

Socio-Economic and Climate Change Issues on Vegetable Seed Production in Rukum District

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Abstract

The research entitled "Socio-economic and climate change issues on vegetable seed production in Rukum district" was conducted in various location of Musikot and Chaurjahari municipality with the objectives to know the socio-economic status and climate change issues on vegetable seed production. Rukum with low land to high hill climate is famous for the vegetable seed production which is considered as the high value low volume agro-product. Survey was conducted with the questionnaire and focus group discussion was conducted the farmers group, co-operatives and organization working in the field of vegetable seed production. This study revealed the farmers experienced on climate change, marketing and their socio-economic situation in vegetable seed production. The data and information on vegetable seed production were carried from various magazines, journal and report. The collected data were analyzed using the computer software SPSS and MS-Excel. The study will be beneficiaries to the farmer co-operatives, organizations, policy makers and seed traders. Majority of respondent found education level of primary (55%) and few were found with higher level (8.3%) while 11.7% respondent were found illiterate. The study showed that the number of farmers involving in the seed production are increasing (61.7%) but the number of different vegetable varieties decreased due to the high cost of production and low return. Change in the cropping pattern of crop (66.7%) experienced by respondent along with decrease in the rainfall and hailstone pattern, increase in temperature. Farmers were found with good knowledge of crop rotation as 46.66% change the site of production to maintain the soil fertility. The main problem farmers facing was the lack of quality seed source, irrigation facility at the critical stage of crop, grading problems and marketing. Majority of the farmers were found to involve in the onion seed production leaving other vegetables seed to grow. There is need of climate change mitigating measures to cope with changing climate change.

Keywords: Socio-Economic; Climate; Vegetable; Seed

Introduction

Nepal is an agricultural country where majority of people (65.6%) directly depend on agriculture and contribute one third of total GDP (31.2%) (Economic Survey, MOF 2072/73). Rukum District located at 28°29'N to 29°00'N latitude, 82°29'E to 82°53'E longitude, a hilly and mountain district extended from the altitude 754 to 6072 masl. The average maximum temperature is 24 °C and minimum temperature 13°C and relative humidity 79% along with annual rainfall from 1400-3200 mm which is best for the vegetable seed production [1].

Rapti zone contribute 25%-30% of the total country vegetable seed production and out of which 60% seed production from Rukum, as the major source of income. 89% of people involved in agriculture as their major occupation [2]. Vegetable seed production, spice crops production, fruit production are the major agricultural commodities famous in Rukum. Rukum district is the food secure district which has possibility to grow various crops. Onion, radish, bean, cowpea, cauliflower, green cress, Mustard, pea, etc. are the major vegetable seeds produced which cover 124 ha of total agriculture land in Rukum [1].

2070/71		2071/72		2072/73	
Area (hactre)	Production (Metric ton)	Area (hactre)	Production (Metric ton)	Area (hactre)	Production (Metric ton)
53	62	56	64	124	110

Table 1: Trend analysis of vegetable seed production in Rukum.

Source: DADO Rukum

Vegetable seeds have been identified as a high value; low volume product that if effectively implemented can be used to address issues of both food security and self-sufficiency, as well economic development of rural areas. There have been efforts from both government and non-government agencies to promote and develop the sector although efforts from the government’s side have been mostly evaluated to be insufficient as a result of budgetary deficits. Presently, despite considerable efforts that have gone into the sector, the sector lies overall fragmented and organized, and unable to meet the changing demands and market variations and it is for this purpose that the involvement of private sectors should be encouraged.

Year	Production (Metric ton)
2012/13	1250
2013/14	1284
2014/15	1355

Table 2: Production of vegetable seed in Nepal.

Source: Central Vegetable Seed Production Centre 2014/15

Formal seed production and distribution in Nepal began in late fifties and sixties with the introduction of new varieties of Rice like Taichung Native 1 and IR 8; of Wheat Lerma 52 and, Lerma Roho 64, and Maize Amarilo de Blanco [3,4]. Seed production in those days was target oriented and mainly produced in government farms and stations, and seeds were distributed through extension services. With the establishment of Agriculture Supply Corporation (ASC) in 1974, it started to procure and market limited quantity of seeds to farmers. Organized seed production and distribution started in early seventies when FAO established a high capacity seed drying, processing and bagging plant at Hetauda for Agriculture Input Corporation (AIC). During eighties, GTZ and USAID further helped to establish seed processing and storage facilities at five AIC regional centers in Terai and 20 mini seed houses in the mid hills [51]. Until 1990, public sector continued to play a key role in production and supply of Agricultural seeds in Nepal.

Climate change is an emerging environmental challenge, which has been considered through several basic indicators such as increased temperature, variability and uncertainty of precipitation. Extreme weather condition such as heat waves, drought, floods, erratic and inconsistent rainfall, change in crop production pattern, rise in sea level, polar ice and glacier melting, increase in infestation of disease and pest are some of incidences likely to happen due to climate change [6]. Despite having only 0.4 percent of the total global population and being responsible for only 0.025 percent of total GHG emissions in the world (Oli and Shrestha, 2009), Nepal ranks among the fourth most vulnerable country to climate change impact. The unusual changes in the climatic parameter influence on the production of the agriculture commodity. Majority of Nepalese population depend directly on agriculture for the livelihood which highly influence due to climate. Atmospheric temperature in Nepal has increased by 1.7°C during last 30 years from 1975 to 2005 (Parry, 2007) and, the average temperature increased by 0.06°C per annum [7], variation and uncertainty of rainfall increase leads to crop failure. Moreover, the overall climate change impact on agriculture sector is expected to be negative even though there may be positive effect on some crops in some region of the world, threatening the global food security [8]. Millions of Nepalese are estimated to be at risk to climate change. In the past 90 years, a glacier in the Sagarmatha region has receded 330 feet vertically. Because of glacier melting, new glacier lakes have formed. Although there will be an increase in river flows un till 2030, this is projected to decrease significantly by the end of this century. (IPCC) The problems arising due to climate change are increasing over the years. Nepal has to implement adaptation programs even if it is not being responsible for climate change. Hence, Nepal has considered climate adaptation as a national agenda and has taken initiatives for implementing different programs for risk reduction in the recent years. Vegetable seed production is affected by the climate change related indicators due to which the quality and productivity is decreasing.

Materials and Methodology

Data collection and analysis

The primary data were collected by conducting face to face interview with the vegetable seed producing farmers of the study area using a structured questionnaire. Similarly, Focus Group Discussion and Key Informant Survey were also conducted for the collection and triangulation of the data. Secondary data were collected from various sources like annual report book of DADO Rukum, Mild Temperate Vegetable Seed Production Centre, Central vegetable Seed Production center, district profiles and other different publications relevant to the study were collected.

The collected data were coded, entered and analyzed by using different data analysis software like SPSS and MS Excel sheet. The survey focus on the problem faced by the farmers in the vegetable seed production were analyzed based on the data obtained by face to face interview with respondents using structured questionnaires.

Different variables like education level, family size, organization involved, level of food sufficiency, size of land holding, access to irrigation, fertilizers, seeds, training etc. were analyzed for socio demographic characteristics and access to resources.

Trend of rainfall and temperature in 10 years in Rukum

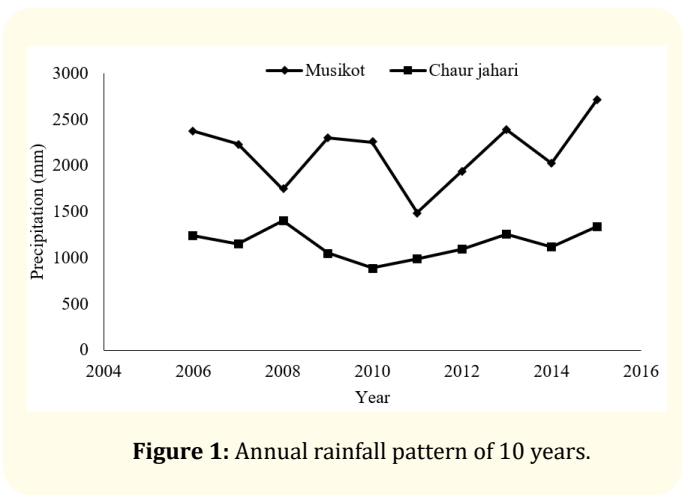


Figure 1: Annual rainfall pattern of 10 years.

Result and Discussions

The small farmers, mostly illiterate or with low level of education depend heavily on their culture, habit and traditional practices to earn their livelihood without understanding the science behind their day to day decisions (Pant, 2011).

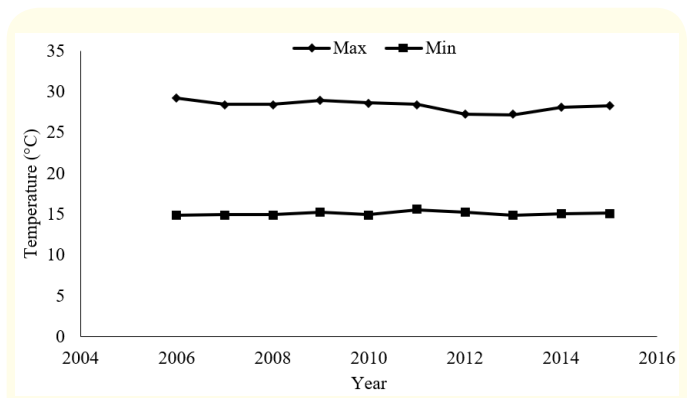


Figure 2: Maximum and minimum temperature of study area.

	Sex	Male	Female	Total
Ethnicity	Brahmin	9 (15)	3 (5)	12 (20)
	Chhetri	17 (28.33)	11 (18.33)	28 (46.66)
	Janajati	11 (18.33)	4 (6.67)	15 (25)
	Dalit	4 (6.67)	1 (1.67)	5 (8.34)
Total		41 (68.33)	19 (31.67)	60 (100)

Table 3. Ethnicity and sex of respondent.

Figure in the parenthesis indicate percentage

Source: Field Survey, 2017

Education level	Frequency
Primary level	33 (55)
Secondary level	15 (25)
Higher level	5 (8.3)
Illiterate	7 (11.7)
Total	60 (100)

Table 4: Education level of respondent.

Figure in the parenthesis indicate percentage

Source: Field Survey, 2017

Food-sufficiency	Frequency
3 - 6 months	6 (10)
6 - 9 months	40 (66.7)
9 - 12 months	14 (23.3)
Total	60 (100)

Table 5: Food-sufficiency of respondent.

Figure in the parenthesis indicate percentage

Source: Field Survey, 2017

Farmer level	Area (ropani)	Frequency
Small	< 10	19 (31.7)
Middle	11 - 20	37 (61.7)
	> 20	4 (6.7)
Commercial		
Total		60 (100)

Table 6: Land holding of respondent. Figure in the parenthesis indicate percentage Source: Field Survey, 2017

Farmers are categorized as the small size farmer with less than 10 ropani of land, medium size farmer with land between 11-20 ropani and farmer with land size more than 20 Ropani as the commercial farmer [2].

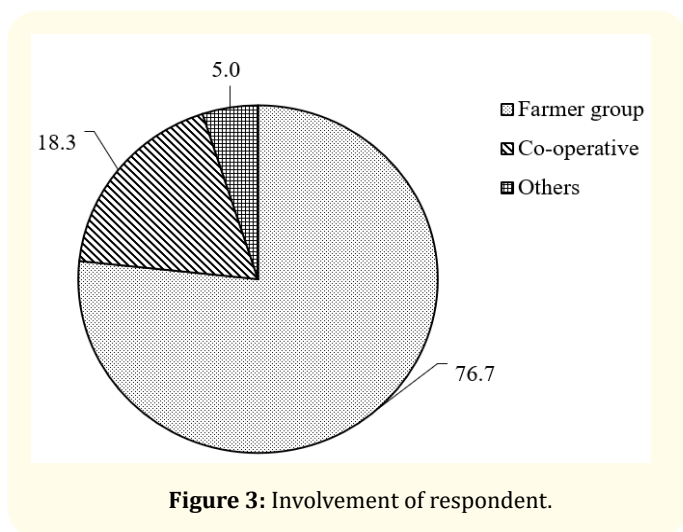


Figure 3: Involvement of respondent.

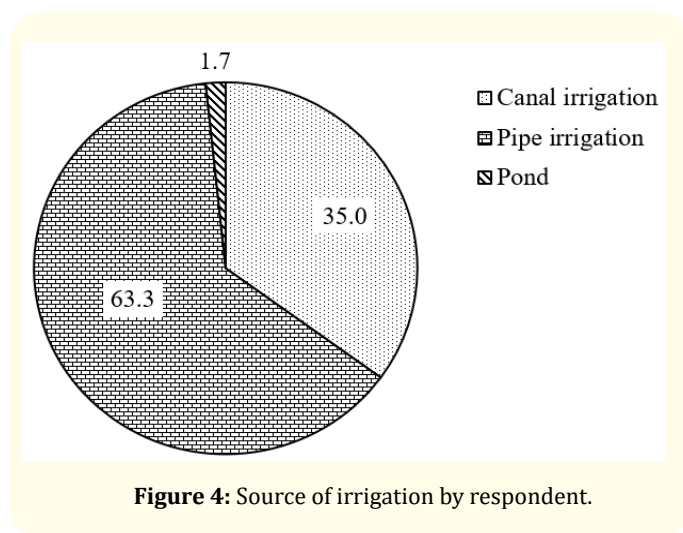


Figure 4: Source of irrigation by respondent.

Training	Frequency
Yes	32 (53.3)
No	28 (46.7)
Total	60 (100)

Table 7: Training on vegetable seed producing respondent farmers. Figure in the parenthesis indicate percentage Source: Field Survey, 2017

Nepal is the rainfed country depending mostly on monsoon rainfall. Irrigation is one of the prerequisites of agriculture farm for high and successful production. The major problem of low production of vegetable seed is due to the low availability of water during the critical stage of crop.

Type of fertilizer	Frequency
Organic fertilizer	8 (13.3)
Mixed fertilizer	51 (85)
Low use of manure and fertilizer	1 (1.7)
Total	60 (100)

Table 8: Types of fertilizer used by respondent farmers. Figure in the parenthesis indicate percentage Source: Field Survey, 2017

Rainfall pattern	Frequency
Increased	8 (13.3)
Decreased	52 (86.7)
Total	60 (100)

Table 9: Respondent perception on rainfall pattern due to climate change. Figure in the parenthesis indicate percentage Source: Field Survey, 2017

Increase in heavy rainfall generally found to be occurring in most places, even when mean precipitation is not increasing [9].

There is gradual increase in atmospheric temperature in different ecological zones of western development region of Nepal (Manandhar, 2009).

Temperature pattern	Frequency
Increased	52 (86.7)
Decreased	8 (13.3)
Total	60 (100)

Table 10: Respondent on temperature.
Figure in the parenthesis indicate percentage
Source: Field Survey, 2017

Hailstone pattern	Frequency
Increased	46 (76.7)
Decreased	12 (20.0)
No change	2 (3.3)
Total	60 (100)

Table 11: Respondent perception on hailstone.
Figure in the parenthesis indicate percentage
Source: Field Survey, 2017

Effect	Frequency
Positive	3 (5.0)
Negative	4 (6.7)
No change	11 (18.3)
Don't know	42 (70)
Total	60 (100)

Table 12: Climate change effect on seed production.
Figure in the parenthesis indicate percentage
Source: Field Survey, 2017

Reason of site change	Frequency
Climate change	13 (21.67)
Infrastructure	16 (26.67)
Crop Rotation	28 (46.66)
Others	3 (5.0)
Total	60 (100.0)

Table 13. Change of seed production site.
Figure in the parenthesis indicate percentage
Source: Field Survey, 2017

Change in cropping pattern	Frequency
Yes	40 (66.7)
No	20 (33.3)
Total	60 (100)

Table 14: Change in cropping pattern.
Figure in the parenthesis indicate percentage
Source: Field Survey, 2017

Over the past three years, the delay in monsoon season experienced in Nepal has changed the cropping pattern and crop maturity period. It has delayed the planting and harvesting season by a month, which has in turn affected rotation practices. The delay in monsoon season has also made thousands of hectares of farm land fallow and reduced production due to lack of water (Regmi and Adhikary, 2007).

Adaptation to climate change	Frequency
Change in planting time	38 (63.33)
Mulching	4 (6.67)
Change in crop variety	18 (30)
Total	60 (100)

Table 15. Adaptation to cope climate change in vegetable seed production:
Figure in the parenthesis indicate percentage
Source: Field Survey, 2017

Local knowledge and innovations are important insights to solve the big problems so they should be promoted instead of being ignored or subsided (Krone, 2006).

Status and the problems of vegetable seed production

Trend of vegetable entrepreneur	Frequency
Increasing	37 (61.7)
Decreasing	23 (38.3)
Total	60 (100.0)

Table 16: Trend of vegetable seed entrepreneur continuing.
Figure in the parenthesis indicate percentage
Source: Field Survey, 2017

Way if selling	Frequency
To seed company through group/co-operatives	58 (96.7)
Local seed seller	1 (1.7)
Own self	1 (1.7)
Total	60 (100.0)

Table 17. Way of selling vegetable seed.
Figure in the parenthesis indicate percentage
Source: Field Survey, 2017

Insecticides used trend	Frequency
Increasing	42 (70.0)
No change	18 (30.0)
Total	60 (100.0)

Table 18: Insecticide use in last 10 years.
Figure in the parenthesis indicate percentage
Source: Field Survey, 2017

Damage intensity	Frequency
Very low	2 (3.4)
Low	28 (46.7)
Medium	26 (43.3)
High	4 (6.7)
Total	60 (100)

Table 19. Degree of damage by disease, insect and pest.
Figure in the parenthesis indicate percentage
Source: Field Survey, 2017

Crop	Disease	Insect
Onion	Purple blotch	Seed Borer
Radish	Root rot	Aphid
Pea	Wilt	Pod borer

Table 20: Major vegetable seed disease and insect.

The decrease in production of vegetable seed due to various disease and pest observed during the field survey in the study area as mentioned in the table. The number of farmers growing other vegetable seed production was decreased and the majority of farmer found producing vegetable seed.

Major problems found in the study area are ranked as below on the basis of respondent view [10-24].

Problems	Percentage
Poor seed quality	36.6
Marketing	32.1
Grading, labelling and processing	14.5
Low seed price	9.3
Transportation	7.5
Total	100

Table 21: Problems of seed farmers.
Source: Field Survey, 2017

Conclusion

Climate change is evident in the study areas. Communities have started to experience unusual changes in temperature, rainfall and hailstone patterns, which were supported by a number of indicators such as decreased rainfall over the last few years, increasing temperature, change in hailstone pattern outbreak of pests and diseases. These outcomes were linked to increased risks and hazards, increased magnitude of impacts and their severity and vulnerability posed by such factors in vegetable seed production and hence to the livelihoods of farmers residing in Rukum.

There is no any disappearance of any species of the vegetable seed based on the knowledge of respondent. But the number of farmers growing different vegetable seed production is decreasing and limited to few crops. Previously farmers used to grow different vegetable seed and now most of them involved in onion seed and radish seed production.

Similarly, coping mechanisms, external interventions, traditional knowledge and innovations all play an important role in shaping vulnerability. Coping strategies and adaptation mechanism were limited at all study sites. Local knowledge, practices and innovations are important elements for community-based coping and adaptation mechanisms. There were few examples of adaptation strategies mostly in agriculture such as change in cropping patterns, choice of crops, and improvement in the system. There was limited awareness, knowledge and capacity at local and district levels to understand climate change scenarios, address issues, and conduct long-term planning. However, some observations were made regarding changing climate and its indicators. At the national level, there was lack of information, knowledge, and proper database regarding local and regional information, and government plans and strategies to deal with climate change impacts.

Recommendation and Suggestion

Impact of climate change on vegetable seed production is a burning issue which affects food security, employment and livelihoods in the developing countries like Nepal. The condition of Nepal is even more vulnerable with problems like: insufficient investment, weak infrastructure, inefficient irrigation, low productivity, fragile geology, lack of trained manpower weak policy etc. Thus, to minimize such vulnerabilities in vegetable seed production; water, seed and soil management should be implemented with focus on seed production and livelihood with following suggestions:

- Develop mechanism to assess the effects of climate change on vegetable seed production to identify the vulnerable pocket area of vegetable seed.
- Enhance adaptive capacity of climate change to increase a mechanism for seed production pockets.
- Enhance climate smart vegetable crops to reduce GHG emissions for mitigating climate change.
- Develop cooperation and coordination with farmers group, co-operatives and stakeholders to cope with vulnerabilities.
- Develop irrigation infrastructure for reducing drought hazards and promote rainwater harvest and micro irrigation systems.
- Enhance locality specific research activities so as to develop crop varieties suitable to heat resistant, drought resistant, insect pest resistant, submerged varieties.
- Identify safe agrochemicals like organic or bio-pesticides to reduce human/animal health hazards.
- Increase mechanism of IPM (Integrated Pest Management) to minimize pest and disease damage in the vegetable crop.
- Develop quality seeds and planting materials to improve the productivity of vegetable crops.
- Communicate with farmers' intensively regarding impact of climate change on vegetable seed production and its importance on improving people livelihoods.
- Develop crop insurance schemes in vegetable seed production to enhance farmers' interest on the vegetable seed production.
- Initiate plans for medium-term adaptation measures like policy development also the long-term adaptation measures like strengthening of research institutions.
- Quality of the vegetable seeds depends upon the genetic purity and quality of source seed. So need of quality vegetable seed in farmer level.
- Varietal maintenance program is very much required.

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