Profitability and Value Addition in Wheat Supply Chain in Kangra Valley of Himachal Pradesh, India

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Abstract— *Wheat is a critically important crop in the Kangra district, serving as a primary source of food security and livelihood for a large portion of the population. The need to analyze its processing costs, returns, and value addition stems from the necessity to improve farmer incomes and make the local agricultural economy more resilient. Thus, an attempt has been made in this research script toanalyse the costs and return from processing of wheat and degree of value addition at each stage of the supply chain in wheat in mid hills of Himachal Pradesh. The results revealed that processing of wheat in the study area incurred both variable and fixed costs, which influenced the overall cost structure. Study indicated that raw material (grain), energy expenses, labour and packaging costs, staff salary were the important components of variable costs which accounted to Rs. 2,619,95 per quintal while, interest on term loans and depreciation were the constituents of variable costs which amounted to Rs. 135.68 per quintal. As a result, the total processing cost was Rs. 2,755.63 per quintal. The returns from processing in the study area showed processing add value to the final product. The processing unit was functioned at a utilization capacity of 0.96, which means the unit is operated at 96 per cent of its capacity. The gross return was Rs. 3400 per quintal. After deducting processing and marketing costs from gross return, the net revenue was Rs. 494.37 per quintal. The degree of value addition in wheat differs across the different supply chains. According to the results, at processor's stage, the degree of value addition in channel III was highest which was worked out to be 23.79 per cent and lowest at trader's level which was found to be 4.9 per cent. Consequently, the highest degree of value addition was exhibited in the processing channel i.e. channel III. In channel II, the intermediaries added 5.50 per cent value at retailer level to 7.28 per cent value at secondary wholesaler level whereas in channel III, it varied from 4.90 per cent at traders stage to 23.79 per cent at flour millers stage before reaching to retailer and then to ultimate consumers. This suggested that longer marketing chain involving traders and processors exhibited higher degree of value addition in wheat in the study area. Therefore, farmers can and should be encouraged to directly link with processors or flour mills so that they can take part in value added activities that can augment their returns and revenues by effectively capturing value along the chain.*

Keywords— *costs and returns, mapping, wheat, value chain, value addition, Kangra Valley.*

HIGHLIGHTS

a) *Processing cost of wheat*
b) *Processing returns from wheat*
c) *Value chain map of wheat*
d) *Degree of value addition in wheat.*

I. INTRODUCTION

Wheat is the most important *rabi* (winter) cereal crop and a dietary staple, primarily consumed in the form of *chapatis* (flatbreads), in the region. Agriculture is the main occupation for over 90% of Himachal Pradesh's population, with Kangra being a major producer of wheat.

The crop provides direct employment and forms the backbone of the agrarian economy. The rice-wheat and maize-wheat rotations are the dominant cropping systems in the Kangra valley, encompassing vast areas of cultivated land. Wheat straw is a nutritious and important source of fodder for local livestock, creating an interdependent farming system.

Calculating processing costs, returns, and the degree of value addition is essential for the following reasons: The average income of agricultural households in the region is often low compared to their expenditure. Analyzing costs and returns helps identify inefficiencies and opportunities to enhance net returns, especially for small and marginal farmers. Accurate data on economics is crucial for formulating effective agricultural policies, selecting appropriate production and processing strategies, and identifying regional comparative advantage. Reliance solely on primary produce makes farmers vulnerable to market forces and price fluctuations. Value addition can create stable, higher-value products, such as flour, biscuits, and other bakery items, that fetch better prices. The cost of cultivation is rising due to factors like labour costs and climate change impacts. Understanding the processing economics can offset these challenges by increasing the final product's value. While the state promotes diversification into high-value cash crops, improving the profitability of traditional staples like wheat through value addition ensures food and nutritional security while providing viable alternative income streams.

Value addition at various stages transforms raw wheat into higher-value products, increasing income potential. By working out the specific costs and returns at each stage of marketing, farmers and local entrepreneurs can identify the most profitable processing avenues and attract necessary investment for local agro-industries.

Wheat value chain mapping visually charts the journey from farm to consumer, identifying actors / functionaries such as input suppliers, farmers, traders, processors, retailers and the their activities like input supply, growing, harvesting, storing, milling, selling where value is *added*, primarily through processing wheat into flour, maida and logistical functions like grading, storage, and distribution, with processors and retailers often adding significant value, though farmers add the initial fundamental value but often get a smaller profit share.

There are various stages in wheat value chain and the various functionaries that are involved in at each stage who add value when the produce goes through their hand. In case of wheat input suppliers provide seeds, fertilizers, insecticides, pesticides, herbicides, modern production technology and machinery to wheat growers who grow

wheat and adding fundamental value through cultivation. Value addition at each stage is assessed through by doing basic production at farmer's level that has the potential for growing quality crops by using high yielding and good quality seeds, disease resistance varieties and better farming practices. Village traders, commission agents buy wheat produce from the farmers. Wholesalers buy wheat in bulk, sort, clean, grade to improve quality and store the grain to prevent losses and then the wholesalers sell to the processors or retailers. Processors then do value addition by way of milling wheat into flour, suji, maida, etc. Transforming raw wheat into high-demand products (flour, maida, etc.), creating the *highest* relative value addition done by the processors. Then, retailers come into picture. They buy wheat flour, suji, maida from the processors who ultimately sell it to consumers, adding value through convenience and smaller quantities. Consumers are the final destination of different stages of wheat value chain.

Value addition activities generally increase the final market price and the share of profit for those involved. With this background in view, an attempt has been made in this research script to evaluate the cost and return from processing of wheat into flour, value chain map, and the value addition at different stages of supply chain in Kangra district of Himachal Pradesh.

II.   METHODOLOGY

2.1 Selection of the Study Area: The present study was purposively under taken in Kangra district of Himachal Pradesh as this district holds the first position in terms of wheat production in the state. The district produced about 1, 35,247 metric tons of wheat as per the statistical abstract of Himachal Pradesh (2021-22). As a result, this region was suitable for investigating the supply chain and value addition processes associated with wheat cultivation. This district also has an established network of agricultural markets and functionaries who are involved in transferring the produce from its production point to end consumers. This enabled the mapping of multiple marketing channels for wheat.

2.2 Sampling Plan and Sample: Multistage random sampling was adopted for the selection of the sample for this study. In order to achieve the objective of the study, list of wheat growing blocks of Kangra district was prepared first and then two blocks namely, Nurpur and Indora were selected randomly in the first stage. These two blocks have the highest potential of agricultural marketing of wheat as these two blocks are located in the adjoining area of Punjab. In the second stage, list of wheat growing villages was prepared for these two selected blocks in consultation with the official of the agricultural

department. The five villages in each block were selected randomly. In the third stage, a list of wheat growing farmers in each selected village was prepared and eight farmers from each selected village were selected randomly that made it a total sample of 80 farmers which was selected for the study. For the analysis of data, farmers were classified into two categories, viz, small and large based on the size of their land holding using cumulative square root frequency method. By following this method, those farmers having land holding less than one hectare, we call it as small and their number was 43 and those farmers having land holding lies between 1-3 ha, we call it as large and their number was 37. Thus, total samples of 80 household were analyzed for this study.

2.3 Data Requirement: Both primary and secondary data were collected. Primary data were gathered from the sampled households on a well designed and pre-tested schedule by personally interviewing the cultivators for the agricultural year 2024-25. In addition, data from flour miller, traders, and commission agents, five each were also collected to understand the supply chain dynamics and value additions. Secondary data were collected from government publications, Statistical Abstracts of Himachal Pradesh.

2.4 Analytical Framework: To arrive at the results, simple averages, percentages, ratios were employed and cost concepts were applied to calculate processor's level economics. Marketing margins, price spreads and degree of value addition were calculated for different marketing channels using formulae available in the literature.

The procedure for working out the **degree of value addition** at each stage of the wheat supply chain involves calculating the margin (selling price minus all associated costs) for each actor, and then expressing this margin as a percentage of the total value added across the entire chain.

Step-by-Step Procedure for calculating the degree of value addition:

Here is the procedure for calculating the degree of value addition which was followed:

1. **Map the Supply Chain:** Identify all the key actors and stages in the specific wheat supply chain being studied. A typical chain might involve:

   a. Input Suppliers (seed, fertilizer)
   b. Farmers (production)
   c. Village Traders/Collectors (aggregation)
   d. Wholesalers (storage and distribution)
   e. Processors (milling into flour, rawa, etc.)
   f. Retailers (sale to consumers)
   g. Consumers

2. Collect Data for Each Stage: Gathered data on prices and costs for each actor or functionary involved. This typically involves surveys and interviews with the stakeholders. Key data points are:

a. Purchase Price: The price at which an actor buys the wheat or intermediate product.

b. Selling Price: The price at which the actor sells the product.

3. Marketing & Operating Costs: All costs incurred during that stage, including transportation, labor, storage, packaging, processing, and any taxes or commissions.

4. Calculate the Margin at Each Stage: For each actor, determine their gross margin by subtracting their costs from their revenue (selling price).

Example: A wholesaler buys wheat for ₹2,682.99 per quintal and sells it for ₹2,922.44 per quintal, incurring marketing costs of ₹67.09. Their margin is ₹2,922.44 - (₹2,682.99 + ₹67.09) = ₹172.36.

5. Calculate the Degree of Value Addition:

a. Per Stage (as a percentage of purchase price): Divide the margin by the initial purchase price at that stage and multiply by 100 to get a percentage value added relative to the product's value when acquired.

b. Overall Share (as a percentage of total chain value): Sum the margins of all actors to find the total value addition in the entire supply chain. Then, divide each individual actor's margin by this total sum and multiply by 100 to determine their percentage share of the total value addition.

In short, the primary formulas used for finding out the percentage share of the degree of value addition in wheat at each stage are:

- **Margin at each stage** = Selling Price - (Purchase Price + Marketing Costs + Processing Costs)

- **Value Addition at each stage (%)** = (Margin at each stage / Purchase price at that stage) * 100

   ▪ *Alternatively, as a share of total value added:*

- **Percentage Share of Total Value Addition (%)** = (Margin at each stage / Sum of margins at all stages) * 100

III.   RESULTS AND DISCUSSION

3.1 Results:

3.1.1 Processing cost and degree of value addition

3.1.1a Processing cost of wheat

Wheat processing primarily involved flour milling (Table 3.1). The total variable cost per quintal was Rs. 2,619.95, which included raw material, energy, labour, packaging and staff salary. Fixed costs of Rs. 135.68/quintal were incurred for interest and depreciation, resulting in a total processing cost of Rs. 2,755.63/quintal.

Table 3.1: Processing cost of wheat

Particulars	Cost (Rs./Quintal)
1. Variable cost	
a. Raw material	2521.87
b. Energy expenses	25.02
c. Labour and packaging cost	35.00
d. Staff salary	38.06
Total Variable cost	2619.95
2. Fixed cost	
a. Interest on term loan and working capital	85.15
b. Depreciation	50.53
Total fixed cost	135.68
Total processing cost	2755.63

3.1.1b Returns from processing of wheat

The economic viability of wheat processing, as presented in Table 3.2, was examined by estimating gross returns, processing costs, marketing costs, and net returns per quintal of processed wheat. The processing unit operated at 96 per cent of its capacity, indicating efficient use of resources.

The gross returns obtained from selling processed wheat were recorded **at** Rs. 3400 per quintal**.** The marketing cost**,** including expenses for transportation, packaging, and handling was Rs. 150 per quintal**.**

The total processing cost, which includes variable costs as well as fixed costs, was found to be Rs. 2755.63 per quintal. The net return from processing wheat was Rs. 494.37 per quintal**,** indicating a reasonable profit margin for the processing unit.

These results highlight that wheat processing can provide additional value to the raw produce, improve profitability for processors, and contribute to overall efficiency in the supply chain.

Table 3.2: Returns from processing of wheat

Particulars	Cost (Rs./Quintal)
Capacity utilized	0.96
Gross returns	3400.00
Marketing cost	150.00
Total processing cost	2755.63
Net return	494.37

This analysis demonstrates the potential profitability of wheat processing and emphasizes the importance of optimizing both processing operations and marketing strategies to maximize net returns for stakeholders

3.1.1c Value chain map of wheat

Sequence of operations and procedures that occur from farming to their final consumption by end consumers is known as value chain. It involves various steps, each of which enhances the value of final product. Value chain mapping refers to visual representation of sequence of operations and procedures that a good or service goes through from conception through delivery to final consumer. Value chain map helps to identify each step taken in developing and providing the good, as well as the value contributed to each one. The value chain maps for wheat in the study area are showed in Figure 3.
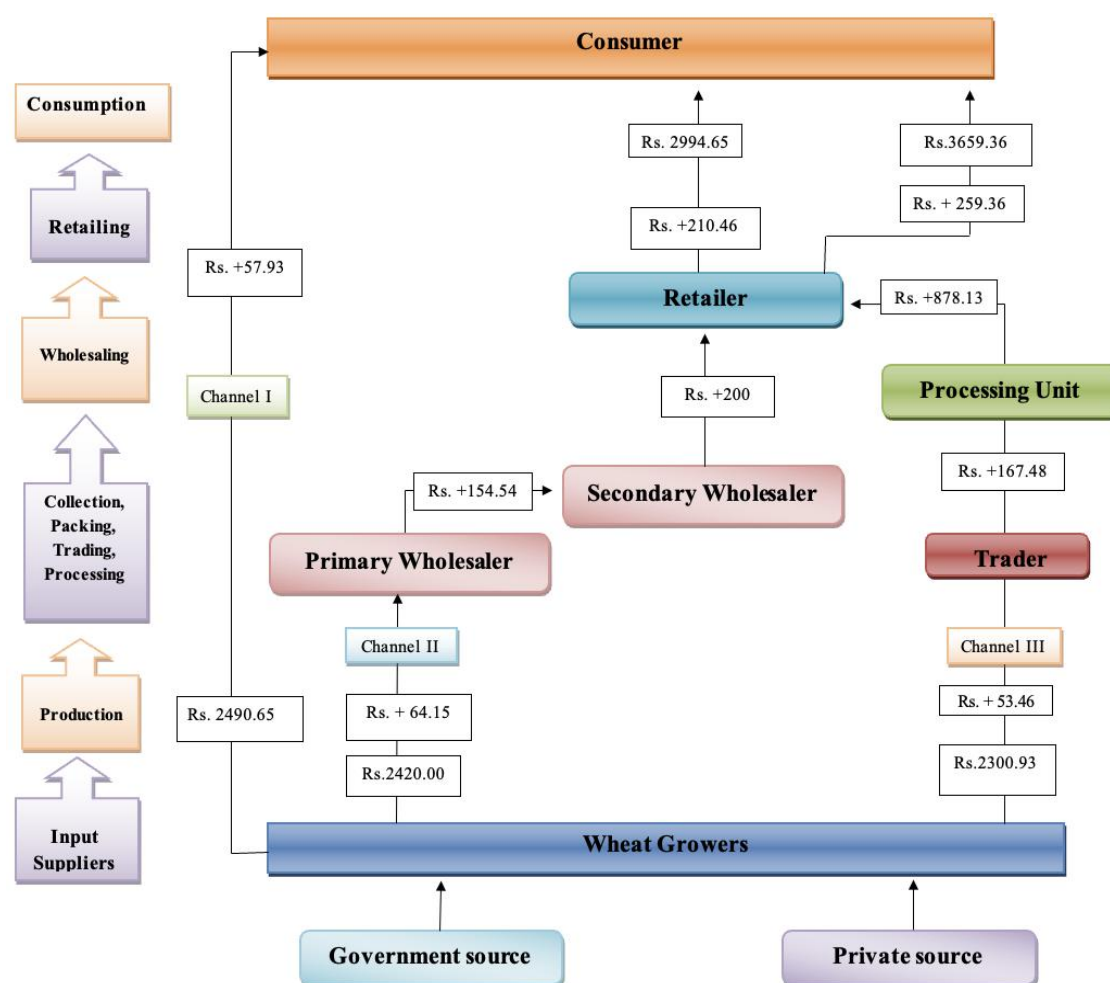
Fig.3: Value chain map of Wheat

3.1.21c Degree of value addition in wheat

As wheat move through the supply chain and change possession among various actors the value changes and this process is known as value addition. The extent of value addition is determined by the quantity or percentage increase in the product's value.

Degree of value addition in wheat is presented in Table 3.3. According to the results, the degree of value addition in channel -III was highest at the flour miller's stage (23.79%). This indicated that the processing channel exhibited the highest degree of value addition, as the transformation of raw grain into flour significantly raised both its market price and consumer demand. As a result,

the processing channel exhibited the highest degree of value addition. In case of processed wheat (flour), some of the important approaches to maximize value addition include processing into refined flour or diversified products, improved packaging, better storage and preservation techniques, along with effective marketing and branding strategies that create consumer preference. At channel II, the highest degree of value addition was found to be at the retailer's stage i.e., 7.58 per cent, mainly through conducting tasks such as transportation, handling, and direct retailing of the produce to final consumers.

Table 3.3: Degree of value addition in wheat

Particulars	Degree of Value Addition (%)			
Channel II	Producer → Wholesaler	primary wholesaler → secondary wholesaler	secondary Wholesaler → Retailer	Retailer → Consumer
Sale price(Rs./q)	2484.15	2638.69	2783.69	2994.65
Purchase price(Rs./q)		2484.15	2638.69	2783.69

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Cost(Rs./q)	64.15	98.52	75.00	90.58
Margin (Rs./q)		56.02	70.00	120.38
Degree of Value addition (%)		(6.22)	(5.50)	(7.58)
Channel III	**Producer → trader**	**Trader → Flour → Miller**	**Flour Miller→ Retailer**	**Retailer → Consumer**
Sale price (Rs./q)	2354.39	2521.87	3400.00	3659.36
Purchase price (Rs./q)		2354.39	2521.87	3400.00
Cost (Rs./q)	53.46	105.63	150.00	89.36
Margin (Rs./q)		61.85	494.27	170.00
Degree of Value addition (%)		(4.90)	(23.79)	(7.63)

3.2 Discussion:

3.2.1 Processing cost and degree of value addition

3.2.1a Processing cost of wheat

The processing of wheat in study area incurred both variable and fixed costs, which significantly influenced the overall cost structure. Study revealed that variable costs were raw material cost, energy expenses, labour and packaging costs, staff salary, accounted to ₹2,619.95 per quintal. Fixed costs were interest on term loans and depreciation, amounted to ₹135.68 per quintal. Consequently, the total processing cost was ₹2,755.63 per quintal. These results are consistent with findings from Himachal Pradesh by Mandial (2025), who noted that raw material and labor were the dominant cost components in wheat processing. Efficient management of processing costs is therefore critical for improving profitability and ensuring better returns for producers and processors.

3.2.1b Returns from processing of wheat

The returns from wheat processing in the study area showed that processing add value . Capacity utilization of processing unit was 0.96, which means unit operated at 96 per cent of its capacity. Gross returns were Rs. 3,400 per quintal, and after deducting processing and marketing costs, the net return was Rs. 494.37 per quintal. This finding was consistent with Mandial (2025), which showed that post-harvest processing increases profitability. Torane, 2023 also observed that processing resulted in higher returns, indicating the economic advantage of value addition in agricultural produce. Overall, processing provides an effective means to augment their income beyond farm level earnings.

3.2.1c Degree of value addition in wheat

The degree of value addition in wheat differs across marketing channels. According to results, the degree of value addition in channel -III was highest at processor's stage (23.79%) and lowest at the Trader's stage (4.90%). As a result, the processing channel exhibited the highest degree of value addition. Similar findings of higher value addition in after processing were reported by Sharma et al. 2010**.** In Channel II, intermediaries added 5.50 to 7.28 per cent value, whereas in Channel III, it ranged from 4.90 to 23.79 per cent, reflected higher value addition in longer marketing chains involving traders and processors. Similar findings were observed by Kumar (2022) in the apple value chain in Shimla, Himachal Pradesh, where post-harvest handling and processing significantly increased market value. This indicates that improved processing and marketing practices can enhance returns for farmers by effectively capturing value along the chain.

IV.   CONCLUSION

The study on the cost and returns of processing and the degree of value addition of wheat at each stage of marketing bring forth the following points: Firstly, the cost and returns structure from processing suggested that the average cost of processing which includes variable costs as well as fixed costs was found to be Rs. 2755.63 per quintal. Total variable cost per quintal was Rs. 2619.95. Fixed cost was accounted Rs. 135.68 of total processing costs. On average, the plant generated a net return of Rs. 494.37 per quintal. Secondly, channel-I (Producer → Consumer) was identified as the most efficient marketing channel. Thirdly, the cost of processing and margin of processing unit were found to be high in channel III, making this channel the least efficient marketing route. Fourthly, according to the

results, the degree of value addition in channel -III was highest at the flour miller's stage (23.79.60%). This indicated that the processing channel exhibited the highest degree of value addition, as the transformation of raw grain into flour significantly raises both its market price and consumer demand. Consequently, the processing channel exhibits the highest degree of value addition. And lastly, at channel II, the highest degree of value addition was found at retailer's stage (7.58 per cent) for the reason that at this stage the tasks of transportation, handling and direct retailing of produce to ultimate consumers were being conducted at this stage.

Therefore, from policy perspective, as the flour mill channel (Channel-III) provides the highest value addition, farmers should be encouraged to directly link with flour mills or form processing cooperatives/FPOs so that they can participate in value-added activities and capture a greater share of the consumer's rupee.

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