Research Article

COMPARATIVE ECONOMICS OF MAIZE GRAIN AND SEED PRODUCTION IN OKHALDHUNGA, NEPAL

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ABSTRACT

Maize (*Zea mays* L.) cultivation is very popular in Nepal. Basically, in the rural hills of Nepal such as Okhaldhunga, it dominates any other crop production. This study was done to for a comparative assessment of economics, marketing, and to identify major problems of maize seed and grain production in hilly eastern district of Okhaldhunga during June of 2017. The data were obtained by the interview of 66 purposively selected producers (33 each of maize grain and seed producers) with the use of pre-tested semi-structured questionnaire. Both the grain and seed producers were similar in terms of socio-demographic characteristics and marketing accessibilities, but the seed producers were significantly benefited from the trainings, extension services, and credit facilities despite having comparatively small size of land holding (0.14 ha) than the grain producers. The inputs (manures, fertilizers, and the seed) contributed 48% and 50% of the total cost incurred for grain and seed production, respectively whereas the pre-sowing and sowing activities contributed more than 77% of cost in both the cases. In spite of higher cost for seed production, the benefit cost ratio of seed production was higher (1.52) than grain production (1.13). Findings also revealed that only 24% of the total harvest was processed and marketed as seed whereas using optimum quantity (66% middle portion of the cob) for seed production could further increase the income by 23.35%. The major production problems were scarce farm labor followed by lack of infrastructures, while low seasonal price followed by low volume of production ranked the first and second most important marketing related problems. Subsidies on the agri-inputs, timely availability of inputs, and encouragement of the youth towards agri-enterprise via various youth oriented programs can be done to overcome these problems.

Key words: Maize seed, economics, production problems, grain

INTRODUCTION

Agriculture is the major source of livelihood and employment of Nepalese people, contributing a major portion (32.7%) in Gross Domestic Product (AICC, 2017). The agriculture of Nepalese plains and hills is cereal based under which rice, wheat and maize are predominantly cultivated. The contribution of cereal crops to Agriculture Gross Domestic Product (AGDP) is about 49.41%.

Maize (*Zea mays* L.) is the main crop after rice in Nepal in term of area and production(MOALD, 2018). Out of the total maize area, maize is cultivated 17.34% of Terai region, 72.85% of mid hills and 9.81% of high hills of Nepal (B.K et al., 2015). Two third of the maize produced in hills of Nepal is consumed directly by the farmers. However, maize can be used for multi purposes. The recipe of baby corn and other variety of corns (sweet corn, flint corn, flour corn, popcorn, dent corn, pod corn waxy corn) is yet to be explored in the local level for increasing the maize enterprise establishment.

Despite the large area coverage, the productivity of maize is limited to 2.678t ha^{-1}. The reason behind this is that 80% of the maize grown land is rain-fed, unavailability of improved seed and lower seed replacement rate (11.30%) (NMRP, 2017).Consequently, Nepalese agriculture failed to meet the increasing maize demand (11% per annum) and Nepal has turned into an import driven country importing 45% of maize from India (NMRP, 2019). Maize is the principal food crops of the majority of the hill people particularly among poor and disadvantaged groups and is the prime source of animal feed for growing livestock industries in Terai of Nepal (MoAD, 2073).

Seed is the genetic material, which is the first link in the food chain, source of life and even source of culture and use of improved seed can increase the yield by 20-30% (SQCC, 2013). About 90.78% of improved seed and 9.22% of local seed has been cultivated for maize production in the hills (ABPSD, 2014), yet the seeds quality are mostly unchecked. In Nepal, improved maize seed covers 614 thousands hectares of land in the hill with the yield 2.48 t ha^{-1}, the total production is 152 thousand tons in contrast use of local seed covers 62,350 hectares of land, 96,600 tons of production and yield is 1.56 t ha^{-1}(ABPSD, 2014).

Maize cultivation is the way of life in Okhaldhunga district, eastern midhill of Nepal . People rely on maize for food, feed and fodder. In Okaldhunga District, maize is cultivated 12400 ha area with the production of 24800 tons (DADO, 2017).The major varieties of maize produced in the region are Manakamana-1, Manakamana-3, Ganesh-1, Ganesh-2, Poshilo Makai-1, Manakamana-4, Deuti, Arun-2, Khumal Yellow, Rampur composite, Sarlahi

White, Sitala, Kakani Yellow etc. during rainy seasons and winter seasons. Maize being staple crop of the district, the increment in the production of maize can fill the food deficit of 2,157 tons per annum (DADO, 2017). The 10 tons seed deficit in the district also indicates the need of maize production in Okaldhunga district.

Traditionally, farmers used to produce maize for home consumption and for the feed to their livestock but now they have realized the economic value of commercial maize production. Due to higher price and more income form the seed enterprise, farmers are attracted more towards it. But the proper documentation of the economics of maize seed and grain production is still not accessible. The difference in the social and financial status of the farmers might also have influenced their involvement in seed and grain production. Hence, this study was done to assess and comparing the cost of cultivation, income and profit as well as making comparative remarks on the social status of the maize grain and seed producersof the Okhaldhunga district. In addition to this, the study was also focused to point out the major problems regarding the production and marketing of maize in the district.

MATERIAL AND METHODS

The research was conducted in Okhaldhunga district eastern development region of Nepal. It lies between the range of lower tropical (1849masl) - highest sub-tropical(3627masl)with annual rainfall 144.40 mm and the average maximum and minimum temperature 22.6^0Cand 8.75^0C respectively which is favorable for the maize cultivation. Rumjataar, of Siddhucharan municipality was selected as a block of maize seed and grain production block under PMAMP (Prime Minister Agriculture Modernization Project) and hence was purposively selected for study. For the purpose, 33 each of maize grain and seed producers were selected. The grain producers were randomly selectedwhereas seed producers were selected from the seed producing group '*Majh Chandeswori Beeu Utpadan Samuha'* and the sample size was determined using Raosoft. The research was conducted on the basis of pre-designed semi-structured questionnaire and the required information was collected with the face to face interview with the farmers.

The information obtained from individual interview was validated by focus group discussion which included officers of DADO, Okhaldhunga, ward representatives, lead farmers, head of a cooperative, and the manager of the Local market '*Haat Bajaar'* . The Key informants survey (KII) with the DADO officers and progressive farmers and local leaders was used to tally the response from farmers.

Secondary information were collected from various published journals, research articles and report from DADO, district profile, yearly agriculture development program and statistical book of DADO, Okhaldhunga, Reports from MoAD, Central Bureau of Statistics (CBS), VDCs, Cooperatives and publications from different district offices on maize.

Cost benefit analysis

The cost of production for both maize seed and grain producers was calculated by adding all the variable cost items such as seed, FYM, fertilizer, tillage, labor, intercultural operations, harvesting and post-harvest management and marketing was calculated separately for maize grain and seed producers. Likewise, the revenue obtained from the sale of maize grain and seed in addition of maize byproducts were also evaluated on monetary terms. And finally the benefit cost analysis was conducted using the formula:

$$\text{Benefit cost ratio} = \frac{\text{Gross return}}{\text{Total variable cost}}$$

Gross return = Total quantity of seed/grain produced (Kg)* Price per unit of maize seed/grain (Rs.) + total quantity of byproducts (Stover, nubbin, husk) produced (Kg) *Price per unit byproducts (Rs.). The cost of maize grain and seeds along with byproducts like Stover, nubbin and husk were evaluated based on the local prices as suggested by the farmers themselves.

Total variable cost = seed cost + Bullock cost + Labor cost + fertilizer and manure cost + machine cost

Problem ranking

The major problems were discussed and enlisted based on the FGD and KII and were presented to respondents, who ranked all these problems based on severity in their production system. The intensity of problems faced by the producers were identified by using five point scaling techniques comparing most serious to no problems at all using score of 1.00, 0.75, 0.50, 0.25,and 0.00, respectively.

The index of the problem was calculated using the following formula (Bajracharya & Sapkota, 2017).

$$I = \sum \left(\frac{SiFi}{N}\right)$$

Where

I=index value; □=summation
Si = ith scale value(i=1.00, 0.75, 0.50, 0.25,0.00)

F = frequency of ith importance given by the respondents

N = total number of respondents

Regression analysis

The regression technique was used to compute of effect of various factors of the production of maize grain and seed. The proposed equation of the multiple linear regression model is

$Y_{income} = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} +$ …………………..(i)

Where, Y_{income}= Household annual agriculture income

α = Intercept made of regression plane.

Where, X_1, X_2, X_3, X_4, X_5, X_7, X_8, X_9 and X_{10} represents the farmers' category, gender of household head, age of household head, education of household head, access to extension service, access to training, total land holding area, agro-input price, price of machinery and labor price respectively

Similarly β_i represents the regression coefficients of the respective factors.

RESULTS

Household characteristics

In the study area, the average age of the household head of the grain growers and seed producers was more than 55 years (56.36 years and 59.63 years respectively) and they were the rightful person for family decision making. Likewise, the average household size ofboth category of the farmers was higher than the average national household size, 4.88 (MOALD, 2018).The family members that are in the age range of 15 to 59 years are considered economically active members and are directly involved in agricultural activities. The people of remaining age group are the dependent members. On this basis the economically active members among the grain producers were slightly higher (4.27) than that of the seed producers (4.18) and hence the dependency ratio of the seed producers was higher (0.75) than that of the grain producers (0.63).The farmers in the study area followed livestock integrated farming system. The majority of the farmers reared cow and goat and this livestock was the major source of FYM that is applied for maize production. The livestock holding (LSU) of the grain producers was 4.66 and that of the seed producers was 4.40 however the difference was found statistically non-significant.

Table 1. Socio-economic characteristics and assets of the sampled household

Variables	Farmer's category		Mean difference	t- value	p-value
	Grain producers	Seed producers			
Age of HH head	56.36 (13.55)	59.63 (14.42)	3.27	0.950^{ns}	0.346
HH size	6.42 (4.06)	6.30 (3.49)	-0.12	-0.130^{ns}	0.897
Economically active members	4.27 (2.45)	4.18 (2.54)	0.09	-0.148^{ns}	0.883
Dependency ratio[1]	0.63 (0.53)	0.75 (1.07)	0.11	0.506^{ns}	0.614
Total operational land (ha)	0.53 (0.07)	0.60 (0.11)	-0.07	0.595^{ns}	0.554
Livestock holding (LSU)[2]	4.66 (0.51)	4.40 (0.52)	0.26	-0.346^{ns}	0.730

Notes: Figures in parenthesis indicate standard deviation; p-values are the result of t-test
[1]Dependency ratio= Dependent members/Economically active members (CBS, 2015)
Notes: Figures in parenthesis indicate standard deviation; p-values are the result of t-test
([2]LSU: 1.5(number of buffalo) +1(number of cow/bull)+0.6(number of swine/pig)+0.4(number of sheep and goat)+0.2(number of poultry) (Adhikari, 2000)

Other social characteristics of HH

Table 2. Distribution of the socio-economic characteristics with farmer's category

Variables	Farmer's category		Chi-square value	p- value
	Grain producers	Seed producers		
Gender of the HH (Male)	30(90.00)	26(78.78)	1.886	0.170
Occupation (Agriculture)	14(42.40)	10(30.30)	3.482 ^{ns}	0.481
Education status(Literate)	18(54.50)	19(57.6)	0.062^{ns}	0.804
Access to extension services	8(34.80)	15(45.50)	3.270*	0.071
Access to trainings	11(33.30)	21(63.60)	6.066**	0.014
Easy access to credit facilities	11 (33.30)	10 (30.30)	11.879**	0.008
Involvement in social groups and cooperatives	28(84.80)	33(100)	16. 583***	0.01

Note: Figures in parenthesis indicate the percent. ***, ** and * indicate 1%, 5%, and 10% levels of significance, respectively.

In the study area, 90% and 78.78% household head were male for grain producing and seed producing farmers respectively. Though statistically non-significant, more grain producers (42.40%) have agriculture as major occupation than that of seed producers (30.30%) The household head having agriculture as major occupation is higher in grain producers (42.40%) than that of seed producers (30.30. This study has found literacy rate higher among the HH of seed producing farmers than the grain producing farmers, which showed that literate household head tends to shift from grain to seed production.. Among the farmers in the study area, only 34.80% of the seed grain producers and 45.50% of the seed producers had access to extension services. Likewise, the training receiving members were higher among the seed producers (63.60%) than grain producers (33.30%). All the seed producers were involved in the social groups and cooperatives whereas 15.20% of the grain producers weren't involved inany such social organizations. The access to credit facility was not easy as mentioned by both categories of the farmers.

Production economics for maize

Inputs used for maize cultivation

The major inputs that are being used are the Farmyard manure, Chemical fertilizers (Urea, DAP, MOP) and labor. The seed is also another major input but the rate of seed applied by the farmers was similar i.e. 50.17 kg ha^{-1} on an average. All the other inputs that had been used are more for the seed producers than the grain producers as indicated in table 3. The use of labors was significantly greater in seed production as more number of labors were required for the additional operations like rouging, field inspection, post-harvest management.

Table 3. Cost of inputs with Farmer's category

Inputs	Farmer's category		t-value	p-value
	Grain growers	Seed growers		
Manures (NRs. ha^{-1})	42858.00 (50.09)	71560.72 (64.69)	1.368^{ns}	0.176
Urea (NRs. ha^{-1})	9215.02(10.77)	29093.323 (26.30)	1.414^{ns}	0.162
DAP (NRs. ha^{-1})	8376.52(9.79)	9126.23 (8.25)	0.112^{ns}	0.911
MOP (NRs.Ha^{-1})	701.61(0.82)	0.00 (0.00)	-1.490^{ns}	0.141
Labor (NRs.Ha^{-1})	6742.29 (7.88)	8739.06 (7.99)	2.340**	0.022
Total cost of production(NRs. Ha^{-1})	85562(100)	110621(100)	2.336**	0.023

Note: MD, man days. Figures in parenthesis indicate the percent. ** indicates 5% level of significance

Yield and cost benefit analysis

The average yield of maize for the grain producers was 2591 kg ha^{-1} and that of that of the seed producers was 2595 kg ha^{-1}. The yield of fresh Stover for grain producers was 12005 kg ha^{-1} and that of the seed producers was 17176.03 kg ha^{-1} as shown in table 6. The price of maize stover (straw, husk, nubin) was also added along with the grains and the final return of the farmers was calculated. The total return for maize grain producers is NRs. 90,451and that for maize seed producers is NRs. 145,224 on hectare basis.The benefit cost ratio (B:C) was computed

as the ratio of gross returns to the total cost involved in maize production. The B:C ratio for grain producers was 1.13 and that of seed producers was 1.52 however the difference was statistically non-significant as indicated in table 4. The higher B: C ratio indicates that the seed producers were more benefited than grain producers and this could encourage the grain producers to shift toward seed production. The average B: C ratio of maize production in Okhaldhunga district was found to be 1.34 (average cost being Rs.55186 and gross return being Rs.73852 (MoAD, 2073).

Table 4. Production and cost, benefit of maize and seed and their byproducts

Outputs	Farmer's category		t-value	P-value
	Grain growers	Seed growers		
Grain (kg ha^{-1})	2591.49 (228.84)	12005.41 (1130)	1.20	0.232
Stover-fresh (kg ha^{-1})	2595.79(373.14)	17176.03(299)	1.62	0.111
Return of maize grain (NRs.)	81447 (7192)	101181 (14679)		
Return of maize seed (NRs.)	0	31181 (5338)		
Return of stover (NRs.)	9004 (848)	12882 (2244)		
Total return (NRs.)	90451 (7834)	145244 (21168)		
Total cost (NRs.)	85562.21 (6645.09)	110620.69 (8419)	2.34	0.023
B:C ratio	1.13 (0.06)	1.52 (0.24)	1.59	0.118

Note: Figures in parenthesis indicate the standard error of the mean.(The average price of the maize grains was Rs.31.42 and that of maize seed was Rs.50. According to consumer price index of Nepal Rastra Bank, the average price of fresh Stover is 75 paisa per kg)

Marketing status

Market for maize grain and seed

The marketing of maize is not that tedious despite the topographical remoteness. Despite the topographical remoteness the marketing of maize seed and grains is not that tedious in Okhaldhunga district. The seed producers sold the produced maize seed directly to DADO and hence they had no problem of market. The grain producers had various options for selling their grains. *Haat bazaar*/local people were the major market for majority of the respondent i.e. 63.60% whereas 28.80% of the farmers do not sell maize at all. The other markets were retailors andagro-vets.

Marketing distance

The major market for the most of the farmers in Okhaldhunga district is the local *Haat bazaar* which is held every Friday. The average distance to market for grain producers is 24.70 minute walk whereas that for the seed producers is 8.21 minute walk. The difference might be due to the fact that the seed producers are confined in an area near to the place where *Haat bazaar* is held. The distance isolation for seed production is another fact that has confined the seed producers and on the other hand the grain producers are scattered and are relatively far from the area where *haat bazaar* is conducted.

Determinants of annual income from maize production using linear regression model

The income obtained from maize (maize grains, maize seeds, and stover) was regressed with the important socioeconomic explanatory variable. The r^2 of the model was 0.44 for income from maize cultivation. It indicates that about 44% of variation in the income was explained by the explanatory variables in the model. The adjusted r^2 was found 0.34. It indicates that when the degree of freedom is taken into account, the variation in the dependent variable (income) is explained by explanatory variables by 58% in the model. There were total 10 explanatory variables in the model. Among them, 4 variables were found significant whether at 1% and 10% level as shown in Table (5).

Table 5. Factors affecting income from maize production

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	-57823.90	52912.59	-1.09	0.28	-163863.11	48215.31
Farmer's Category	26918.59	9905.28	2.72	0.01	7067.97	46769.21
HH head gender	-14878.99	12370.66	-1.20	0.23	-39670.35	9912.36
HH head age	91.19	410.95	0.22	0.83	-732.38	914.77
HH head schooling year	7776.57	11050.12	0.70	0.48	-14368.37	29921.51
Extension Service	-9064.23	11068.49	-0.82	0.42	-31245.98	13117.51
Training	4529.21	11729.55	0.39	0.70	-18977.33	28035.74
Area	3029.64	1589.04	1.91	0.06	-154.87	6214.14
Input price	-0.52	0.84	-0.62	0.54	-2.20	1.17
Machinery Price	5.50	3.15	1.74	0.09	-0.82	11.82
Labor price	3.26	1.82	1.79	0.08	-0.39	6.90
R Square = 0.44;	Adjusted R	Square = 0.341;	Standard Error = 31973.252			

The above regression shows that on shifting the farmers from grain producing to seed producing, the annual income from maize could be increased by Rs.26918.59 keeping other factors constant. On increasing unit area for maize production the income would increase by Rs.3.030 and this increment is significant at 10% level. The age of the farmers also influence the income of HH and on unit increment in the age of the farmers would increase the income of the household by NRs.0.90. The negative coefficient in input price indicates that more than enough quantity of inputs had been used in the maize production and decrease in inputs doesn't affect the income at all and can increase the profit by reducing cost of production. All the other considered explanatory variables like gender of the household head, age of household head, trainings, extension services, household head schooling year, had positive impact on the annual income of the farmers but were statistically insignificant.

Optimization of seed production

Usually the two third (66%) of the cob can be used as seed removing the topmost and lowermost parts of the cobs but the farmers here were found utilizing only 24% of the cobs for maize seed preparation and the rest of the maize is used as grain. At present condition out of total produced maize, on an average only 624 kg seed per ha was marketed and remaining 1794 kg seed per ha was marketed. If two third of the cobs would have been utilized for seed production then the marketed seed would be increased to 1968 kg ha^{-1} and the grain would be decreased to 869 kg ha^{-1}. The seed producers were receiving Rs.93028 from the marketed seeds at present time but if the optimum quantity of the cobs was utilized then the return from maize seed would be Rs.114,757 which is Rs.21,729 (23.35%) more than currently received price as shown in figure 1. So, it seems necessary that proper trainings should be provided for the farmers to increase their knowledge regarding maize seed selection.

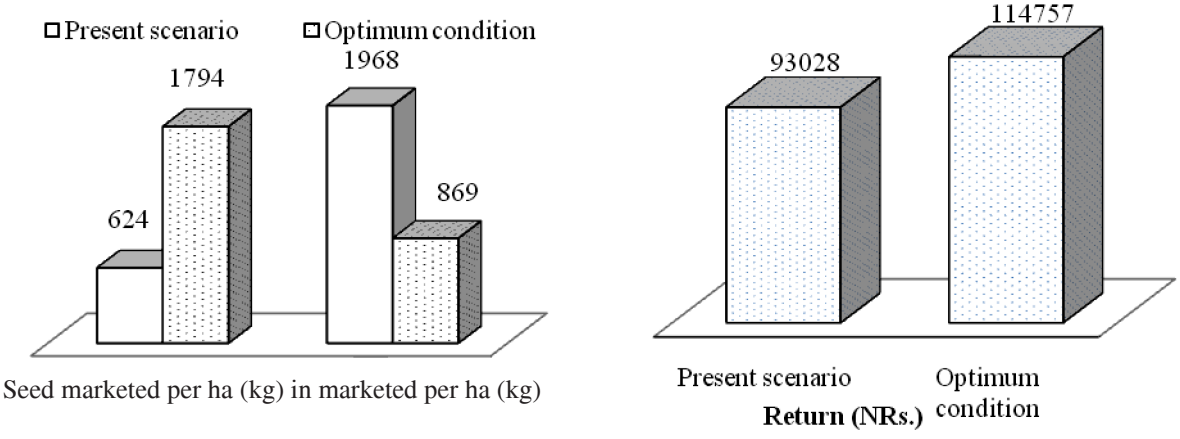

Figure 1. Optimization of seed production

Problems related to production and marketing

Based on the direct field observation and discussions with DADO officers, major problems associated with maize production in the district were identified and included in the interview schedule. The farmers were asked to rank these problems. Forced ranking scales were used for scaling by giving score of 6 to the most severe problem and descend the score on less severe problems. The index value was obtained and ranking was done based on high index value. The majority of the farmers responded that the unavailability of the labor during peak working season was the major problems for them. As already discussed, 39% of total cost of production for grain producers and 37.50% for seed producers were shared by labor and this major input if not available in sufficient amount then farmers are forced to pay higher for those labor and hence the cost of production would further increase. The problems like lack of infrastructures/irrigation, input unavailability, lack of technical knowledge and problems of disease/insect/pest were ranked 2nd, 3rd, 4th and 5th problems respectively.Likewise, on behalf of the market related problems, low seasonal price, low volume of production, lack of marketing problems, lack of bargaining power and distant market were ranked 1st, 2nd, 3rd, 4thand 5th problems respectively in the study area as shown below in Table (6).

Table 6. Ranking of the problems related to maize production and marketing

Problems of production	Index value	Rank	Problems of marketing	Index value	Rank
Input unavailability	0.56	III	Low seasonal Price	0.540	I
Technical knowledge	0.48	IV	Lack of Marketing knowledge	0.144	III
Scarce farm Labor	0.83	I	Lack of bargaining power	0.088	IV
Disease/Insect/Pests	0.46	V	Low volume of production	0.265	II
Infrastructures	0.67	II	Distant market	0.083	V

DISCUSSION

The decision makers of HH of Okhaldhunga, the rural Nepal were the old aged males who were also the household heads as also stated by Bajracharya & Sapkota (2017). The average size of the family was larger in the hilly regions of Nepal than the national average ie.4.88(MOALD, 2018). The farming in the Okhaldhunga was livestock integrated farming system where people reared some cattle, buffaloes, goats and some hens to satisfy their family needs and get some economic benefits which depict the scenario of farming system in Nepal (FAO, 2017). In addition to this the main asset of the rural farmers was the land that they hold and seed producers were more efficient in using their assets despite having lesser land holdings and livestock. The livestock they reared were the main source of FYM that are applied in the land they possess. Most of the seed producers were the indigenous and so called marginalized ones (*Janajatis and Dalits)*. The majority of the people of Okhaldhunga district lived in joint family. The migrated members of the HH of seed producers were more than that of the grain producers and it was the exposure to the foreign land which has encouraged the farmers of Okhaldhunga to be involved in more economic agriculture ie. seed production (Sapkota & Pokhrel, 2010). Community based organizations like farmers' group, cooperatives were the assets of the community that strengthen the unity among the farmers and provide economic and social helps. The farmers of Okhaldhunga district started producing seed due to more accessible the extension facilities, trainings, credit facilities and assured market facilities (Seyoum, Battese and Fleming,1998). The involvement of farmers in the social groups helped them to acquire knowledge and discuss and share the problems and skills among each other.

The major inputs require for the maize production were the manures and fertilizers, seed, and labor. The inputs (manures and labors) required for seed production was higher than grain production. The larger labor required for this was due to the more intercultural operations like rouging, weeding and more post-harvest operations as well and hence the seed production requires more inputs than grain production (Pal et al., 2016) . The general impression is such that pre-sowing operations such as primary tillage, field preparation, manure transportation and application shared about three fourth of the total cost incurred for the maize cultivation. The average yield of maize in the Okhaldhunga was 2.5 t/ha and which is similar to the average yield of Nepal and is more than that of the Okhaldhunga district (MOALD, 2018). The benefit from the seed production is higher because of the higher price of the seed than gain. The B: C ratio was higher for the seed producers than that of the grain producers in the study area which is in accordance to (Pokhrel, Dhakal, & Pandey, 2018). The markets for the rural area was the local *Haatbajar* where all the agricultural goods along with maize grains were sold whereas the governmental

organizations like DADOs, CBOs, CSB were the market for the maize seed in Okhaldhunga district. The periodical markets were mostly common when we move from west to east of Nepal where agricultural products and livestock aresold are common in eastern Nepal. The producers andconsumers traded several agricultural and livestock products among themselves.

The income of the HH would be increased by NRs. 3.03 if the area was increased by 1ha and on unit increment of the age of the HH, the income of the HH would be increased by NRs.0.90. the similar results were found by Sapkota et al., (2017) on assessing the technical efficiency of the maize growers.

The major problems related to maize cultivation in Okhaldhunga were found to be the input availability. The farmers there also are devoid of technical knowledge for the maize seed and grain production which was also shown by the study of (Bajracharya et al., 2016). The low seasonal price and lack of marketing knowledge were the major market related problems of Okhaldhunga district.

CONCLUSION

The seed producers were technically efficient because of the more number of trainings and extension services they had received; hence they have better market penetration and market information. The major input for both the seed and grain producers was labor, and the more number of labors were required for the seed production. Maximum share on the cost of production was on the pre-sowing and sowing activities for both the seed and grain producers. The seed producers were more benefited than grain producers due to higher income form the seed sale. Farmers on the study area did not exploit the full potential of the maize seed, if full utilized as the seed production; it would significantly increase the income of the farmers in meeting the seed demand of the district. The market was comparatively far for the grain producers, but the seed producers were near to the market due to the confinement of seed producing field in the market area. The major hindrance in the marketing was the low seasonal price followed by lack of marketing knowledge whereas the unavailability of inputs and lack of technical knowledge were major constrains for the maize production.

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Conflict of interest

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

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