its higher shelf life compared to other biomass sources like sugarcane and sorghum, demand for maize in ethanol industry is picking up in the recent years. Therefore, soon maize has assured returns in Tamil Nadu due to its high demand in value added products like poultry feed, starch, sweeteners, biodegradable plastics etc...

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Authors' contributions

APS collected and analysed the data. VPN, KM and BM conceived of the study and participated in its design and coordination. MD and SKMS participated in the design of the study. APS and MD participated in design of the study and performed the statistical analysis. All authors read and approved the final manuscript.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interests to declare.

Ethical issues: None

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