Research Article

Economics of production and marketing of wheat in Rupandehi district of Nepal

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ABSTRACT
Wheat is the third most important cereal crop of Nepal after rice and maize in terms of area. The study on profitability and marketing of wheat was conducted in the Rupandehi district in 2019. The household survey, focus group discussion, interview with the individual market actors such as input suppliers, producers, collectors, wholesalers, millers, and retailers in selected clusters was carried out. The study showed that the Benefit-Cost Ratio of wheat production (BCR) was 1.87. The marketing margins at three different levels of marketing farm-wholesale, wholesale-retail, and farm-retail were also analyzed. The farm-retail marketing margin was found highest (31.42%) and the farm-wholesale marketing margins were less (15.78%). The producers' share in consumer price was 68.5% and the total gross margin was 56.36%. This showed if value-added activities are absent in the chain, the shorter chain can provide a higher margin to farmers by bypassing the intermediaries.
Keywords: Benefit-cost ratio, Marketing margin, Producers' share

INTRODUCTION

Wheat (*Triticum aestivum*) is one of the third most important cereal crop after rice and maize in both area and production in Nepal and second in terms of human consumption. Currently, wheat is grown in 706,843ha with a total production of 1,949,001 mt and the productivity is 2,757 kg/ha(FAO, 2018). It occupies 20.916% of total cereal area and contributes 19.23% of the total cereal production in the country (MOALD, 2016/17). Similarly, productivity has steadily increased from 2.22 to 2.75 t/ha in the last ten years (FAO, 2018). The contribution of wheat in AGDP and GDP is 6.98 % and 2.30 % respectively (MoF, 2014). According to Pandey *et al*., 2017 wheat is mostly cultivated in terai region of Nepal constitute an area of 57.8% and production of 65.2%. Wheat is considered a good source of protein, minerals, B-group of vitamins, and dietary fiber (Shewry, 2007; Kandel *et al.,*2018). The area as well production of wheat in Nepal has been distinctly increased after the introduction of semi-dwarf varieties from Mexico, which has contributed to the food supply (Pandey *et al*.,2019). However, the average productivity of wheat is low as compared to neighboring countries India and China, 3.37 ton/ha and 5.48 ton/ha respectively (Sendhil*, et al.,* 2019). China, India,Russia, USA, France are the

top five producers of wheat in the world (FAO, 2018). Wheat crop was considered as a minor cereal until early 1960s'. Now it is widely grown in all the three agro-climatic regions of the country ranging from 65 to 4000 masl. Nepal Agricultural Research Council has been recommended more than 40 improved varieties for different ecological regions of Nepal of which 17 for hill and 26 for terai region (Timsina *et al.*, 2018). In terai region, more than 60% of wheat is produced among three regions of Nepal (Subedi *et al.*, 2020).

Although the production and productivity of wheat are increasing the domestic production is not enough to fulfill its demand and therefore a large amount is imported from neighboring countries. The export quantity and value were higher than import quantity and value during 1961 but after that import quantity and value were just seen less or with no export (Gairhe *et al.*, 2017). Most of the farmers have been following less profitable, traditional production practices which result in a high cost of production, low productivity, and low profitability. The producer wheat prices, annual average flour retail price, per capita consumption are in rising trend (Gairhe *et al.,* 2017). Similarly, the problem of marketing is mainly low price and the involvement of middlemen. Nepalese farmers typically depend heavily on middlemen in wheat marketing. A weak marketing system not only affects the farmers and the consumers but also the total economy. The poor marketing system in wheat has been felt as one of the major bottlenecks in accelerating the progress of the wheat sector. Generally, farmers are forced to sell at a very low price in season, which results in lower profit. According to Kalita (2017), due to high and fluctuating consumer prices, only a small share of the consumer rupee reaches the farmers. It is necessary to conduct empirical research to generate knowledge on the economics of agricultural production and its marketing. In this context, this study was carried out to analyze wheat profitability and marketing. Furthermore, this research analyses the benefit-cost ratio, marketing margin, and marketing channel of wheat in the study area.

METHODOLOGY

Site selection
Rupandehi district is located in the Lumbini province. It lies in terai in with an area of 1360 sq km but some area extends up to the hill. The altitudinal range varies from 100 m to 1219 m above masl. The district headquarter is Bhairahawa which is the biggest market of Nepal bordering India. Total cultivable land in the Rupandehi district is 85122 ha which comes to be 60.2 percent of the total land area. The major cereal crops grown are rice, wheat, and maize. Wheat is the second most important crop after rice in the district. The productivity has been fluctuating in the district; it was cultivated in 29400 hectares and harvested 83,349 tonnes in 2017 which were 3,969 tonnes more compared to last season's harvest (MoALD,2017). According to Kathmandu post-2017, in the district, more than 40,000 people are involved in wheat farming. The most popular Nepali varieties among farmers in the district are Vijay, Aditya, Gautam, Bhrikuti, and NL-297. National Wheat Research Centre in Rupandehi district conduct research on 37 varieties of wheat. In the Rupandehi district, the major wheat production pockets in the district were identified through the consultation of the respective Agriculture Knowledge Centre (AKC). Large millers, wholesalers, and retailers were visited at different market places within and outside the selected pockets. The selected pockets were Siyari Municipality, Dhaddhagi; Rohihi Municipality, and Farsatighad Sudhodhan Municipality.

Data Collection
Formats and checklists were prepared in advance to collect information from the market actors. From each pocket, samples were selected through simple random sampling, and the sample size was 100 households. One Focus Group Discussion (FGD) in each pocket was conducted. On average 15-20 farmers were present in each FGD. Individual market actors took part in the interview. The name of the collectors/local traders was identified from producers/sellers through the FGD. Similarly, the name of wholesalers and processers/millers were identified from the collectors/local traders. All these market actors were visited in their market destination and interviews were taken using the different checklists for each actor. Similarly, additional information was collected from secondary sources to validate the primary sources, and the information related to wheat production, marketing margin, producer share, supply, export, and import was also gathered.

Gross margin
The difference between the gross return and the variable cost incurred by any venture is gross margin. It is calculated by using the following formula.
Gross margin = Gross return - Total variable cost
Where, Gross return = Price × total quantity marketed
Total variable cost = Summation of the cost incurred in all the variable items.

Benefit-Cost Analysis
For analyzing the cost of production, only the variable cost items were considered. The variable costs were farm expenditure on seed, fertilizers, irrigation, plant protection, labor, bullock, machine, etc. The total cost of production was calculated by adding all the expenditure on variable inputs. The benefit-cost analysis was analyzed by calculating the gross return and total variable cost from the wheat cultivation. The total variable cost of production was calculated by summing the variable cost items in the production process. For calculating gross return, income from the wheat sale was accounted. Timsina (2010), Adhikari (2011), Amgai *et al.* (2016), and Subedi *et al.* (2019) has also used a similar method to calculate the Benefit-Cost Ratio (BCR). The benefit-cost ratio was calculated using the following formula.
B/C ratio = Gross return/ Total variable cost

Marketing margin and production share
Marketing margins from the data set was estimated as different stages of marketing and producer share in consumer rupee. The simple arithmetic mean technique was used to compare the prices at different levels of market operation. The marketing margins of farm-wholesale, wholesale-retail, and farm-retail were calculated by using the following equations (Hassan *et al.,* 2017). Hassan *et al.* (2017) has also used a similar formula to calculate the marketing margins of farm-wholesale, wholesale-retail, farm-retail production share in consumer price.

Farm-Whole sale marketing margins=WP–FP/ WP* 100………… (eq. 1)
Whole sale-retail marketing margins=RP–WP/ RP* 100…………. (eq. 2)
Farm-Retail marketing margins= RP–FP/ RP* 100 …………. (eq. 3)

In these equations, FP is the average farm Price, WP is the mean wholesale price and RP is the average retail price.

Producers' share in consumer price=FP/RP*100 ………….. (eq. 4)

RESULTS AND DISCUSSION

Cost of production
The total variable cost in the study area was found to be Rs.47571.46 per hectare(ha).In the study area, cost of human labor (22.95%), seed cost (20.50%), land preparation (17.57%), chemical fertilizer (16.97%), harvesting (16.50%), and irrigation (5.48%) was found to be the major cost attributing items among all variables. During land preparation the farmers use a tractor. Human labor is mostly used in seed sowing, chemical fertilizer application, harvesting, load-unload, and packaging. Similar to Bist *et al.* (2017) the human labor was found highest cost attributing factor followed by the cost of seed. Mostly tractor is used in land preparation, the combination of both manual and combine harvester were used for harvesting. The cost of irrigation was less because in the study sites there was a facility of canals. Bhujel *et al.* (2009) reported in both traditional and resource conservation tillage (RCT) methods, fertilizer cost was found major contributor, 24% and 29% of the total cost respectively. Similarly, Ghimire *et al.*(2013) found chemical fertilizer (23%) as the major cost item for wheat production. The details of the variable cost of wheat production are shown in Table 1.

Table 1: Average cost of wheat production per hectare

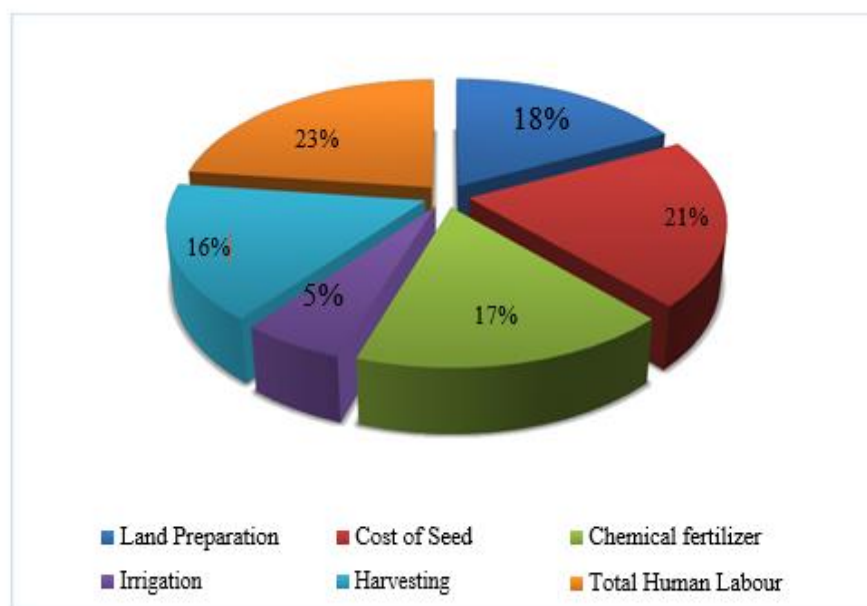| Cost attributing items	Variable cost in the study area(NRS)
Land Preparation	8362.9
Cost of Seed	9753.06
Chemical fertilizer	8076.1
Irrigation	2610
Harvesting	7850
Total Human Labour	10919.4
Total Production cost	47571.46

Source: Field Survey, 2019

Fig:1 Share of different cost in wheat production

Gross Margin
The average total returns from wheat production in one hectare of land in the study area were calculated NRs. 41473.3.

Gross Margin = Gross return (ha)- Total variable cost (ha)

NRs (89044.8-47571.46)= NRs 41473.3per ha

Benefit-Cost Analysis
The benefit-cost analysis was calculated by computing the variable cost of production which includes land preparation, cost of irrigation, cost of seeds, human labor cost, fertilizer cost, harvesting cost. Table 1 showed that the variable cost of production of the wheat crop was NRs. 47571.46 per ha. Similarly, per ha benefit /gross return was NRs.89044.8 and gross margin was NRs. 41473.3 per ha. The benefit-cost ratio (BCR) was estimated by dividing the gross return by costs. The BCR was 1.87. The BCR in the study area was found to be greater than one. This result shows that wheat production is financially feasible in terai region. The benefit-cost ratio can also be expressed as return per rupee invested. Thus if we invest one rupee we can get a return of Rs 1.87. Bista *et al.*(2017), found a benefit-cost ratio of 1.79 in wheat production in the Kanchanpur district. Bhujel *et al.*(2009) reported a benefit-cost ratio of 1.77 in a traditional method and 2.19 in machine used RCT in wheat production in the eastern terai region of Nepal. Ghimire (2013) and Dhital (2017) found BCR of 1.38 and 1.22 respectively in wheat production in Nepal. Similarly, Gairhe *et al.* (2017) also reported BCR in wheat production under irrigated and rainfed conditions as 1.2 and 1.3 respectively.

Marketing margin and production share
Marketing margins at different stages of marketing and producer share in consumer rupee have been estimated from the data set. The simple arithmetic mean technique was used to compare the prices at different levels of market operation. The marketing margins at three different levels of marketing: farm-wholesale, wholesale-retail, and farm-retail were calculated by using the equations 1 to 3. The farm-retail marketing margin was found to be the highest (31.42%) while the farm-wholesale marketing margin was the lowest (15.78%). The producers' share in consumer price was 68.5% and the total gross margin was 56.36% as shown in table 2. It has been reported that the farmers who sold their produce directly to consumers received a higher share of the consumer's price than did those who sold their products through agents (Vasish*et al*., 1995).

Table 2: Marketing margin and production share

SN	Particulars	Percentage
1	Farm-Wholesale marketing margins	15.78
2	Wholesale-retail marketing margins	22.80
3	Farm-Retail marketing margins	31.42
4	Farm-processer marketing margins	25
5	Producers' share in the consumer price	68.5
6	Total Gross Margin	56.36

Source: Field Survey, 2019

Marketing channel
Aharya and Agrawal (1999) defined agricultural marketing as comprising of all activities involved in the supply of farm input to the farmers and the movement of agricultural products from the farmers to the consumers. In the study site, many actors in the wheat value chain play different roles in product marketing from input supply to production, collection, processing/ milling, wholesaling, retailing, and ultimately to consumers. The major input suppliers in the wheat value chain are agro-vets, seed producer cooperatives, NARC, AKC, agriculture machinery dealers, fertilizers dealers, and financial institutions. They supply inputs and also provided technical advice to farmers.

Farmers get inputs required for the wheat production from local level input suppliers mostly agro-vets. Small collectors are permanent residents of their collection areas. The collected wheat is then sold to the large traders in the district. In some clusters, they took to the large millers. Large millers are then sold to wholesalers and retailers inside the district and also outside the district like Kathmandu, Pokhara, Hetauda, in the hill district, and other districts. The marketing channel producer-collector-millers-retailers-consumers was found as a major marketing channel. In the case of other staple food crops such as rice, Sapkota *et al*. (2018) identified producer–collector– millers–consumer as the major marketing channel of rice marketing in the Naghlebhare rice block of Kathmandu district of Nepal. Major market channel for wheat in the study area have been identified as:

First Channel
Producer ⟶ Consumer

Second Channel

Producer ⟶ local trader ⟶ Wholesaler ⟶ Consumer

Third Channel
Producer ⟶ local trader ⟶ Wholesalers ⟶ Small Millers ⟶ Consumer

Fouth Channel

Producer ⟶ local trader ⟶ Large Millers ⟶ Retailer ⟶ Consumer

Fifth Channel
Producer ⟶ local trader ⟶ Wholesaler ⟶ Large Millers ⟶ Retailer ⟶ Consumer

Figure 2. Major market channel for wheat in the study area
Source: Field Survey, 2019

Constraint on production and marketing of wheat
In the study area, the farmers were facing several production constraints that slowed down the speed to get the potential yield of wheat crop. Timely unavailability of improved seeds and fertilizers, limited technical knowledge of farmers, disease, and pest incidence were the major constraints on wheat production. The constraints faced by farmers while marketing wheat grain in the study area were fluctuating market price, lack of storage facility, limited market information, and limited infrastructures and services available for quality assurance.

CONCLUSION

The average cost of wheat production was calculated NRs 47571.46, gross return NRs. 89044.8 and gross margin of NRs 41473.3 per hectare. The BCR (1.87) greater than one indicated the financial viability of wheat production. Among the variable cost items, the cost of human labor (22.97%) was the major cost item followed by seed cost (20.50%), land preparation (17.57%), chemical fertilizer (16.97%), and harvesting (16.50%). The efficient use of seed and fertilizer can reduce the production cost. The use of machinery could be helpful to reduce the human labor cost. The farm-retail marketing margin was found to be the highest (31.42%) while the farm-wholesale marketing margin was the lowest (15.78%); it is due to the involvement of the middleman which results in to increase in the final price. The supply chain in the study area was found to be dominated by numerous intermediaries who did not add significant value along the chain but their involvement affects the final price. The situation is further stressed by a very

little bargaining power of the farmers along with the problem of timely unavailability of the quality fertilizers and seed. The producers' share in consumer price was 68.5% and the total gross margin was 56.36%. This showed if value-added activities are absent, the shorter chain can provide higher margin to farmers by bypassing the intermediaries.

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Authors' contribution

M. Kharel was the lead investigator, collected data, and wrote the manuscript. S.P. Adhikari, S. Subedi, and H.K. Poudel were responsible for collecting data and revision of the paper. Y.N. Ghimire and K.P. Timsina provided the comments and feedback for the finalization of the paper. The final form of the manuscript was read and approved by all authors.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this manuscript.

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