Azarian J. Agric. VOL (4) ISSUE 3, 2017: 80-86

Azarian Journal of Agriculture

www.azarianjournals.ir

Azarian Journals

Research article **ISSN:2383-4420**

Socioeconomic analysis and problems of maize seed production in mid hill area of Nepal

Mahesh Sapkota*

Article Info

Accepted:
3 June 2017

Keywords:
Extension service, insect/pests, irrigation, seed, training

ABSTRACT

Maize is considered as staple food and is a way of life for the hilly region of Nepal. The production and yield of maize crop is very low which is unable to meet the current demand and is mostly affected by various insect/pests and diseases. For such a backdrop, 182 cross sectional data were collected using simple random techniques in Palpa in June, 2016. Forced scaling technique was used to rank problems based on index value. The total average landholding was 0.91 hectare with 0.32 ha under maize seed cultivation. About 90.7 and 69.8% farmers were access to extension service and had received training respectively. Infestation of insect/pests ranked at first as a major problem in maize seed production with 0.79 index value followed by infrastructure/credit, storage, unavailability of inputs and marketing problems. Similarly poor bargaining power ranked as a 1st major marketing problem. Better access to extension service as well as frequent training service to farmers should be provided to increase production and yield of maize seed. Government and other stakeholder organizations should focus to develop irrigation infrastructure for the overall development of maize sector.

INTRODUCTION

Maize (*Zea mays* L.) is considered as second most important crop in terms of area and production in Nepal and it is mainly grown in summer season (Karki et al. 2015) for feed, fodder and food purpose and is important way of life for the majority of the hill farmers of Nepal. The area, production and yield of maize in Nepal is 891,583 hectare (ha), 2, 231, 517 metric tons (mt) and 2.50 mtha^{-1} respectively in Nepal showing deficit of 610,000 mt (CDD 2016). Looking at the production and yield status of maize, there is no any remarkable achievement despite of many efforts made in policies, programs and periodic plans (ABPSD 2014). The demand of maize for feed and consumption purpose is supposed to increase by 4% to 6% annually for more than 20 years (Paudyal et al. 2001). This increase in demand is pushing towards increase in import due to low production and yield of maize. The low production of maize might be due to poor management practice, decline in soil productivity and higher cost involved. Vega et al. (2001); Liu et al. (2004); Luque et al. (2006) reported that yield of maize is highly affected by plant density. Plant populations of maize highly affect the growth parameters and determines the degree of competition between plants (Sangakkara et al. 2004). The optimum maize plant population is crucial as it does not have tillering nature to manage variation in plant stand. The yield of winter maize is more as there is less risk of pests and diseases and including maize under rice-wheat system could be the new intervention to increase maize production in Nepal. Summer season maize comprises about two-thirds production in mid and high hills under rainfed condition. Shortage of labor in maize production is detrimental for yield (Joshi et al. 2012). Farmers are found cultivating Manakamana-3 and Manakamana-6 in study area and it was tolerant to gray leaf spot disease which is common in mid hills.

Weevils (Sitophilus spp.) and Angoumois grain moth (*Sitotroga cerealella*) are found as major insect pests detrimental to storage of grain (Paudyal et al. 2001). There is a practice of using higher seed rate at the time of planting to reduce the burden of sowing seed again and to replace the plant where there is no germination. Higher

[1] Nepal Agricultural Research Council, Nepal.
*Email: sapkotamahes@gmail.com

densities (92,000 plant) at vegetative stage and about 30,000 plants per hectare at harvesting period prevails in maize (KC et al. 2015). There was about 70% yield reduction in maize due to weeds at the eastern mid hill area of Nepal (Mishra 2004). The decline in yield is also caused by delay in onset of monsoon, variation in precipitation and long spell of drought situation at the base period of crop season. National Maize Research Program situated at Rampur is governmental unit involved in research activities of maize seed and is found producing 36,000 kg of source seed (breeder, foundation and improved) yearly (KC et al. 2015) and distributes it for its multiplication throughout the country. An integrated approach of varietal development and crop management research might help to reduce the constraints of maize production. There has been an urgent need to use recently developed maize production technologies to increase its production and yield. Seed quality is considered as important and inexpensive input which increases the yield by 20-30%. Hence, this study was aimed to assess the socioeconomic status and identify the major constraints in maize seed production.

MATERIALS AND METHODS

Selection of the study area

Maize is staple food which plays major role in food security and livelihood options of the majority of the population in mid hill area of Nepal. Palpa district of mid hill area of Nepal was selected for this study. The district was found better in maize seed production and the production was highest among other districts. The production trend of maize seed is increasing in Palpa district (DADO Palpa 2014). The district falls under Province Number five having subtropical climate at an altitude of 1350 meter above mean sea level. Geographically, it is situated at $27^0 52'$ north latitude and $83^0 33'$ east longitude. It is bounded by Syangja, Rupandehi, Nawalparasi and Arghakhanchi districts in North, South, East and West respectively. Similarly, there are total of 60 VDCs and 2 municipalities in the district.

The list of farmers involved in maize seed production was obtained from DADO Palpa, cooperatives and farmer groups. There were altogether 260 farmers involved in maize seed production in whole district through registered cooperatives and farmer groups. The sample size was determined using the software Raosoft (http://www.raosoft.com/samplesize.html). The margin of error was set to 4% with confidence level of 95% and expected responses was 50%, which recommended the sample size of 182 (i.e. 70% representative of population). In order to avoid bias in the selection of the sample, a simple random sampling technique is considered as the best way as this provides an equal chance for a selection of the element from the sampling frame (Scheaffer 1979). The samples were selected using simple random sampling technique. The interview schedule was pretested with 10 respondents in Madanpokhara VDC of Palpa district. The finally corrected interview schedule was administered to actual respondents for each household in June, 2016. Generally, it is believed that the more and reliable information can be collected from the interactions between the participants (Finch and Lewis 2003). Four Focus Group Discussions (FGDs), Key Informant Interview (KII) with crop development officer, president of cooperatives and farmer groups was done to collect necessary information and for the triangulation of data. District profiles, annual reports of DADO, reports from NARC, MoAD, CBS, and research articles were the sources of secondary data.

The data collected were coded and entered in the Statistical Packages for Social Sciences (SPSS) software. Data cleaning and management of missing data was done during analysis. The socioeconomic and demographic data were analyzed using descriptive statistics in SPSS software such as mean, frequency, percentages and standard deviation.

Scaling techniques for qualitative variables

Forced ranking scale was used for indexing which constructs index of importance or index of severity to facilitate comparison of different problems or alternatives from the response of study on problem analysis and importance analysis. The intensity of problems faced by the farmers was identified using five-point scaling techniques: most severe, high severe, medium severe, less severe and least severe in maize seed production and scale values were given as 1, (1-1/n), (1-2/n), (1-3/n) and (1-4/n) respectively. From the viewpoint of optimistic nature, the last rank was not provided with the scale zero.

Most severe = 1, High severe = 0.8, Medium severe = 0.6, Less severe = 0.4, Least severe = 0.2

Where, n = number of categories in ranking.

And the calculation was done using formula;

$I = \sum S_i f_i / n$

Where,

I = index $0 < I < 1$

S_i = scale value at i^{th} severity

f_i = frequency of the i^{th} severity

n = total number of respondents = $\sum f_i$

RESULTS AND DISCUSSION

Socioeconomic and demographic characteristics of the sampled households

With respect to age, it was found that the average age of the household head was 56.77 years which ranged from 23 to 93 years. Similarly, the average schooling year of household head was 5.51 years. In the least developed country like Nepal, household head is supposed to be the major decision maker in the family. Maize for grain purpose is common in the hilly regions. Shifting their cultivation towards maize seed production cannot be decided without the agreement from the household head. Thus, household head plays a major role in decision-making in the family. It was found that farmers were involved in the production of maize seed since from 16 years and minimum from 1 year with an average 5.51 years of experience. The average household size was 5.4. Similarly, the male and female members in the household were 2.81 and 2.60 respectively. The economically active population referred to the population belonging to 15-60 years of age group and others as dependent population. The economically active members of the household determine the economic status of the family. In the study area, the average economically active members were 3.59 and dependency ratio was 0.62, this indicates that 100 economically active members had to fulfill the basic necessities of 62 dependent members in an average there were about five educated members in the household.

The total landholding is the sum of lowland, upland and khoriya owned by household. The average landholding of the household was 0.91 ha which was higher than the national average (0.68 ha). Similarly, the average area on lowland and upland of the household was 0.17 ha and 0.43 ha respectively (Table 1). But, only on an average of 0.49 ha was under the cultivation[2]. The average area under maize seed production was found 0.32 ha in the study area. Livestock Standard Unit (LSU) was calculated to study the livestock holding of household by a common unit. All the livestock species were converted into a single input following the formula by Kattel (2015)[3]. The livestock holding was found 3.05 LSU.

Out of 182 sampled household, 74.2% were male headed household and 25.8% were female headed household (Table 2). There were also about 25% female headed household in the census survey held at 2011 (CBS 2012). From the table 2, it is evident that Brahmin/Chhetri (68.7%) was the dominating groups in the study area followed by Janajati (20.9%) and Dalit (10.4%). The major occupation of the majority of the household (92.3%) was agriculture followed by government service (4.4%), private service (2.7%) and wages (0.5%). About 50.5% and 49.5% household were joint and nuclear type family respectively. Labor is considered as an active factor in the factors of production (Chopra 2011). The migration of household member from the country might lead to the decrease in manpower in agricultural activities. On an average, 42.31% of household responded that they had migrated member from their household whereas 57.7% responded that they had not any migrated member. Farmers having more than 0.32 ha (6.202 ropani) i.e. more than average area under maize seed production were categorized under large scale whereas those having less than 0.32 ha (6.202 ropani) were categorized under small scale. So it was found that there were 71 households (39.01%) under large scale whereas 111 households (60.99%) under small scale.

Table 1. Socioeconomic and demographic characteristics (continuous variable) of the sampled household

Variables	Mean (± standard deviation)
Age of household head (year)	56.77 (± 14.30)
Schooling (year)	5.51 (± 4.69)
Experience on maize seed production (year)	6.63 (± 3.91)
Household size	5.41 (± 2.72)
Male members of household	2.81 (± 1.71)
Female members of household	2.60 (± 1.46)
Economically active members	3.59 (± 2.21)
Dependency ratio	0.62 (± 0.62)
Educated members of household	4.80 (± 2.49)
Total landholding (ha)	0.91 (± 0.79)
Lowland (ha)	0.17 (± 0.27)
Upland (ha)	0.43 (± 0.30)
Khoriya (ha)	0.31 (± 0.49)
Land area under cultivation (ha)	0.49 (± 0.36)
Land area under maize seed cultivation (ha)	0.32 (± 0.17)
Livestock holding (LSU)	3.05 (± 5.63)

Note: Dependency ratio = Dependent members/Economically active members CBS (2014) and 19.657 ropani = 1 hectare.

[2] Khoriya land was not considered as cultivated land.

[3] LSU: 1 cattle/buffalo = 10 goats = 4 pigs = 143 chickens/ducks

Table 2. Socioeconomic and demographic characteristics (categorical variable) of the sampled household

Variables	Frequency	Percentage
Gender of household head		
Male	135	74.2
Female	47	25.8
Ethnicity		
Brahmin/chhetri	125	68.7
Janajati	38	20.9
Dalit	19	10.4
Occupation		
Agriculture	168	92.3
Government service	8	4.4
Wages	1	0.5
Private service	5	2.7
Family Type		
Joint	92	50.5
Nuclear	90	49.5
Migration status		
Yes	77	42.3
No	105	57.7
Farm category		
Large scale	71	39.01
Small scale	111	60.99

Social capital characteristics

Under this heading, the membership in social groups, training, extension service, credit access, responsible agencies involved in the seed inspection are discussed. Participation in social groups enhances the capital allowing trust, dissemination of idea and exchange (Mignouna et al. 2011). Maize seed production requires the sound technical knowledge about its management. Through the involvement in social groups, they can conduct training and can exchange their ideas with each other which would ultimately lead to the higher production and good management. About 39.6, 25.3, 35.2% households were the members of farmer groups, cooperatives and both (farmer groups and cooperatives) respectively. Participation in training enhances the knowledge, helps in the adoption of new technology and encourage the farmers towards commercialization. The responses about the training received by any member of household about maize seed production technology or marketing or maize grain cultivation were collected. The majority of the household (69.8%) had received training and rest 30.2% had not received training. The major training providers were found to be DADO/GOs (62.75%) followed by cooperatives (27.45%) and I/NGOs (9.80%). During FGDs and KII with the SADO, DADO officers, it was found that the DADO was the major unit involved in the encouragement of farmers, monitoring of the crops, encourage farmers and facilitate.

Better extension services provide good knowledge, helps in the adoption of new technology and encourage the farmers towards commercialization. Access to extension service here means the visit of officers and extension worker of DADO, I/NGOs, regional offices to the farmer's household. The majority of the household (90.7%) were access to extension service (Table 3). The number of times of training received about maize seed production in last 3 years and a number of times of visit of extension worker in last year were interviewed and recorded. An average of 2.09 and 1.79 times the household members had received training and were accessed with extension services respectively.

During FGDs, KII and field survey, it was found that none of the household had taken any sort of credit for any activities of maize seed production. Altogether 81.9 and 18.1% respondent responded that the access to credit was easy and satisfactory respectively if they had to take credit. This revealed that access to credit was good in the study site. It might be due to the reason that every household were the members of farmer groups and cooperatives, also nearer from the headquarters (Tansen municipality) and some households were members of

Table 3. Description of social and institutional variables

Variables	Overall	Variables	Overall
Membership		Training providers	
Farmer group	72 (39.60)	DADO/GOs	96 (62.75)
Cooperative	46 (25.30)	Cooperatives	42 (27.45)
Both	64 (35.20)	NGO/INGOs	15 (9.80)
Training received		Extension service	
Yes	127 (69.8)	Yes	165 (90.70)
No	55 (30.2)	No	17 (9.30)
Credit access		Seed inspection	
Easy	149 (81.90)	DADO	110 (48.03)
Satisfactory	33 (18.10)	RSTL	96 (41.92)
		NARC	23 (10.04)
Training received	2.09±1.26		
Visit of extension worker	1.79±0.29	Field inspection	1.41±0.93

Notes: Figures in parentheses indicate percent and value after ± indicate standard deviation.

Table 4. Ranking of major problem in maize seed production

Problems	Most severe	High severe	Medium severe	Less severe	Least severe	Index value	Rank
Insect/pests	73 (40.1)	60 (33.0)	23 (12.6)	22 (12.1)	4 (2.2)	0.79	I
Infrastructure/credit	34 (18.7)	50 (27.5)	62 (34.1)	29 (15.9)	7 (3.8)	0.68	II
Storage	49 (26.9)	33 (18.1)	45 (24.7)	37 (20.3)	18 (9.9)	0.66	III
Unavailability of inputs	22 (12.1)	38 (20.9)	45 (24.7)	62 (34.1)	15 (8.2)	0.59	IV
Marketing	4 (2.2)	1 (0.5)	7 (3.8)	32 (17.6)	138 (75.8)	0.27	V

Note: Figures in parentheses indicate percent.

microfinance, finance and commercial banks. Frequent inspection from the responsible and reliable organization is needed which helps in increasing the production and maintaining the quality of seed. DADO of Palpa; Regional Seed Testing Laboratory (RSTL), Bhairahawa; NARC station of Lumle and Rampur were found involved in the inspection of maize field. About 48.03% respondents responded that the DADO of Palpa involved in the inspection of maize seed field followed by RSTL (41.92%) and NARC station (10.04%). with an average of 1.41 times inspection in field.

Table 5. Ranking of marketing problems of maize seed production

Problems	Most severe	High severe	Medium severe	Less severe	Least severe	Index value	Rank
Poor Bargaining power	69 (37.9)	53 (29.1)	41 (22.5)	18 (9.9)	1 (0.5)	0.79	I
Low volume of production	30 (16.5)	56 (30.8)	30 (16.5)	55 (30.2)	11 (6.0)	0.64	II
Inefficient middle men	15 (8.2)	51 (28.0)	68 (37.4)	33 (18.1)	15 (8.2)	0.62	III
Poor marketing infrastructure	47 (25.8)	6 (3.3)	31 (17.0)	34 (18.7)	64 (35.2)	0.53	IV
Price variation	21 (11.5)	15 (8.2)	13 (7.1)	42 (23.1)	91 (50.0)	0.42	V

Note: Figures in parentheses indicate percent.

Problem associated with maize seed production

Ranking of major problems of maize seed production

Infestations of insect/pests and diseases was identified as the major and serious problem based on index value (0.79) in maize seed production (Table 4). The problem of insect/pests includes the damage of maize plant at standing stage and infestation of pests at storage time. This might be the main reason to have low yield and low sale of quality seed in the study area. Bajracharya and Sapkota (2017) reported infestation of diseases and pests as the major cause of low yield of potato in Baglung (mid hill area) district of Nepal in a study conducted on 2016. Paudyal et al. (2001) stated that the major problem in maize seed production was insect/pests throughout the country. Similarly, the problems like infrastructures/credits (0.68), storage (0.66), unavailability of inputs (0.59) and marketing (0.27) were ranked as 2nd, 3rd, 4th and 5th problems, respectively. Infrastructures/credits comprises the problem of irrigation. There was no any irrigation facility as irrigation is considered as crucial in agriculture practice. There seems very much difficulty to make the availability of irrigation in the study site due to lack of water source nearby. Problem of storage comprises lack of metal bin and plastic bag for the storage of maize seed. Harvesting of maize seed falls at August/September and farmers sell it on March/April. Farmers were found just hanging the harvested maize on the top floor of the house or spreading it on the floor and few household practiced storing in the metal bin or plastic bags. Such unmanaged practice of storage deteriorates the seed quality. Unavailability of inputs here indicates the unavailability of seeds, fertilizers at the appropriate time.

Marketing of quality seed was done with the help of DADO Palpa. Farmers sold quality seed to agrovets and DADO Palpa. Market facilitation was mainly done by DADO Palpa. Bajracharya et al. (2016) reported lack of technical knowledge, irrigation facility, high seed cost, low quality of seed and low price as major constraints in maize seed production in Arghakhanchi (mid hill area) district of Nepal. Similarly, Sapkota et al. (2016) identified lack of technical knowledge, irrigation facility, unavailability of quality seed and pesticides at appropriate time as major problem in cereal (mainly maize and rice) production in mid hill area of Nepal.

Ranking of major marketing problems of maize seed production

Marketing is as critical to better performance in agriculture as farming itself (Acharya and Agrawal 2011). The good market is needed to promote the commercialization of agriculture sector. The selling of maize seed was mainly facilitated by the DADO Palpa. As marketing is considered as crucial and critical, so within marketing the most probable problems were identified and the responses were recorded. Poor bargaining power, low volume of production, inefficient middle men, poor marketing

infrastructure and price variation was ranked as 1st, 2nd, 3rd, 4th and 5th major problems (based on index value) in the study site (Table 5). Farmers were unknown whether they would get a better price if they would involve themselves in the marketing of maize seed.

CONCLUSION

Seed is the most vital input which determines the production and yield of maize. The rapid growing populations is demanding more food to sustain the livelihood. Maize is considered as one of the staple food for the majority of the farmers living in mid hill area of Nepal. The study area was male dominated with majority of Brahmin community. Farmers were better accessed to extension services and training. Credit access was also found easy and inspection of seed was done mainly by DADO Palpa and regional seed testing laboratory, Bhairahawa. The major problems in maize seed production was infestation of insect/pests during storage. This caused huge loss of quality seed and deterioration in seed quality. This has compelled the farmers to use this maize seed to feed their livestock. Similarly, the major problems in the marketing of maize seed was poor bargaining power of farmers followed by low volume of production, inefficient middle men, poor marketing infrastructure and variation in price. In general, farmer sold their seed to agrovets in contract basis, cooperatives or DADO office which has made dependent on these units for selling which has created low bargaining power among farmers to fetch higher price. So this study appeals the need of necessary and effective extension services and training about the management of storage insect/ pests. Government and other stakeholder organizations should focus to develop irrigation facility to increase maize seed production and yield.

ACKNOWLEDGMENTS

I would like to acknowledge Directorate of Research and Extension (DORE), Agriculture and Forestry University (AFU), Rampur, Chitwan for partial support to complete this study. I would like to provide cordial thanks to my respected advisors who guided to complete this study. I am highly indebted to my colleagues, respondents of Palpa district who provided reliable data for this study.

REFERENCES

ABPSD (2014) Statistical Information on Nepalese Agriculture. Agri-Business Promotion and Statistics Division, Statistics Section. Government of Nepal, Ministry of Agricultural Development, Singha Durbar, Kathmandu, Nepal.

Acharya S.S. Agrawal N.L. (2011) Agricultural Marketing in India. Oxford and lbh, India.

Bajracharya M. Sapkota M. (2017) Profitability and productivity of potato (Solanum tuberosum) in Baglung district, Nepal. Agriculture and Food Security, 6(1): 47.

Bajracharya M. Sapkota M. Dhungana S.M. (2016) Socio-economic analysis of maize seed production in Arghakhanchi district of Nepal. Journal of Maize Research and Development, 2(1): 144-150.

CBS (2012) National population and housing census 2011 (National report). Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics, Kathmandu, Nepal.

CBS (2014) Population monograph of Nepal volume II (Social demography). Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics, Kathmandu, Nepal.

CDD (2016) Annual progress report 2015/16. Crop Development Directorate, Department of Agriculture, Ministry of Agricultural Development, Kathmandu, Nepal.

Chopra (2011) Principles of economics. Kalyani publisher, India.

DADO Palpa (2014) Annual report 2013/14. District Agriculture Development Office, Department of Agriculture, Ministry of Agricultural Development.

Finch H. Lewis J. (2003) Focus groups. Qualitative research practice: A guide for social science students and researchers, 170-198.

Joshi K.D. Conry C. Witcombe J.R. (2012) Agriculture, seed, and innovation in Nepal: Industry and policy issues for the future. Project Paper for International Food Policy Research Institute.

Karki T.B. KC G. Shrestha J. Yadav J.P. (2015) Tillage and planting density affect the performance of maize hybrids in Chitwan, Nepal. Journal of maize research and development, 1(1): 10-20.

Kattel R.R. (2015) Rainwater harvesting and rural livelihoods in Nepal. South Asian Network for Development and Environmental Economics (SANDEE). SANDEE Working Papers, ISSN 1893 1891; WP 102–15.

KC G. Karki T.B. Shrestha J. Achhami B.B. (2015) Status and prospects of maize research in Nepal. Journal of Maize Research and Development, 1(1), 1-9, doi: 10.5281/zenodo.34284

Liu W. Tollenaar M. Smith G. (2004) Within row plant spacing variability does not affect corn yield. Agronomy Journal, 96: 275-280.

Luque S.F. Cirilo A.G. Otegui M.E. (2006) Genetic gains in grain yield and related physiological attributes in Argentine maize hybrids. Field Crops Research, 95: 383-397.

Mignouna D.B. Manyong V.M. Rusike J. Mutabazi K.D.S. Senkondo E.M. (2011) Determinants of adopting imazapyr-resistant maize technologies and its impact on household income in Western Kenya.

Mishra M. (2004) Studies on weeds management in maize crop in the eastern hills of Nepal. In 24th National Summer Crops Research Workshop, 2004. NARC. Pp. 180-181.

Paudyal K.R. Ransom J.K. Rajbhandari N.P. Adhikari K. Gerpacio R.V. Pingali P.L. (2001) Maize in Nepal: Production Systems, Constraints, and Priorities for Research. Kathmandu: NARC and CIMMYT.

Sangakkara U.R. Bandaranayake P.S. Gajanayake J.N. Stamp P. (2004) Plant populations and yield of rain-fed maize grown in wet and dry seasons of the tropics. Maydica, 49: 83-88.

Sapkota M. Dutta J.P. Dhungana S.M. Bajracharya M. (2016) Socioeconomic characteristics and status of cereal producer in Arghakhachi district of Nepal. International Journal of Agriculture and Environmental Research, 2(4): 768-776.

Scheaffer R. (1979) Elementary Survey Sampling. Massachusetts, USA, Duxbury Press.

Vega C.R.C. Andrade F.H Sadras V.O. Uhart S.A. Valentinuz O.R. (2001) Seed number as a function of growth. A comparative study in soy-bean, sunflower, and maize. Crop Science, 41: 748-754.

Journal sponsorship

Azarian Journal of Agriculture is grateful to the ***University of Maragheh*** and its faculty members for their ongoing encouragement, support and assistance.