



RIVERBED VEGETABLE FARMING'S CONTRIBUTION IN LIVELIHOOD RECOVERY OF NEPALESE FARMERS

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Abstract: A study was conducted on municipalities and rural municipalities of Udayapur and Siraha districts, Nepal in 2019 to analyze the contribution of riverbed vegetable farming in livelihood of farmers among 120 households. Descriptive and statistical tools were used to analyze the data collected through multistage purposive random sampling procedure using structured interview schedule, Key Informants Interview (KII) and Focus Group Discussion (FGD) as well as secondary data from Agriculture Information Centre, Village Level Government Agriculture Worker and local NGO's report. The data and analysis suggested that there were positive changes in livelihood of farmers assisted by riverbed vegetable farming in both districts. Furthermore, results revealed by study showed that annual gross household income of riverbed vegetable farmers was higher in the Siraha district compared with the Udayapur district. Wilcoxon signed Rank sum test revealed that food self-sufficiency, food intake, change in shed type, latrine type positively changed after riverbed vegetable farming whereas there was no change in the land status and roof type in both the districts. Paired t-test showed the positive changes in the physical assets like television, mobile, chair, bed, table owned by the riverbed farmers in both districts. The result of this study indicated that contribution of riverbed vegetable farming in the livelihood of farmers are different for both farmers and are specific in the respective district. Findings of study will be useful for policy makers and others who are working on the livelihood of farmers in riverbed vegetable farming.

Keywords: Assets, Farmers, Riverbed, Livelihood, Wilcoxon.

INTRODUCTION

The climate change has resulted in massive soil erosion, a landslide in the hilly region and the warming of Himalayas has already a significant impact on agriculture production in both hill and terai region (Awal, 2014). Climate change influences farmers' practice (Mandal and Singh, 2020). In Bangladesh, farmers' have started to use cropping pattern and new farming technology in the plain land (Islam *et al.*, 2020). In developing countries like Nepal, majority of the population

depend on agriculture for their livelihood and are most vulnerable to climate change (Kaushik and Sharma, 2015). However, agriculture should be sustainable because unsustainable farming is not much beneficial in long run (Verma, 2017 and 2018). Increasingly erratic weather patterns and regional hydrological systems have doubled the risk that farmers are destined to face as environmental shocks in the terai region of Nepal. The increased frequency and extent of floods and land cutting have rendered the

agriculture sector more vulnerable and reduced the productivity of land and the potential for crop and vegetable production (Schiller *et al.*, 2013). The heavy rainfall with sudden flash floods especially in the terai part of Nepal has resulted in immense and catastrophic loss of agricultural land which has reduced production every year (Regmi, 2007). Not only production, there is also decrement in the agricultural land area.

As rivers leave the narrow valleys of the hills and enter the terai, they spread out covering large tracks of land and as the speed of water flow reduces, silt is deposited in large quantities along riverbeds (Dixit *et al.*, 2007). Farmers along the riverbanks face floods annually, with their arable land being silted over (Meena *et al.*, 2016). Soil degradation due to over-siltation from flooding means that farmers face larger pressure to adapt to produce on marginal lands or under less than optimal conditions (Pokhrel *et al.*, 2018). Riverbeds are the areas or land which are developed or found near the rivers between the natural levees of the river and are formed mainly due to periodic erosion and deposition of sediments under the influence of river's flowing behaviors (Choudhary *et al.*, 2019). Sediments that are brought down or washed from the hills during heavy rainfall and are deposited with the flow of water on the river banks of terai are also responsible for the formation of riverbed (Valdiya and Bartarya, 1989). Topography and irregularity of water scenarios due to the undulating terrain of the country are also the causes and increments of riverbed areas in Nepal (Das *et al.*, 2014).

Riverbed farming is an environmentally, economically, socially and technologically sustainable technology that can contribute to creating rural employment opportunities and enhance marginal farmers' capacities to sustainably adapt to the effects of climate change (Kriesemer *et al.*, 2016). Moreover, Riverbed farming is one of the important tools for sustainable land management techniques which helps to combat the global problem of land degradation (Mirzabaev, 2016). Riverbed farming exploits the production potential of under-utilized land resources with the potential for expansion and also enables land-poor farmers to access land for agricultural production (Liu *et al.*, 2011). Riverbed farming enables households to gain extra income, which allows them to invest in other income opportunities business or service that help them to diversify their income opportunities and mitigate the risk of being solely involved in conventional farming (Mor *et al.*, 2018).

MATERIALS AND METHODS

Selection of the study area and site

The Udayapur (fig. 1) and Siraha (fig. 2) districts were purposively selected for primary data collection and both these districts lie in the terai part of Nepal. Both districts have large riverbed areas which are used for earning and adding in livelihood.

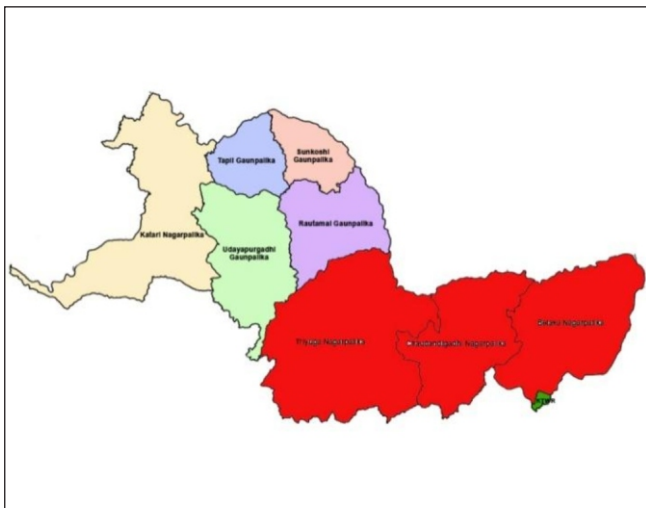


Fig. 1: Study area of Udayapur district.



Fig. 2: Study area of Siraha district.

Sampling Technique

The multistage purposive random sampling procedure is used in sampling (fig. 3). Firstly, the two districts viz. Udayapur and Siraha were purposively selected from province 1 and 2 respectively. Secondly, 3 municipalities from each district were randomly selected for the

purpose of study. Finally, 120 riverbed vegetable farmers were selected using simple random sampling technique from list of farmers as far information and list provided by agriculture knowledge center of these districts, village level government agriculture worker, social mobilizer, NGO reports, and progressive farmers.

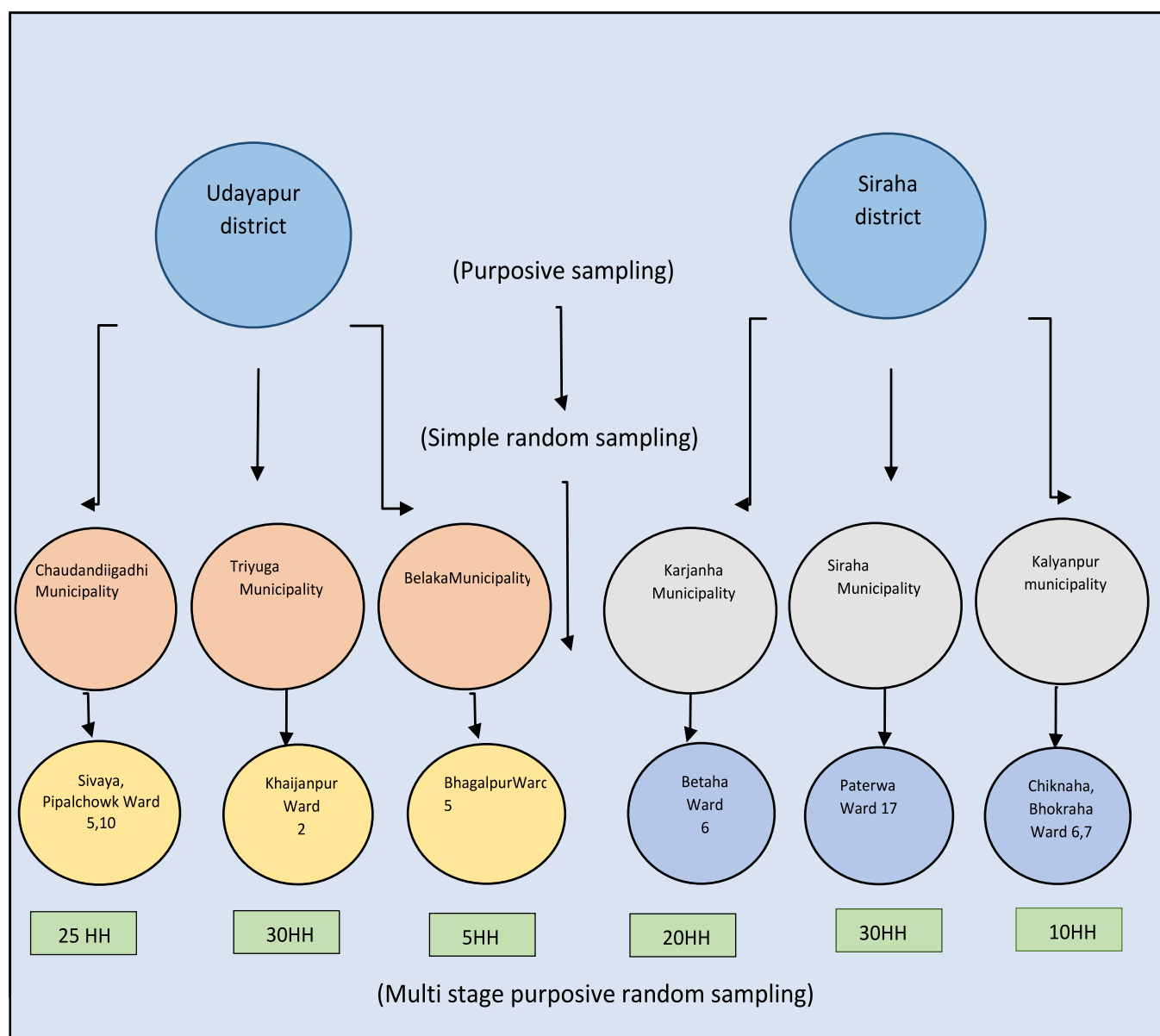


Fig. 3: The multistage purposive random sampling procedure used for study.

RESULTS

1. Socio-demographic characteristics of respondent's households

In terms of the gender of respondent's

households, 5% were females and 95% were males in the Udayapur district whereas 1.7% was female and 98.3% males in the Siraha district. With respect to the study sample, total female was 3.3% and male 97% as respondents.

Table1: Gender of respondent's households in both study districts.

Gender of household head	Udayapur	Siraha	Total
Female	3(5)	1(1.7)	4(3.3)
Male	57(95)	59(98.3)	116(96.7)

Note: figures in parentheses indicate the percentage

(Source: Field survey, 2019)

2. Farm characteristics

The table 2 shows that the low landholding was 11.86 Katha in the study districts. It was 13.26

Katha in Udayapur while it was 10.45 Katha in Siraha.

Table 2: Farm characteristics of respondent's in both study districts.

Variable	Udayapur (n=60)	Siraha (n=60)	Total (n=120)
Lowland	13.26(8.47)	10.45(1.14)	11.86(1.01)
Upland	0.09(0.647)	0.9167(5.29)	0.50(3.78)
Riverbed farming area	8.49(4.64)	19.733(1.52)	14.11(1.25)
Leased riverbed area	0.166(0.90)	1.2(3.31)	0.72(2.49)
Livestock holding (LSU)	5.48(2.92)	3.66(2.64)	4.57(2.92)

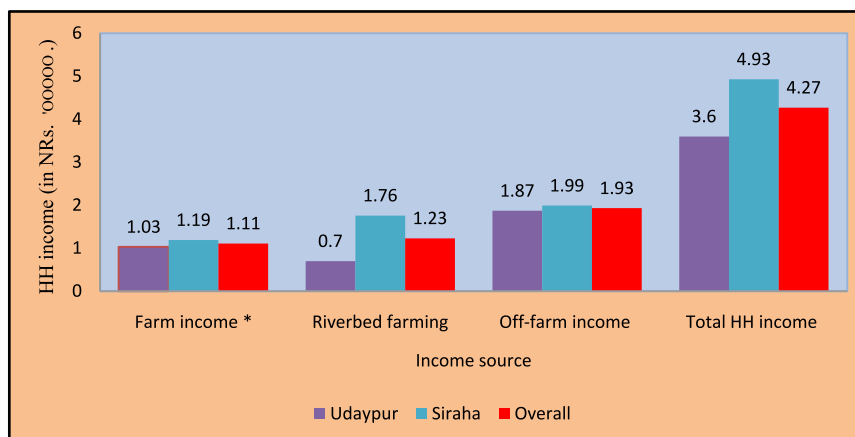
Note: Figures in parentheses indicate standard deviation

(Source: Field survey, 2019)

The average landholding of riverbed farmers was 13.26 Katha lowland and 0.09 Katha upland in Udayapur district with a standard deviation of 8.47 Katha lowland and 0.65 Katha upland respectively. Riverbed farming was done in 8.49 Katha among which 0.17 Katha was taken in lease from riverbed farming in Udayapur. Similarly, the average landholding of riverbed

farmers was 10.45 Katha lowland and 0.91 Katha upland in Siraha district with a standard deviation of 1.14 and 5.29 respectively. Riverbed farming was done in 19.73 Katha among which 1.2 Katha was taken in lease from riverbed farming in Siraha district. The livestock holding found in Udayapur and Siraha district were 5.48 and 3.66 respectively.

3. Contribution of riverbed farming in annual household gross income in Udayapur and Siraha districts.

**Fig.4: Contribution to annual household gross income by riverbed farming.**

Note: * indicate farm income without accounting income from riverbed farming.

The annual income was categorized into three broad categories: Farm income without riverbed farming, off-farm income, and income from riverbed farming. The mean on-farm income without accounting riverbed farming was 1.11 lakhs. It was 1.19 lakhs in Siraha and 1.03 in Udayapur. The income from riverbed farming was higher in Siraha (1.76 lakhs) than Udayapur (0.7 lakhs). It was NRs. 1.23 lakhs in study area. The

off-farm income was found to be 1.93 lakhs in study area. It was NRs. 1.99 lakhs in Siraha and 1.87 lakhs in Udayapur district.

The mean annual income was found to be 4.27 in study area. The mean annual HH income was higher in Siraha (NRs. 4.27 lakhs) than Udayapur (3.6 lakhs).

4. Livelihood changes by riverbed farming (RBF) in both Udayapur and Siraha districts.

Table 3: Livelihood changes made by riverbed farmers in both study districts.

Properties	-ve rank			+ve rank			Tie	Z value
	N	Mean	Sum of ranks	N	Mean	Sum of ranks		
Food SS after-food SS before	7	54.21	379.50	100	53.99	5398.50	13	8.039***
Food intake after – food intake before	4	21.50	86	39	22.05	860	77	5.308***
Roof after – roof before	24	27.67	664	28	25.50	714	68	0.257
Shed after – Shed before	16	22.0	352	28	22.79	638	76	1.896*
Land after – Land before	6	9.92	59.5	11	8.50	93.50	103	0.895
Latrine type after – latrine type before	1	16.50	16.50	31	16.50	511.50	88	5.303***

Note: ***, **, * indicate significance at 1%, 5%, 10% level respectively.

Riverbed farming has resulted and proved best livelihood assisting technique in both district and there's a lot positive and significant result through RBF. Food self-sufficiency (SS), food intake (times per day) have been significantly increased after RBF at a 1% level of significance.

Income from RBF has assessed farmers for improving their sanitary hygienic habits and nutrition. They have started using the improved latrine and it was significantly increased at a 1% level of significance. In the same way, improved sheds were made through the income of RBF and

that has also been increased significantly at a 10% level of significance.

5. Physical assets before and after riverbed farming in Udayapur and Siraha districts

There were many positive changes found in the physical assets of riverbed farmers after practicing or doing RBF. Farmers of both districts have significant changes in their physical assets and livelihood in both districts *i.e.* Udayapur and Siraha and the changes in physical assets after riverbed farming is presented in table 4. The number of mobiles was found to be increased

(0.88) after riverbed farming which was statistically significant at a 1% level. The no. of radios was 1.30 before riverbed farming and 1.38 after farming but no statistical difference was found.

The number of televisions increased from 0.38 to 0.72. It was statistically different at the 1% level. The no. of beds was found to be increased from

3.98 from 3.26 which were statistically different at the 1% level. The no. of tables was increased (0.20) with a statistical difference at 5% level between before and after the riverbed farming. Regarding no. of cupboards, the increment was 0.63 which was not statistically different. The no. of chairs was increased 3.21 to 3.79 with statistical difference at the 1% level.

5. Physical assets before and after riverbed farming in Udayapur and Siraha districts.

Table 4: Physical assets owned by riverbed farmers before and after introducing riverbed farming.

Variables	After riverbed farming	Before riverbed farming	Paired mean difference	t-value
No. of mobiles	2.04(0.52)	1.16(0.86)	0.88(0.76)	12.58***
No. of radios	1.38(0.53)	1.30(0.74)	0.08(0.65)	1.392
No. of televisions	0.72(0.48)	0.38(0.48)	0.34(0.47)	7.859***
No. of beds	3.98(1.75)	3.26(1.452)	0.72(0.90)	8.724***
No. of tables	1.43(0.65)	1.48(0.59)	0.42(0.20)	2.275**
No. of cupboards	1.41(0.57)	1.39(0.63)	0.02(0.41)	0.446
No. of chairs	3.79(1.55)	3.21(1.41)	0.58(0.91)	7.00***

Note: ** and *** indicate significance at 5% and 1% level, respectively.

DISCUSSION

The study revealed that in the study area there were 95% male and 5% female-headed households in Udayapur district; 98.3% male and 1.7% female-headed households in the Siraha district. The household head as revealed by the study were mostly male than female in both districts, and that suggests male dominance in household's level decision which is the common scenario of Nepal (Pokhrel *et al.*, 2018). The average house holding size in Udayapur and Siraha district was 6.48 and 6.75 respectively which is slightly higher compared to the data from CBS (2011) where average house holding size in Udayapur and Siraha district are 4.89 and 4.89 respectively.

The study findings clearly envisaged that the contribution of riverbed vegetable farming in annual house holds gross income was higher in the Siraha district than Udayapur district because riverbed farmers in the Siraha district have many years of experience and huge riverbed

areas for cultivation than Udayapur district. Many years of experience and a huge area for cultivation directly benefits in income generation.

Farmers earned a good income from the riverbed vegetable farming which was far better than conventional mode of farming in permanent agriculture land. This finding as per is also supported by the study of the findings from Gurung *et al.* (2012) and Maharjan (2017). Kumari *et al.* (2018) revealed that cucurbit vegetable farming is a kind of forcing off-season vegetable farming and farmers fetch the good prices in comparison to normal season vegetables. Off-season vegetable farming is a good startup earning to the poor farmers that has scope of good price in the market and makes extra earning of farmer including other on-farm and off-farm income (Shrestha, 2008). Wilcoxon signed-rank test and paired t-test revealed that there are positive changes in the livelihood and physical assets earned by riverbed vegetable growers.

On an average 80% households had a positive change in livelihood with the help of riverbed farming and owned physical assets that represent the basic necessity of livelihood sustainability. The increase of assets can be correlated to the earnings from riverbed farming which increases the purchasing capacity of farmers. This finding was quite similar with the study results of Udoh *et al.* (2017). Moreover, results revealed by Wilcoxon signed-rank test shows that farmers are quite sincere and aware of their daily hygiene and health perhaps due to improvement in income and awareness. As earning made by farmers from riverbeds are also used to build latrine and sanitation, which showed that farmers are more conscious about family health and hygiene. It may be helpful in bringing the sustainable development but environmental ethics cannot be ignored (Verma, 2019).

Change in livelihood includes food self-sufficiency, food intake, house type, shed type, latrine type and physical assets include mobile, bed, table, chair, cupboard, TV, radios, etc., these assets are added according to the need of farmers. Increased income of farmers has made farmers accessible for food self-sufficiency, food intake, change in latrine type, change in their shed type through profit made by vegetable farming, are used for earning staple and cereals food. This finding is similar and is in line with the findings of Joosten *et al.* (2015) and Minten *et al.* (2009).

CONCLUSION

Among several factors, this study is mainly focused upon the effects and contribution of riverbed vegetable farming in livelihood in both the districts and it was found that riverbed farming has a significant contribution in annual household gross income in Udayapur and Siraha district. The annual household gross income through RBF was higher in the Siraha district in comparison to Udayapur district, and it was 1.76 lakhs in Siraha and 0.7 lakh in Udayapur district with the mean annual HH income higher in Siraha district than Udayapur district. The reason for the higher income received from riverbed farming in the Siraha district than in Udayapur district which might be due to large area coverage and experience for riverbed farming leading

higher in the case for Siraha district than Udayapur district.

The Wilcoxon signed Rank sum test, Paired T-test, tools were used to know the changes in livelihood *i.e.* food self-sufficiency, food intake, gain in physical assets by the earning made from riverbed vegetable farming. Physical assets include a number of beds, chairs, house types, cupboards, mobile, table, television, etc. Both the statistical methods *i.e.*, Wilcoxon Signed Rank Test and paired t-test suggested that there is a positive change in livelihood after the introduction of riverbed farming including otheron-farm and off-farm activity but environmental ethics must be followed.

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