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Resource productivity analysis of wheat production in Kanchanpur district, Nepal

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Abstract
Wheat is the third most important cereal crop of Nepal both in terms of production and area of cultivation after rice and maize. However, the domestic wheat production of the country is unable to meet its national demand. In this context, a study was conducted to determine the profitability and productivity of wheat production in Kanchanpur district of Far-Western Nepal. A total of 120 wheat farmers were randomly selected and surveyed with a structured interview schedule. Descriptive and statistical tools including Cobb-Douglas production function were used to analyse data. The benefit cost ratio (1.79) indicates that wheat production in the study area was profitable with productivity of 2.53 ton per ha. The magnitude of regression coefficient (0.24) implied that nutrient cost had significant positive effect on gross returns with estimated decreasing return to scale (0.28). Other costs like seed, human labour, tractor and bullock labour were not statistically significant. Introduction of farm machineries through cooperative farming, use of sustainable nutrient management techniques and use of good quality seed would increase the productivity and profitability of wheat farmers of the study area.

Keywords: productivity, regression coefficient, Cobb-Douglas Production Function, Benefit cost ratio, return to scale

1. Introduction
Nepal is an agrarian country having 33.32% of its land under cultivation. Agriculture sector contributes 28.79% of Gross Domestic Country (GDP) of the country and provides employment to 65.6% of its population. Within the country, wheat ranks third among the cereal crops both in terms of production and area under cultivation after rice and maize. The area under cultivation, production and productivity of wheat is 762,373 hectare, 1,975,625 metric tons and 2.59 tons per hectare, respectively (AICC, 2016).
Kanchanpur is one of the major wheat producing districts of the country. Area under wheat cultivation in the district is 31,433 hectares which is 4.12% of total area under wheat production of the country. The district produces 70,500 tons of wheat grains with a productivity of 2.24 tons per hectare (DADO Kanchanpur, 2016) [3].

Materials and Methods
Study area and sampling design
Wheat production is one of the major farm activities in far-western terai region of Nepal. Kanchanpur is one of the leading wheat producing districts of the country (DADO profile, 2016) [3]. Hence, Kachanpur district was selected for the study. Three municipalities namely Bheemduttanagar, Bedkot and Punarwas Municipality were randomly selected. A total of 40 households from each municipality and hence 120 households in total were randomly selected from the study area.

Data Collection and Analysis
Primary data was collected by the use of structured interview schedule using face to face interview technique in April-May 2017. Focus Group Discussions (FGD) and Key Informant Interviews (KII) were carried out to supplement the collected information. Secondary data was collected from publications of various government and non-government organisations. The collected information was coded, entered and analysed by using SPSS and MS-Excel software. The results were derived by using descriptive statistics, mean comparison and Cobb-Douglas regression function.

Cost and Return Analysis
The total variable cost of wheat production was calculated by considering all variable inputs like seed, organic manure, inorganic chemical fertilizer, tillage by bullock or tractor, human

labour and threshing by tractor valued at their current market prices.

Total variable cost = C_{seed} + C_{manure} + $C_{fert.}$ + $C_{tillage}$ + C_{labour}+ $C_{threshing}$

Where, C_{seed} = total cost on seed (NRs./ha), C_{manure} = Cost on organic manures (NRs./ha), $C_{fert.}$ = Cost on inorganic chemical fertilizer (NRs./ha), $C_{tillage}$ = cost on tillage by tractor and bullock (NRs./ha), C_{labour} = cost on human labour (NRs./ha), $C_{threshing}$ = cost on threshing (NRs./ha).

Similarly, gross returns was calculated as total quantity of wheat grains produced × average price of wheat grain + equivalent amount of wheat bhusha

Undiscounted benefit-cost ratio (BCR) was estimated by following formula as used by Dhakal *et al.* (2015) [2]:

$$\text{Benefit cost ratio (BCR)} = \frac{\text{Gross Returns}}{\text{Total Variable Cost}}$$

Gross margin is an estimate of the difference of gross returns and variable costs (Olukosi, et. al., 2016). It was calculated by the following formula:

Gross Margin (NRs./ha) = Gross return (NRs./ha) – Total variable cost (NRs./ha)

Resource productivity analysis

Cobb-Douglas production function was used to determine the contribution and efficiency of different variable inputs on wheat production. Cobb-Douglas production function of following form was fitted to examine the resource productivity of the inputs.

$Y = aX_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} e^u$

Where, Y = Gross return (NRs./ha), X_1 = Cost on sources of seed (NRs./ha), X_2 = cost on plant nutrients (NRs./ha), X_3 = cost on human labour (NRs./ha), X_4 = cost on tractor and bullock labour (NRs./ha), e = Base of natural logarithm, u = Random disturbance term, a = constant, and b1, b2, b3 and b4 are coefficient of respective variables.

Results and Discussion

Cost of production

The largest portion of the cost of wheat production was found to be covered by human labour. The cost per hectare on human labour was estimated at about NRs. 20328.60 which accounted about 41.98% of the total variable cost of production. The production activities requiring human labour are seed sowing, application of organic manure and chemical fertilizer and harvesting. This indicates that wheat production in the study area is labour intensive. The cost per hectare on tractor labour was estimated to be NRs. 9851.47 which accounted about 20.34% of total variable cost. Wheat growers of the study area used tractor for land preparation and threshing. The cost on seed was estimated to be NRs. 6953.22 per hectare which constituted about 14.63% of total variable cost. The cost on chemical fertilizers was about NRs. 6609.43 per hectare which constituted about 13.71% of the total variable cost of wheat production. The most commonly used chemical fertilizers are urea, Diammonium Phosphate (DAP) and Muriate of Potash (MOP). The cost of organic manures per hectare which mostly constitutes farmyard manure was estimated to be NRs. 4653.53 which constituted about 9.61% of total variable cost. The cost of irrigation was negligible in the study area as most of the farmers have the facility of government managed irrigation channel while others cultivate wheat on residual moisture or largely depend on winter rain. It was found that the farmers in the study area do not use any pesticide or insect pest management technique during cultivation.

Table 1: Average cost of wheat production (NRs./ha)

Inputs	Mean	Percentage of total cost
Human labour	20328.60	41.98
Tractor Labour	9851.47	20.34
Seed	6953.22	14.36
Chemical fertilizers	6609.43	13.71
Organic manures	4653.53	9.61
Total variable cost	48433.57	100

Source: Field survey 2017

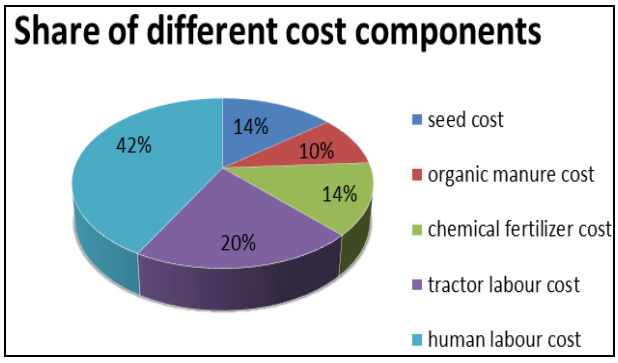

Fig 1: Share of different cost components to total variable cost

Returns from wheat production

The average farm size under wheat cultivation in the study area was 0.55 hectare. The average productivity of wheat grain was estimated to be 2.53 ton per hectare. The gate price of wheat was NRs. 25.0 per kilogram. Per hectare gross return and total variable cost were estimated at about NRs. 86513.28 and 48433.57, respectively. Per hectare gross margin of wheat production was estimated at about NRs. 38079.71. Since the livestock production and management is also the integral farm enterprise of the farmers in the study area, *bhusha* obtained after threshing of wheat plants is also of significant economic value as a livestock feed. It was observed that the overall undiscounted benefit cost ratio considering total variable cost was 1.79. Thus, it was found that the wheat production was profitable in the study area.

Table 2: Economic statement of wheat production in the study area

Measuring criteria	Average value
Area (ha)	0.55
Productivity (t/ha)	2.53
Average revenue (NRs./kg)	25.0
Gross return (NRs./ha)	86513.28
Total variable cost (NRs./ha)	48433.57
Gross margin (NRs./ha)	38079.71
Benefit cost ratio	1.79

Source: Field Survey, 2017

Resource productivity analysis

Table 3: Estimated value of coefficients and related statistics of Cobb-Douglas production function of wheat production

Factors	Coefficient	Standard Error	t-value	p-value
Constant	8.53***	2.087	4.09	0.000
Seed Cost	-0.13**	0.115	-1.14	0.255
Nutrient cost	0.24***	0.084	2.81	0.006
Human labour cost	0.17*	0.199	0.86	0.981
Tractor cost	-0.003	0.131	-0.02	0.391
F-value	3.37			
R square	0.105			
Adjusted R-square	0.0737			
Return to scale	0.28			

Source: Field Survey, 2017

The estimated values of the coefficients and related statistics of Cobb-Douglas production function are shown in Table 3. Out of four independent variables included in regression analysis, the costs on seed, plant nutrients and human labour were found significant at 5%, 1% and 10% level of significance respectively while tractor labour cost was found non-significant in wheat production in the study area. The regression coefficient of seed cost was negative (- 0.13) which indicates that with unit increase in cost of seed, gross return could decrease by 0.13. It is because, the seed rate applied by the farmers in the study area (159.15 kg/ha) is more than the recommended seed rate (120 kg/ha) (Krishi Diary, 2016). The regression coefficient of nutrient cost was 0.24 which indicates that with unit increase in nutrient cost, gross return could be increased by 0.24. Similarly, unit increase in human labour cost could increase the gross return by 0.17. The sum of the regression coefficients of all the inputs taken into account in the regression function turned out to be 0.28 which indicates that the production function exhibited in a decreasing return to scale. This implies that if all the inputs specified in the production function are increased by unity, the gross return will increase by about 0.28.

Thus wheat production, being a profitable farm enterprise, should be promoted in the region. Cost of wheat production can be reduced by substituting human labour by farm machineries like combined harvester, using recommended seed rate and extension of sustainable nutrient management techniques. Cooperative farming can be a promising step towards farm mechanisation.

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References

1. Krishi Diary Agriculture Information Communication Centre (AICC), Hariharbhawan, Lalitpur, 2016,
2. Dhakal SC. et. al. Resource Use Effficiency of Mustard Production in Chitwan District of Nepal, International Journal of Applied Science and Biotechnology, 2015; 3 (4):604-608.
3. District Profile of Kanchanpur District Agriculture Development Office (DADO), Kanchanpur, 2016,
4. Olukosi JO, Isitor SU, Ode MO. Introduction to agricultural marketing and prices: principle and application. American J. Agri. and Forestry, 2006; 2(4): 199-205.