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Study on value chain analysis of maize in Aligarh district of Uttar Pradesh

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Abstract

Maize (*Zea mays* L.) is an important cereal crop contributing significantly to food security, livestock feed, and agro-industrial development. In India, maize has emerged as a commercial crop due to rising demand from the poultry, feed, and processing industries. The present study titled "Value Chain Analysis of Maize in Aligarh District of Uttar Pradesh" was undertaken to examine the socio-economic profile of maize growers and analyze the structure, performance, and efficiency of the maize value chain in the study area. The study also assessed marketing channels, marketing costs, marketing margins, price spread, and producer's share in the consumer's rupee.

The study was based on primary data collected from 100 maize farmers selected through multistage sampling from Aligarh district. The data were analyzed using statistical tools such as averages, percentages, and ratios. The findings revealed that the majority of respondents belonged to middle-aged groups with moderate literacy levels, and most households depended primarily on agriculture with some level of occupational diversification. Small and marginal farmers dominated maize cultivation, indicating the prevalence of small-scale farming in the region. Three major marketing channels were identified, with Channel II being the most commonly used due to easy access to traders and immediate cash payments. However, results indicated that an increase in intermediaries led to higher marketing costs, wider price spread, and reduced producer's share in the consumer's price. Channel I was found to be the most efficient, while Channel III showed higher value addition but lower efficiency for farmers. Major constraints identified included price fluctuation, lack of storage facilities, high transportation costs, and market intermediaries' dominance.

The study concludes that improving market infrastructure, strengthening farmer access to storage and credit, and promoting direct marketing and value addition can enhance marketing efficiency and increase farmers' income in the maize value chain.

Keywords: Maize, Value Chain Analysis, Marketing Channels, Price Spread, Marketing Efficiency, Socio-economic Profile, Aligarh District, Uttar Pradesh, Farmers Income, Agricultural Marketing

Introduction

Maize (*Zea mays* L.) is one of the most important cereal crops in the world and plays a significant role in food security, livestock feed, and industrial production. It is widely cultivated due to its high yield potential, adaptability to different agro-climatic conditions, and multiple uses. Maize is used as food for human consumption, feed for poultry and livestock, and raw material for industries producing starch, oil, ethanol, and other products. Globally, major maize-producing countries include the United States, China, Brazil, Argentina, and India. In India, maize has emerged as an important commercial crop because of increasing demand from the poultry, feed, and processing industries. The crop occupies a prominent place in the agricultural economy and contributes significantly to farmers' income and employment generation. Uttar Pradesh

is one of the important maize-growing states in India, where maize cultivation is gaining popularity due to rising market demand and better price realization. In Aligarh district, agriculture is the primary occupation of the rural population, and maize cultivation has become an important source of livelihood for farmers. The development of improved varieties, better irrigation facilities, and modern cultivation practices has increased maize production and productivity in the region. However, efficient marketing and value addition are essential for ensuring better returns to farmers and reducing post-harvest losses. The value chain of maize includes various activities and stakeholders involved in the movement of maize from producers to final consumers. The major participants in the maize value chain are input suppliers, farmers, village traders, wholesalers, processors, retailers, and consumers. Value chain analysis helps in

understanding the flow of products, information, and finance among different market participants. It also identifies the costs, margins, and value addition at each stage of marketing. Efficient value chain management improves market efficiency, enhances farmers' income, and strengthens linkages between producers and markets. The present study, titled "Study on Value Chain Analysis of Maize in Aligarh District of Uttar Pradesh," aims to analyze the socio-economic profile of maize growers and examine the functioning of the maize value chain in the study area. Socio-economic characteristics such as age, education, landholding size, family type, occupation, and annual income influence farmers' production decisions, adoption of technology, and market participation. Understanding these factors is important for improving the efficiency of maize production and marketing systems. The study also focuses on estimating marketing costs, marketing margins, price spread, and market efficiency in the maize value chain. Marketing cost includes expenses related to transportation, storage, packaging, labor, and other activities involved in moving maize from farmers to consumers. Marketing margin refers to the profit earned by intermediaries, while price spread indicates the difference between the price received by farmers and the final price paid by consumers. The study will help identify major constraints in maize marketing and provide suitable suggestions for improving the value chain system in Aligarh district of Uttar Pradesh.

Objectives:

To study the socio-economic profile of the respondents in the study area.

To estimate the cost, margins, and value addition at each stage of the maize value chain.

Research Methodology

Sampling Design

For the present study titled "Study on Value Chain Analysis of Maize in Aligarh District of Uttar Pradesh", a multistage sampling design was used for selecting respondents. At the first stage, Aligarh district was selected, followed by selection of a block at the second stage. In the third stage, villages were selected randomly, and at the final stage, maize-growing farm households were chosen as respondents. This sampling design was adopted to collect reliable data on socio-economic characteristics and to analyze the maize value chain, including costs, margins, price spread, and marketing efficiency in the study area.

Selection of District

The present study was conducted in Aligarh of Uttar Pradesh. The district was selected purposively because it is an important maize-growing area with increasing commercial cultivation and good connectivity to markets and agro-processing units. Aligarh district has favorable agro-climatic conditions, fertile soil, and irrigation facilities that support maize cultivation. The presence of mandis and linkages with nearby consumption centers makes it suitable for studying value chain dynamics.

Selection of Blocks

There are 9 development blocks in Aligarh district. Out of these, one Iglas block was selected purposively for the present study on the basis of maximum area under maize

cultivation. The agro-climatic conditions of the selected block are highly suitable for maize production. The farmers of this block have been cultivating maize for several years, which makes it an appropriate area for the study on value chain analysis of maize.

Selection of Villages

There are a total number of villages in Iglas block as obtained from the Block Development Office. Thereafter, all the villages were arranged in order on the basis of area under maize cultivation. Thus, out of the total villages, five villages were selected randomly for the present study on value chain analysis of maize in Aligarh district.

Selection of Respondents/Farmers

A separate list of farmers maize growers was collected from village records and local agricultural officers. Farmers were classified into different categories on the basis of landholding size. From the selected villages, respondents were selected randomly through proportionate allocation method. A total of 100 respondents were selected for detailed investigation.

Sr. No.	Category	Size Class
1	Marginal Farmers	Below 1.00 hectare
2	Small Farmers	1.00 – 2.00 hectare
3	Semi-Medium Farmers	2.00 – 4.00 hectare
4	Medium Farmers	4.00 – 10.00 hectare
5	Large Farmers	10.00 hectare & above

(<https://www.pib.gov.in>)

From this list 100 respondents were selected randomly through proportionate allocation to the population.

The primary data required for the study were collected through personal interviews using a pre-tested structured schedule. Information regarding socio-economic characteristics, marketing channels, marketing costs, marketing margins, and prices of hybrid wheat seeds was collected from the respondents for analysis.

Analysis of data/ analytical tools used

The present study titled "Study on Value Chain Analysis of Maize in Aligarh District of Uttar Pradesh" was based on both primary and secondary data. The collected data were compiled, tabulated, and analyzed using suitable statistical tools such as averages, percentages, and ratios. For examining the maize value chain, indicators like marketing cost, marketing margin, price spread, and producer's share in the consumer's rupee were used to assess marketing efficiency and performance of the value chain in the study area.

Analytical techniques employed

Chi-Square: A chi-square (χ^2) statistic is a test that measures how a model compares to actual observed data. The data used in calculating a chi-square statistic must be random, raw, mutually exclusive, drawn from independent variables, and drawn from a large enough sample.

Chi-square tests are often used to test hypotheses. The chi-square statistic compares the size of any discrepancies between the expected results and the actual results, given the size of the sample and the number of variables in the

relationship.

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Where, χ^2 = chi squared

O_i = observed value

E_i = expected value

Marketing Cost: The total cost, incurred on marketing either in cash or in kind by the producer seller and by the various intermediaries involved in the sale and purchase of the commodity reaches the ultimate consumer.

$$C = C_f + C_{m1} + C_{m2} + C_{m3} + C_{m4} + C_{mn}$$

Where, C = Total cost of marketing of commodity

C_f = Cost paid by the producer from the time of produce leave farm till he sale it

C_{m1} = Cost incurred by the middleman in the process of buying and selling the product.

Market Margin: This is the difference between the total payments (cost + purchase price) and receipts (sale price) of the middle man (ith agency). Absolute margin of the middle man (AMI)

$$AMI = Pri - (Ppi + Cmi)$$

(a) Percentage margin of the middle man (Pmi)

$$Pmi = \frac{Pri - (Ppl + Cml)}{PRI} \times 100$$

Where,

Pri - the total value of receipts per unit (sale price)

Ppi - the purchase value of good per unit (purchase price).

Cmi - the cost incurred on marketing per unit

Value Addition Analysis

$$\text{Value Addition (VA)} = \text{Selling Price} - \text{Cost of Inputs}$$

Price Spread: Price spread was worked out to estimate the difference between the price paid by farmers and the price received by seed producers.

$$PS = CP - FPPS = CP - FPPS = CP - FP$$

Where:

PS = Price Spread

CP = Consumer's Price

FP = Producer's Price

Marketing Efficiency: It was calculated using Acharya's Modified Marketing efficiency as follows-

$$MME = \frac{FP}{MC + MM}$$

Where

MME is modified measure of marketing efficiency FP = Price received by producer

MC = Marketing cost MM = Marketing margin.

Result and Discussion

The socio-economic characteristics of maize farmers significantly influence production, marketing behavior, and participation in the maize value chain. Factors such as age, education, occupation, family size, and farm size affect the adoption of improved practices and income generation. Therefore, the present study on "Value Chain Analysis of Maize in Aligarh District of Uttar Pradesh" examined the socio-economic profile of respondents to understand their role in maize production and marketing.

Table 1 Socio-Economic and Educational Profile of Respondents

Particulars	Unit/Number	Percentage
Family Composition		
Male members	3.10	50.00
Female members	2.30	37.10
Children	0.80	12.90
Total family size	6.20	100.00
Education Level		
Illiterate	15	12.50
Primary	25	20.83
Secondary	50	41.67
Higher Education	30	25.00

The table shows that the average family size of maize farmers was 6.20 members, consisting mainly of male members (50%), followed by female members (37.10%) and children (12.90%). This indicates that maize farming depends largely on family labour. In terms of education, most farmers had secondary education (41.67%), while 25% had higher education. Only 12.50% were illiterate, indicating moderate literacy among respondents which supports adoption of improved farming and marketing practices.

Table 2 Occupational Pattern and Age Distribution of Farmers

Particulars	Number/Percentage
Occupational Pattern	
Agriculture only	45.00%
Agriculture + Dairy	25.00%
Agriculture + Business	18.00%
Agriculture + Service	12.00%
Age Distribution	
Below 30 years	18 (15.00%)
31-50 years	65 (54.17%)
Above 51 years	37 (30.83%)

The table reveals that agriculture was the primary occupation for most respondents, with 45% depending solely on farming. Other farmers diversified their income through dairy farming, business, and service activities. The age distribution indicates that the majority of farmers (54.17%) belonged to the middle age group (31-50 years), showing active participation in maize cultivation and better managerial ability.

Table 3: Farm Size and Area under Maize Cultivation

Category	No. of Farms	Average Area (ha)	Area under Maize (ha)
Marginal	40	0.75	0.42
Small	50	1.80	0.95
Medium	30	3.60	1.85
Total/Average	120	2.05	1.07

The table indicates that small and marginal farmers

dominated maize cultivation in the study area. Marginal farmers had an average landholding of 0.75 ha, while medium farmers owned 3.60 ha on average. The overall

average farm size was 2.05 ha. The area under maize cultivation increased with farm size, showing that medium farmers cultivated comparatively larger maize areas.

Table 4: Value Chain Structure and Marketing Channels of Maize

Particulars	Details
Major Value Chain Actors	Input Suppliers, Farmers, Village Traders, Wholesalers, Processors, Retailers, Consumers
Channel I	Producer → Consumer
Channel II	Producer → Village Trader → Wholesaler → Consumer
Channel III	Producer → Wholesaler → Processor → Retailer → Consumer
Most Common Channel	Channel II
Reason for Popularity	Easy access to traders and immediate cash payment

The table explains the major actors involved in the maize value chain, including farmers, traders, wholesalers, processors, retailers, and consumers. Three marketing channels were identified. Channel II was the most common because farmers received immediate cash payment and had easy access to traders. However, the involvement of intermediaries reduced the farmers' share in the final consumer price.

Table 5: Cost, Margins and Value Addition in Different Marketing Channels (Rs./q)

Particulars	Channel I	Channel II	Channel III
Farmer Cost	1200	1200	1200
Marketing Cost	50	120	180
Trader Margin	–	100	–
Wholesaler Margin	–	150	200
Processor Value Addition	–	–	300
Retailer Margin	–	100	150
Consumer Price	1250	1670	2030

The table shows that marketing costs and margins increased with the number of intermediaries involved in the marketing process. Channel I had the lowest cost because it involved direct sale from producer to consumer. Channel III recorded the highest consumer price due to processing and value addition activities. This indicates that longer marketing channels increase both value addition and marketing expenses.

Conclusion

Maize (*Zea mays L.*) is an important cereal crop widely used for food, feed, and industrial purposes, and plays a key role in agricultural and economic development. In India, it is the third major cereal crop after rice and wheat, and its production has increased due to rising demand from the poultry, feed, and processing industries. Uttar Pradesh, particularly Aligarh district, is emerging as a significant maize-growing region due to favorable agro-climatic conditions and market access.

However, maize farmers in the study area face several challenges such as high marketing costs, price fluctuations, inadequate storage facilities, and dependence on intermediaries, which reduce their profit margins. The maize value chain involves multiple stakeholders, and inefficiencies in the system limit farmers' share in the consumer price.

The present study on "Value Chain Analysis of Maize in Aligarh District of Uttar Pradesh" highlights the importance of analyzing socio-economic conditions, marketing

channels, costs, margins, and value addition. The findings suggest that improving market infrastructure, strengthening value addition activities, enhancing access to credit and market information, and reducing intermediaries can significantly improve marketing efficiency and increase farmers' income in the region.

Summary

The present study entitled "Study on Value Chain Analysis of Maize in Aligarh District of Uttar Pradesh" was undertaken to examine the socio-economic profile of farmers and analyze the cost, margins, price spread, and value addition at different stages of the maize value chain in the study area. The study was based on primary data collected from 100 respondents selected through a multistage sampling method. The socio-economic analysis revealed that the majority of respondents belonged to marginal and small farmer categories, indicating dominance of small landholdings in maize cultivation. Most of the respondents were young farmers in the age group of 20–35 years, showing active participation of youth in maize production and marketing activities. Male respondents constituted a higher proportion of the sample, while a large share of farmers belonged to nuclear families. The educational profile indicated that a considerable proportion of respondents were either illiterate or had primary level education, while only a few were graduates. The income distribution showed that most farmers belonged to low and middle-income groups, reflecting limited financial capacity for investment in improved technologies.

The study further examined the maize value chain through different marketing channels involving producers, village traders, wholesalers, processors, and retailers. It was observed that marketing cost, marketing margin, and price spread increased with the number of intermediaries in the chain. Channels with fewer intermediaries were found to be more efficient, as they provided a higher share of the consumer's price to the producer and reduced overall marketing costs.

The comparative analysis indicated that Channel-I was more efficient than Channel-II due to lower marketing cost, reduced price spread, and higher marketing efficiency. The involvement of additional intermediaries in Channel-II increased the cost burden and reduced the producer's share in the final price.

The study concluded that improving storage facilities, strengthening direct marketing systems, promoting farmer producer organizations, reducing unnecessary intermediaries, and enhancing access to market information

can significantly improve the efficiency of the maize value chain in Aligarh district. These measures will help in increasing farmers' income and ensuring better value realization from maize production.

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