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Economic Analysis of Marketing Channel of Wheat Production in Hardoi District of Western Uttar Pradesh, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Wheat, a vital global staple, has been cultivated since ancient times, nourishing over a billion people. Its role in agriculture and food security is crucial. In Uttar Pradesh's Hardoi district, the Bharkhani block was chosen for its extensive wheat cultivation, and five villages were randomly selected. Three wheat distribution channels were studied: Producer - Consumer Producer - Village Trader - Consumer Producer - Village Trader - Wholesaler - Retailer - Consumer Findings revealed that in Channels I, II, and III, producers' shares in consumer expenses were 98.63%, 92.14%, and

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73.78%, respectively. Marketing costs were Rs. 20.00, Rs. 53.00, and Rs. 73.78 per quintal, with middlemen's margins of Rs. 00.00, Rs. 69.00, and Rs.
196.00 per quintal in Channels II and III. Channel I stood out as the most efficient due to its lack of middlemen, highlighting its potential to optimize wheat distribution.

Keywords: Disposal; marketing efficiency; marketing cost; marketing margins; intre-channel.

1. INTRODUCTION

Wheat, the world's most extensively cultivated staple crop since ancient times, serves as a fundamental sustenance for over a billion people globally. Its pivotal role in shaping agricultural and food security initiatives cannot be overstated. India, ranking second in wheat production after China, reported an impressive 30.31 million hectares under cultivation in 2019-20, yielding 100.42 million tonnes with a productivity of 33.14qt/ha (Agricultural Statistics at a Glance, 2021). Leading the charts, Uttar Pradesh contributes significantly, accounting for 35.03 percent of the nation's production from an expansive 35.12 percent land share. The wheat acreage in this state stands at 9852.0 thousand hectares, resulting in a production of 35506.6 thousand tonnes (Ministry of Agriculture and Farmers Welfare, GoI & Directorate of Economics and Statistics, 2022). Notably, Hardoi district is a notable wheat producer within Uttar Pradesh, recording 316279 hectares under wheat cultivation during 2013-14, yielding 10068 quintals with a productivity of 31.83 qt/ha (Arth Evam Sankhya Prabhag, Hardoi district, U.P. 2013-14). Post the green revolution, the widespread adoption of new technologies, especially in wheat cultivation, significantly bolstered food grain production. The subsequent emphasis on marketing was crucial to ensure fair returns for farmers' surplus output. India's robust marketing infrastructure, coupled with the development of rural roadways, facilitated connections between rural production centers and urban consumption hubs. While this fostered market-oriented farming in Uttar Pradesh, inherent weaknesses persisted, such as the pressure for immediate cash for production and consumption, driving distress sales to village moneylenders. On the flip side, limited storage capacity and uncertain market prices during lean periods also posed challenges. Nevertheless, increased wheat production augments its marketable surplus, which holds potential for agro-based industrial growth and overall economic development. Effective marketing strategies and market expansion efforts should focus solely on surplus quantities available with farmers, rather than the total production. The pace of agricultural development aligns with the rate of agricultural production expansion, while economic development hinges on growth in marketable surplus. Consequently, boosting production must correspond with increasing marketable surplus for national economic progress. Although marketing systems concentrate on surplus goods entering or expected to enter the market, an understanding of total production remains vital. Given the complex landscape of agricultural activity undertaken by millions of farmers, estimating marketable and marketed surplus in India possesses spatial intricacies.

2. REVIEW OF LITERATURE

Shiv Kumar et al., [1] reported that India stands as a major global wheat producer, contributing to a substantial 20% of the world's wheat output. The wheat cultivation area within India spans 31.20 million hectares, yielding a total production of 95.90 million tonnes, and achieving a productivity rate of 30.88 quintals per hectare. In the state of Uttar Pradesh, the wheat cultivation area covers 98.10 lakh hectares, yielding a production of 303.00 lakh tonnes, with a corresponding productivity of 30.33 quintals per hectare.

Kumar et al., [2] described that The Bundelkhand region plays a pivotal role in Uttar Pradesh's pulse cultivation, contributing over fifty percent of the total pulse cultivation area. However, the region's productivity falls below the state average, indicating a need for technological advancements, infrastructure development, and refined marketing strategies. This study focused on evaluating the profitability of pulse farming, identifying challenges, and proposing policy recommendations. Data collected from 100 pulse growers in Jalaun and Hamirpur, two economically challenged districts of Bundelkhand, during 2016-2017 were analyzed. To gauge the region's pulse cultivation trends, the study computed growth rates in area, production, and yield from 1980 to 2015 using compound annual growth rates. The most substantial

growth occurred between 1980 and 1990. Evaluating profitability employed contemporary cost concepts, uncovering that per-hectare cultivation costs were significantly higher for pigeon pea compared to gram, pea, and lentil crops. In the marketing realm, village traders, wholesalers, and retailers imposed charges ranging from INR 20 to INR 40 per quintal for various crops. Further analysis demonstrated that the marketable surplus volume and its proportion to total production in pigeon pea, gram, and lentil crops grew in tandem with increasing landholding size. However, the pulse production in the area faced constraints throughout the production, processing, and marketing phases. In light of these findings, it becomes evident that embracing suitable technologies and enhancing infrastructure through well-crafted policies is imperative. Such measures can support farmers, ensuring a harmonious equilibrium that safeguards the interests of bothproducers and consumers.

Kumar et al*.,* [2] noticed that Tomatoes hold versatile culinary importance, featuring in dishes like soups, salads, pickles, ketchup, purees, and sauces. However, the value of a bountiful harvest is diminished if farmers aren't adequately compensated, underscoring the critical role of marketing in boosting their yield. Successful vegetable production hinges on supplying high-quality produce that aligns with market preferences. Farmers' vegetable choices are often guided by market demands, yet inadequate market connections can hinder them from receiving fair compensation for their laborious efforts. Analyzing marketing costs and margins benefits both sellers and buyers. This study utilized primary and secondary data sources, conducting agricultural surveys to gather information on farmers' income, employment, and farming activities for the 2018-19 agricultural season. Chitrakoot district's five distinct blocks each contribute a unique character to the region. The research interviewed a sample of 40 tomato growers from the 2018-19 production year, with ten farmers selected randomly from each block's list. Among the marketing channels, Channel III (P-W-R-C) emerged as the primary recipient, accounting for 45.5% of total tomato disposal. Notably, various stakeholders, including producers, wholesalers, village traders, and retailers, incurred a marketing cost of Rs. 45/- per quintal during the tomato marketing process. This translated to Rs. 612/- per quintal in Channel II, and Rs. 403/- per quintal in Channels III and IV. Specifically, wholesalers and village traders paid Rs. 270/- and Rs. 217/- per quintal in Channel III, respectively. Consumption costs reached Rs. 1142/- per quintal across Channels I, II, III, and IV. In the context of market dynamics, Channel I boasted a tomato price spread of 96.09 percent, with marketing costs accounting for 3.94 percent. In Channel II, both producers and retailers contributed 9.79% towards marketing costs, while consumers paid Rs. 1410/qt., with producers claiming 46.81 percent of profits. Channel III witnessed marketing costs of 10.41% attributed to producers, wholesalers, and retailers, while consumers paid Rs. 1473/qt., and producers retained 43.11 percent of earnings. Lastly, in Channel IV, producers, village traders, and retailers collectively bore a 10.41% marketing cost, with consumers paying Rs. 1643/qt., and producers garnering a 39.52 percent share. Notably, Channel II exhibited the highest market margin at 43.40%. In the Chitrakoot district, Channel I emerged as the more profitable option when compared to Channels II and III.

Nimbrayan, P. K. [3] did A comprehensive and profitable comparative analysis on tomato production within Haryana, focusing on various protected structures. The findings highlighted that naturally ventilated polyhouses (NVPH) incurred a cost roughly 34% higher than that of net houses. Across the districts of Sonepat, Karnal, and Hisar, NVPH exhibited the highest total cost (cost C2) for tomato production (amounting to 872,492 in Sonepat, 865,752 in Karnal, and 832,322 in Hisar), while the B: C ratio was most favorable in Karnal district (1.19) among the three. Conversely, within net houses, Sonepat incurred the highest total cost (626,197) in comparison to Hisar (612,524), with Sonepat also achieving the highest B: C ratio (1.48) as opposed to Hisar (1.47). Notably, the research pinpointed Channel-III (producer to direct consumer) as an exceptionally efficient marketing channel. The insights from this study hold the potential to shape impactful policies that aim to curtail the cost of protected structures while concurrently enhancing efficiency across other market channels.

Tiwari, M. [4] analyzed soybean marketing channels, price differentials, marketing margins, and marketing effectiveness in Sagar district, Madhya Pradesh, India. Solely focusing on soybean, primary data were collected via surveys from 80 soybean farmers. The study centered on Sagar district due to its prominent soybean cultivation and production. The selection of

channel participants employed a two-stage stratified random sampling technique. Three principal marketing channels were identified: Producer - Wholesaler - Processor - Retailer - Consumer Producer - Village Trader - Wholesale - Processor Producer - Village Trader - Wholesaler - Processor Among these, farmers encountered notable expenses related to packing materials and transportation. Other intermediaries faced significant marketing costs, including weight loss, spoilage, and transportation. The price spread was minimal in channel II, where farmers directly sold to retailers. Channel I exhibited the highest marketing efficiency. A comparative analysis of channels I, II, and III revealed that channel II's relatively lower efficiency could be attributed to an additional intermediary (commission agent). This study furnishes insights for selecting optimal soybean marketing channels. Furthermore, it offers empirical data to guide stakeholders in adopting effective market strategies, ultimately benefiting all participants along the supply chain.

Sharma et al*.,* [5] reported that Efficient marketing not only enhances the farmer's portion of the consumer's expenditure but also signifies higher profitability for them. This study delves into the analysis of price distribution, marketing channels, marketing efficiency, market margins, and marketing costs related to brinjal in Uttar Pradesh's Mau district. Data collection involved multi-stage stratified random sampling from respondents. Three distinct marketing channels emerged for brinjal handling in the study area: Producer - Consumer Producer - Retailer - Consumer Producer - Commission Agent - Wholesaler - Retailer - Consumer The findings highlighted the marketing efficiency percentages: 123.10% for marketing channel-I, 150.30% for channel-II, and a notable 314.50% for channel-III. Meanwhile, the price spread per quintal stood at 123.10, 150.30, and `314.50 for marketing channels I, II, and III, respectively. When considering the farmer's share in the consumer's expenditure, marketing channel-I represented 86.70%, channel-II 85.77%, and channel-III 66.10%. Ultimately, marketing channel-I emerged as the most efficient option for brinjal handling within the study area.

Saini and Kumar [6] conducted a study in the year 2022-23, to analyse the post-harvest losses occurred in different marketing channels of “Royal delicious” variety of apple. The data were collected by using survey method, with the help of questionnaire by interviewing the respondents personally. A sample of 80 apple growers (54 marginal, 17 small and 9 semi medium farmers) was taken, and the existing marketing channels (Channel I,II,III) were identified. Channel I (Producer – Primary market retailer – Consumer), Channel II (Producer – Wholesaler – Secondary market retailer – Consumer) and Channel III (Producer – Pre-harvest contractor – Wholesaler – Secondary market retailer – Consumer). Out of total 145 market functionaries a sample of 20% i.e. 30 market functionaries were selected randomly. It was revealed that, on an average a total of 12.4% of produce was lost per quintal of produce i.e. 12.4 kg/quintal, with Channel III having highest average post-harvest losses 17.4% of produce lost per quintal of produce. In Channel II the average postharvest losses were found 14.05% loss per quintal of produce. And the Channel I had the minimum post-harvest losses of just 5.75% loss per quintal of produce. In economic terms, average loss of Rs. 744/quintal was observed at the price of Rs. 60/kg. It was concluded that marketing channel III was having highest losses because of more middlemen in the channel and by looking into the channel, at wholesaler level there were having the highest loss. These losses can be minimized by having more cold storage facilities, and quick dispose of produce from producer to consumer.

Verma et al*.,* [7] conducted a study, which focused on economic analysis of wheat production in the Hardoi District of Uttar Pradesh. The study is carried out to determine resource use efficiency of Wheat production in the study area. Production data were collected from 100 farmers randomly from five village areas of Kothawan block for Hardoi district of Uttar Pradesh. In this study, the overall average productivity and gross return of wheat was recorded 28.52 q/ha and Rs 36,306 respectively. The farm size group wise productivity of wheat was27.85 q/ha obtained in marginal size group followed by 28.95 q/ha and 30.35 q/ha in small and medium size farm, respectively. Gross income obtained in small size group was 36073 followed by 35000 in medium and 38900 minimum in large size group. The lead functional form was the cobb Douglas log function which produced R 2 of 0.93,0.94 and 0.94in marginal, small and medium farm group [8,9]. MVP value of various input used in wheat crop grown in Kothawan block revealed that in case of wheat, only manure and fertilizer showed MVP less than unit which means that these resources were overused, so their use should be reduced. Other

than manure and fertilizer, all the resources showed MVP more than unit which stated that these resources were still underuse and their use can be increased to raise the profit.

3. METHODOLOGY

The study drew upon input-output data collected from a sample of wheat cultivating farmers in the Uttar Pradesh state. The research was centered in the Hardoi district and was undertaken through a multistage sampling approach. In the initial phase, the district with significant wheat cultivation, namely Hardoi, was purposively selected from among 19 block. Within this district, the one block Bharkhani , boasting the largest wheat cultivation area, was purposefully chosen. A list of all villages within this selected block was compiled and ordered based on the wheat cultivation area, with five villages selected at random from this list. Subsequently, a separate list of wheat growers from these five villages was created, including their landholding sizes, which were categorized into three groups: (i) Marginal (below 1 hectare), (ii) Small (1-2 hectares), and (iii) Medium (2-4 hectares). From this list, a sample of 100 respondents was chosen using the proportionate random sampling technique. For the examination of marketing aspects, the Shahabad market, a significant hub for food grain disposal in the study area, was selected. To supplement the study, secondary data were sourced from published and unpublished records from district and block headquarters, books, journals, and periodicals. Primary data were collected through well-structured and pre-tested inquiry schedules via personal interviews. The data collected pertained to the agriculture year 2013-2014 [10-12].

Analytical Tools: Suitable statistical tools were used for the analysis of data.

The marketable and marketed surplus of wheat generated by different size groups of farms have been worked out as follow:

$$MS = P-C$$

Where,

MS = Marketable surplus
P = Total production of crop
C = Total requirement (family consumption, seeds, payment of wages to labours, cattle feed, payments to service providers persons such as carpenter, blacksmith, barber, washer man etc).

The marketed surplus indicates the actual quantity of produce sold by the farmers in the markets has been worked out as follows:

$$MT = MS + PS + D – L$$

Where,

MT = Marketed surplus
MS = Marketable surplus actually sold D = Distress sale
PS = Post stock sold out, if any
L = Losses during storage and transmit marketable surplus left for sale.
Marketing efficiency was analyzed with following Shepherd's formula: Marketing efficiency (ME) = $\frac{V}{I} - 1$

Where,

V = Value of goods sold (Consumer's price) I = Total marketing costs (MC)

Higher the ratio, the higher efficiency and vice-versa.

Price spread: Spread was defined as the difference between the price the consumer pays and the net price the manufacturer receives. This includes not only the actual costs associated with moving the goods from the farm to the customer and the profit margin of the various middlemen, but also the expenditures incurred at various levels of the marketing channels.

4. RESULTS AND DISCUSSION

The results emerged out from the primary and farm level data of marigold are given under the following heads:

4.1 Pattern of Disposal of Wheat under Different Size of Sample Farms

Table 1 indicates that marginal, small and medium categories farmers disposed of their produce through different channels viz. Channel-I, Channel-II and Channel-III. Total disposal of wheat by these Channels found was 1800.73 quintals out of which disposal of wheat by Channel-I, Channel-II and channel-III, came to 319.53, 660.64, and 820.56 quintals, respectively.

Table 1. Pattern of disposal of wheat under different size of sample farms (qt./ha)

S. No.	Size of group of forms	Channel- I	Channel-II	Channel-III	Total Quantity
1.	Marginal	151.42 (20.64)	302.56 (41.24)	279.67 (38.12)	733.65 (100.00)
2.	Small	105.46 (18.27)	229.44 (39.75)	242.32 (41.98)	577.22 (100.00)
3.	Medium	62.65 (12.79)	128.64 (26.26)	298.57 (60.95)	489.86 (100.00)
Total		**319.53 (17.74)**	**660.64 (36.69)**	**820.56 (45.57)**	**1800.73 (100.00)**

Note: Figures in parenthesis show per cent to corresponding total quantity

Table 2. Inter-channel comparison as a whole for wheat

(Rs./qt.)

S. No.	Particulars	Channel-I	Channel-II	Channel-III
1	Net price received by producer	1442.00 (98.63)	1431.00 (92.14)	1424.00 (73.78)
2	Total price received by producer	1462.00 (100.00)	1431.00 (92.14)	1424.00 (73.78)
3	Expenses incurred by the producer	20.00 (1.37)	-	-
I	Transportation	9.00 (0.61)	-	-
II	Weighing	-	-	-
III	Loading &unloading	2.00 (0.14)	-	-
IV	Market fees	-	-	-
V	Losses	7.00 (0.49)	-	-
VI	Sample (Karda)	-	-	
4	Producer's selling price / Village trader	-	1431.00 (92.14)	1424.00 (73.78)
A	Expenses incurred by the village trader	-	53.00 (3.41)	72.00 (3.73)
I	Transportation	-	18.00 (1.16)	22.00 (1.14)
II	Weighing	-	4.00 (0.26)	4.00 (0.21)
III	Loading & unloading	-	4.00 (0.26)	5.00 (0.26)
IV	Market fees	-	17.00 (1.09)	30.00 (1.55)
V	Losses	-	4.00 (0.26)	5.00 (0.26)
VI	Sample (Karda)	-	6.00 (0.38)	7.00 (0.36)
B	Village trader net margin	-	69.00 (4.44)	67.00 (3.47)
5	Village trader selling price / wholesalersprice	-	-	1564.00 (81.04)
6	Expenses incurred by the wholesale	-	-	137.00 (7.10)
A	In term of service rendered by thewholesalers	-	-	33.00 (1.71)
I	Packaging and bagging	-	-	500 (0.26)
II	Cleaning and grading	-	-	4.00 (0.21)
III	Loading and unloading	-	-	4.00 (0.21)
IV	Transportation	-	-	16.00 (0.83)
V	Weighing	-	-	4.00 (0.21)
B	Expenses incurred on material and godown charge	-	-	43.00 (2.23)
I	Gunny bag	-	-	34.00 (1.76)
II	Go down charge	-	-	9.00 (0.46)
C	Expenses on market fee, commissionbrokerage	-	-	60.00 (3.11)
I	Market fees	-	-	33.00 (1.71)
II	Commission	-	-	20.00 (1.03)
III	Brokerage	-	-	7.00 (0.36)
D	Wholesalers Margin	-	-	35.00 (1.81)

S. No.	Particulars	Channel-I	Channel-II	Channel-III
7	Whole seller's selling price /retailerpurchase price	-	-	1736.00 (89.95)
A	Expenses incurred by the retailer-		-	100.00 (5.18)
I	Transportation	-	-	27.00 (1.40)
II	Weighing	-	-	6.00 (0.31)
III	Loading unloading	-	-	5.00 (0.26)
IV	Losses	-	-	8.00 (0.41)
V	Market fee	-	-	45.00 (2.33)
VI	Miscellaneous	-	-	9.00 (0.46)
B	Retailer's margin	-	-	94.00 (4.87)
8	Gross market margin	20.00 (1.37)	122.00 (7.85)	506.00 (26.22)
9	Retailers selling price / consumers price	1462.00 (100.00)	155300 (100.00)	1930.00 (100.00)

Note: Figures in parenthesis show per cent to corresponding consumer's price.

Marketing efficiency, price spread, marketing costs and margins of wheat: Marketing channels: The following three channels were identified in the study area for the marketing of wheat crop:

Channel-I: Producer - consumer
Channel-II: Producer-village trader-consumer
Channel-III: Producer-village trader-wholesaler-retailer-consumer Inter-channel comparison as a whole for wheat:

Table 2 highlights of an inter-channel comparison of the spread of wheat prices, margins, and average marketing costs. It's important to note that as the number of intermediaries expanded under Channels II and III, marketing expenditures also rose. By analysing gross marketing margins, it was discovered that Channel III had the highest margin at 26.22 percent, followed by Channels II and I with 7.85 and 1.37 percent, respectively.

Marketing efficiency of wheat: The marketing efficiency of wheat under different marketing channels has beenpresented in Table 3.

Because there was no middleman and produce was sold straight to consumers, Table 3 shows that Channel-I was found to be more efficient than Channel-Ill- II, and Channel-III. This resulted in lower marketing costs in Channel-I compared to other channels. Wheat middleman margins, marketing expenses, and producer share of consumer rupee through various channels:

Table 4 displays the producer's share of consumer rupees (in percentage), marketing costs (in rupees per quarter), and intermediaries profits (in rupees per quarter) for various wheat marketing channels. The highest producer share of the consumer's rupee was found in Channel-I at 98.63%, followed by Channel-II and Channel-III at 92.14 and 73.78%, respectively.

Table 3. Marketing efficiency of wheat in different channel

Channel	Value of wheat sold (Rs. /q.) (consumer's price)	Gross marketing margin (Rs./q.)	Marketing efficiency
I	1462.00	20.00	73.10
II	1553.00	53.00	29.30
III	1930.00	73.78	26.15

Table 4. Producer's share in consumer's rupee, marketing costs and middlemen margins of wheat in different channel

(Rs./qt.)

Particulars	Channel		
	I	II	III
Producer's share in consumer's rupee (%)	98.63	92.14	73.78
Marketing costs (Rs. /q.)	20.00	53.00	73.78
Middlemen margins (Rs. /q.)	-	69.00	196.00

Note: Figures in parenthesis show per cent share in consumer price

Marketing costs and Marketing margins: Marketing costs per quintal were found maximum Rs. 309.00 in Channel-III followed by Rs. 53.00 under Channel-II and Rs. 20.00 under Channel-I. Middlemen margins were estimated Rs. 69.00 and Rs. 196.00 per quintal under Channel-II and Channel-III, respectively.

5. CONCLUSION

1. The average wheat production, marketable surplus, and marketed surplus per farm were recorded at 35.86, 20.88, and 18.00, respectively.
2. The total disposal quantity of wheat was 1800.73 quintals, distributed among Channel-I, Channel-II, and Channel-III in quantities of 319.53, 660.64, and 820.53 quintals, respectively. Among the different farm sizes, marginal and small farms predominantly utilized Channel-II for selling their higher production volumes. In contrast, medium- sized farms favored Channel-III for their produce.
3. In terms of wheat, the average net prices received by producers were Rs. 1442.00, Rs. 1431.00, and Rs. 1424.00 per quintal under Channel-I, II, and III, respectively.
4. The average marketing costs exhibited an upward trend with the increase in the number of intermediaries, moving from Channel-II to Channel-III. A comparison of gross marketing margins revealed the highest value of 26.22% in Channel-III, followed by 7.85% and 1.37% in Channel-II and Channel-I, respectively. Additionally, wholesalers experienced a net margin of 1.81% in Channel-III.
5. The marketing efficiency of wheat was found to be optimal under Channel-I in contrast to Channels II and III. This efficiency in Channel-I was attributed to the absence of intermediaries.
6. Among the different channels, the producer's share in the consumer's rupee during wheat trade was most prominent in Channel-I at 98.63%, followed by 92.14% in Channel-II, and 73.78% in Channel-III.

CONFERENCE DISCLAIMER

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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