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Role of Irrigation in Crop Production and Productivity: A Comparative Study of Tube Well and Canal Irrigation in Shreepur VDC of Kanchanpur District

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Abstract

The main purpose of the study is to find out the changes in production and productivity and the living standard of the people in Shreepur VDC after the introduction of canal and tube well irrigation facility. The prime issue related to the study is whether the canal and tube well irrigation facility has brought changes in crop production and productivity and contributed to improving the living standard of the people in the study area. The researcher took the sample of 113 households out of the total 750 households in the VDC using simple random sampling procedure. The informants were interviewed with the help of questionnaires. Similarly the informants were observed using participatory observation method. It is found that there have been changes in production and productivity after the provision of irrigation facility. Most of the baries (non-irrigable land) where maize, mustard and gram were grown have been utilized to grow paddy and wheat like in khets (irrigated). Paddy production has increased by 68.75 percent and wheat production has increased by 193.0 percent. Living standard in terms of house type, type of toilet, use of pure drinking water, use of consumer accessories has also been improved.

Key words: - Irrigation, Production, Productivity, Food sufficiency, Living standard.

Introduction

Major economic activities i.e. agriculture, industry, trade, etc. are performed in Terai ecological zone of Nepal in large extent. Agriculture, is considered as the backbone of national economy which supports industry and trade of Nepal to a great extent. Lying in the south of the country, the Terai is the fertile plain region with huge potential for agriculture development. This is the major agricultural production region that supplies grains needed throughout the country. In the late 1950's Terai region was opened up to the people living not only within Nepal but also in neighboring states of India (CBS, 2006). Irrigation is one of the major inputs of agriculture which plays an important role in its development. It provides an opportunity for the increase in quantity of agricultural production. Therefore, irrigation is the major invariable component for agricultural development.

Nepal's water development policies are concerned with the exploitation of groundwater for irrigation purposes in the Terai region. Most of the surface irrigation systems in the Terai are fed by medium or small rivers with limited water availability during the dry season, which renders it insufficient for year-round irrigation. The agricultural development policy adopted for the Terai region has therefore emphasized year-round irrigation through the use of groundwater. The Tenth Plan (2002-2007) has outlined the following strategies 2002 (NPC): (a) develop deep and shallow tube-wells with appropriate subsidy support in poverty-stricken areas and bring additional areas under irrigation through other irrigation schemes; (b) increase water use efficiency in the irrigation system; (c) use of local manpower and inputs in the construction of medium and large irrigation systems; and (d) intensify water management activities. Two relevant policies envisaged by the National Water Resource Strategy 2002 (NWRS) related to development of irrigation and agricultural are to: (a) integrate irrigation planning and management with agricultural development, and (b) develop year-round irrigation for intensification and diversification of agriculture (Pradhan, 2008). Irrigation brings changes in socio-economic status such as education, high living standard, per capita income and other indicators of civilization of people. Irrigation facility increases the crop production and intensity of crop in higher rate. Farmers use improved variety of crops. Employment is higher in irrigated area where there is higher production, higher income, higher expenditure and higher saving (Dhakal, 1990).

The Terai's cultivated area represents nearly 48 percent of the country's total cultivated area (2,968,017 ha.). Among the land uses of the Terai region, cultivated land accounts for about 42 percent, second to forest coverage (47%). The cultivated area is irrigated by several methods including canals, tube wells or boring, ponds and other means. Canal irrigation represents 61 percent of the country's irrigated area. The relative share of the Terai's irrigated area to the country's total irrigated area has increased from 76.2 percent in 1981 to 83.9 percent in 2001 (MOAC, 2002). The main issue of this study is to find out which irrigation system has better performance in increasing crop production and productivity based on study in Shreepur VDC.

Approach and Methods

The study is based on the primary sources of data. The relevant and available secondary data and information are also used to supplement primary data. The field work was carried out in ward no. 7 in Hattibojha and in ward no. 5 in Motipur and Shantipur of Shreepur VDC for the purpose of primary data collection. To find out the impact of canal irrigation system Shantipur and Motipur villages were selected. In the same way Hattibojha was chosen to examine the impact of both canal and tube well irrigation system on production, productivity and living standard of the people. These wards were divided based on the type of irrigation system. The three groups are: Canal irrigated areas, tube well irrigated areas, and both irrigated areas. The researcher has sampled 113 households of canal, tube well and both irrigated areas representing 15 percent of the total 750 households in the selected VDC. The sample households were chosen randomly. The data were collected through participatory observation and in-depth interview method. The data were collected from April 29-May 30, 2005 using mixed (structured and unstructured) questionnaires. The questionnaires were administered to the head of the family to collect information about the socio-economic change and the impact of the Mahakali Irrigation Project (MIP) and Tube well irrigation system in the study area. Simple quantitative and qualitative tools and techniques and interpretation approach is adopted for the analysis of data.

The Study Area

The Mahakali Irrigation Project (MIP) is situated in the Kanchanpur district of the Far Western Development Region. It is on the left bank of Mahakali River. Initially it was founded by International Development Association (IDA) and the International Bank for Reconstruction and Development (IBRD). In accordance with the water sharing agreement made in 1920 A.D. between government of Nepal and the government of India the project has to supply water from the Sharada barrage established in 1928 A.D. In 1971 A.D. the Irrigation Department started designing and constructing the main canal. The main objective of the project was to increase agricultural production through a host of activities as: renovation of the existing irrigation system, expansion of the system, construction of feeder roads and institutional strengthening of pilot farm (MIP, 2001).

There are three phases of the Mahakali Irrigation Project. This study focuses on the second phase. The second phase of this project was started in 1990. The World Bank and government of Nepal negotiated the agreement to construct the canal for this phase. The objective of the phase was to irrigate 8476 hector (12460 bigah) of land after its completion but only 5500 hector of land is irrigated. The total cost of the construction of the second phase was about Rs. 954.8 million (MIP, 2001).

The study area Shreepur VDC lies in Kanchanpur district in the Far Western Development Region of Nepal which is bordered by Kalika and Baisibichhawa VDCs in the east; Rampur Bilaspur VDC to the west, Shankarpur and Dekhatbhuli VDCs to the north and Uttar Pradesh of India to the south (Figure 1). The VDC covers the total area of 5990 hector and the altitude is 200 metres from the sea level.

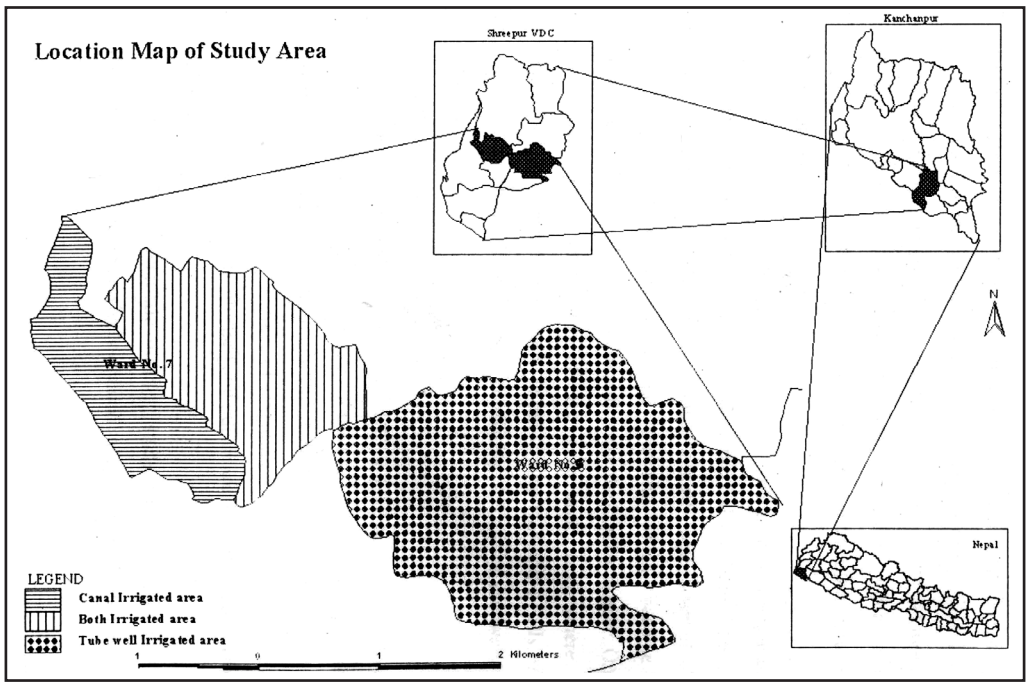

Figure 1: Location of Study Area

The study area is a part of the Indo-Gangetic plain and characterized by subtropical monsoon type climate having wet and dry season. The summer monsoon that arises over the way of Bengal brings rain to the Terai during the period of mid June to mid October. The rainfall is slightly lower in the Western than in the Eastern Terai. In the winter, the Northeast monsoon brings drier and cooler air to the Terai particularly in the Western part.

Changes in Area under Different Crops

There are three irrigation systems in the study area. The first is Canal irrigation, second Tube well irrigation and the last is the both irrigation system. Before irrigation currently irrigated areas were insufficiently cultivated. The field used to be fallow during the dry period. In khets (irrigated), due to presence of moisture, farmers used to produce paddy and wheat crops. But in baries (unirrigated), mustard, gram, masur (lentil) were produced as chief crops. So before irrigation the area of baries (unrrigated) was larger than khets (irrigated). After irrigation most of baries (unirrigated) have been changed into khets (irrigated).

In Shreepur VDC 3950 hectors (5807 bigah) of land is under cultivation and the chief crops are paddy, wheat, maize, sugarcane, mustard seeds and masur (lentil). Vegetables are also cultivated in some areas (Paudyal, 2005).

Canal Irrigation

In the study area, the total length of canal irrigation is 13.2 km. Table 1 shows the changing pattern of the crop production in canal irrigated area.

Table 1.Crop production area in canal irrigation

Crop	Before irrigation (2002)		After irrigation (2005)		Net area change (Bigah)
	Bigah	%	Bigah	%	
Paddy	34	25.76	51	31.68	17
Maize	24	18.18	17	10.56	-7
Wheat	18	13.64	50	31.06	32
Sugarcane	-	-s	17	10.56	17
Masur (lentil)	27	20.45	13	8.07	-14
Mustard	29	21.97	13	8.07	-16
Total	132	100	161	100	-

Source: Field Survey, 2005

Changes in agricultural patterns of the farmers of the study area have clearly been seen after the availability of canal irrigation facility. There has been increase in the area under paddy, wheat and sugarcane cultivation and decline in the areas under masur (lentil), mustard and maize.

Tube Well Irrigation

In Shantipur and Motipur villages of Shreepur VDC, 75 percent of households use tube well system for irrigation. Most of the farmers have installed tube wells from the beginning of the settlement (1990) by taking loans from banks and other financial agencies.

Due to the availability of tube well facility for irrigation, the considerable change has occurred in crop production and productivity. The result of the crop production areas is shown in the following table.

Table 2. Crop production area in tube well irrigation

Crop	Before irrigation (2002)		After irrigation (2005)		Net area change (Bigah)
	Bigah	%	Bigah	%	
Paddy	26	14.86	87	40.85	61
Maize	46	26.28	8	3.75	-38
Wheat	20	11.43	87	40.85	67
Sugarcane	-	-	9	4.23	9
Masur (lentil)	39	22.29	10	4.69	-29
Mustard	44	25.14	12	5.63	-32
Total	175	100	213	100	

Source: Field Survey, 2005.

It is seen from Table 2 that crop production areas have excessively increased in tube well irrigation area after its introduction. Mainly the area of paddy and wheat has increased and the cultivation of sugarcane has also begun after tube well irrigation.

Canal and Tube Well Irrigation

In this study, both irrigation systems: canal irrigation and tube well irrigation system is distributed to Hattibojha village. The similar changing pattern is found in both irrigations areas as other irrigation areas. Farmers have increased paddy, wheat and sugarcane cultivation area. On the other hand, comparatively the area of masur (lentil), maize and mustard has decreased. Irrigation facility has brought drastic change in crop production and productivity in Shreepur VDC. All three irrigation systems have played the significant role to bring changes in production and productivity. Before irrigation 158 Bigahs of land was cultivated where the cultivation areas increased after irrigation. The area reached up to 170 Bigahs.

Changes in Crop Production and Productivity

Paddy, wheat, maize, mustard, masur (lentil) and gram were the common crops grown on the study area before the irrigation system. But after irrigation paddy and wheat have been the dominant crop in low land and maize, mustard, masur (lentil) are the main crops in high land. Potato, sugarcane and other vegetables are also grown in small size of land of the total cropped area.

Table 3.Crop production and productivity in canal irrigated areas

Before irrigation (2002)			Crop	After irrigation (2005)			Net productivity change (Quintal)
Area (Bigah)	Production (Quintal)	Productivity (Quintal per Bigah)		Area (Bigah)	Production (Quintal)	Productivity (Quintal per Bigah)	
34	391.00	11.50	Paddy	51	659.86	13.15	1.65
24	211.92	8.83	Maize	17	123.25	7.25	-1.58
18	190.44	10.58	Wheat	50	558.00	11.16	0.58
-	-	-	Sugarcane	17	4530.4	280.00	280.00
27	182.25	6.75	Masur (lentil)	13	34.45	3.00	-3.75
29	156.60	5.40	Mustard	13	39.00	3.00	-2.40

Source: Field Survey, 2005.

In river irrigated area in baries (unrrigated) mustard and masur (lentil) were the main crops before irrigation and amount of production was also limited. After irrigation the area under mustard and masur (lentil) decreased by forty percent. On the other hand paddy and wheat productivity rate is increased. As other areas, in river irrigated area most of the baries (unrrigated) have been used as paddy and wheat land. The crop production in baries (unrrigated) is good because there is no siltation problem. Due to this fact, sugarcane production is practiced.

Table 4.Crop Production and Productivity in Tube well irrigated areas

Before irrigation (2002)			Crop	After irrigation (2005)			Net productivity change (Quintal)
Area (Bigah)	Production (Quintal)	Productivity (Quintal per Bigah)		Area (Bigah)	Production (Quintal)	Productivity (Quintal per Bigah)	
26	271.96	10.46	Paddy	87	1500.75	17.25	6.79
46	484.84	10.54	Maize	8	66.24	8.28	-2.26
20	176.80	8.84	Wheat	87	1435.50	16.50	7.66
-	-	-	Sugarcane	9	2868.75	318.75	318.75
39	308.10	7.90	Masur (lentil)	10	57.10	5.71	-2.19
44	302.72	6.88	Mustard	12	48.00	4.00	-2.88

Source: Field Survey, 2005.

The production volume of paddy and wheat is increasing in the area facilitated with tube well irrigation system. On the other hand, the production rate of mustard, masur (lentil) and maize is decreasing each year. Due to the tube well irrigation facilities the agricultural trend is deviated. However, sugarcane productivity is good in this area.

Table 5.Crop Production and Productivity in Both irrigated areas

Before irrigation (2002)				After irrigation (2005)			
Area (Bigah)	Production (Quintal)	Productivity (Quintal per Bigah)	Crop	Area (Bigah)	Production (Quintal)	Productiity (Quintal per BIgah)	Net productivity change (Quintal)
51	452.90	8.90	Paddy	71	1026.66	14.46	5.56
14	124.18	8.87	Maize	5	23.30	4.66	-4.21
50	563.50	11.27	Wheat	70	781.20	11.16	-0.11
10	4000.00	400.00	Sugarcane	12	2700.00	225.00	-175.00
16	89.92	5.62	Masur (lentil)	12	38.40	3.20	-2.42
17	80.75	4.75	Mustard	9	36.00	4.00	-0.75

Source: Field Survey, 2005.

Because of sandy soil and lack of use of modern equipments, sugarcane productivity is decreasing in both irrigated areas. Canal irrigation has direct impact on paddy production, which seems positive whereas in the Hattibojha village, the siltation problem has negative impact on wheat production. In this area, also some baries (unrrigated) have been converted into khets (irrigated). So, the production of maize, mustard and masur (lentil) has been decreasing each year.

Saving and Investment

In tube well irrigated areas due to proper irrigation facility, suitable soil condition, nuclear and small family size and scientific farming system, saving and investment is larger. On the other hand in river irrigated areas and both irrigated areas the saving and investment seem to be lower. The fact is that, in this area the distribution of canal is unequal. Similarly due to low volume of water and siltation problem production is not so high as expected. So, it has direct impact on income, saving and investment. The other reason of low saving and investment is unavailability of other occupation and the main source of expenditure is agriculture.

Table 6. No of household reporting saving and investment

Saving	Canal irrigation	Tube well irrigation	Both irrigation
Yes	6	17	7
No	31	22	30

Source: Field Survey, 2005.

Living Standard of People

The living standard of the people of the study area was not good before irrigation system. However, the impact of irrigation does not seem so impressive to raise the living standard of people as expected. River irrigated area is mainly occupied by Tharu Community. The structure of their houses, social status, ways of celebrating festivals, living style etc. seem similar before and after irrigation. But on the other hand, in tube well irrigated areas income and saving status, living standard of people have been changed after irrigation due to impact of urbanization, road transportation, electricity

and drinking water facility. So, the living standard of people of tube well irrigated area has been modernized. Regarding the goods consuming rate, it is maximum in tube well irrigated areas rather than river irrigated and both irrigated areas which is shown in Table no. 7.

Table 7.Living standard before and after irrigation (in household)

Particular	Canal irrigation		Tube well irrigation		Both irrigation	
	B.I (2002)	A.I (2005)	B.I (2002)	A.I (2005)	B.I (2002)	A.I (2005)
A. House type						
Cemented	-	-	2	13	1	3
Wood, hey & tile	33	35	8	5	26	26
Cement & tile	-	-	-	5	1	4
B. Use of fuel						
Fire wood	37	37	39	35	37	35
Bio-gas	-	-	-	4	-	2
C. Toilet						
Local	35	35	37	27	37	35
Cemented	-	-	1	11	-	2
No toilet	2	2	1	1	-	-
D. Drinking water						
Public tap	2	2	-	-	-	-
Private tap	35	35	39	38	37	37
E. Consumer accessories						
Watch	9	26	4	38	4	23
Radio	10	13	3	36	5	19
T.V	20	28	4	30	4	28
Motorcycle	-	-	-	3	-	2
Tractors	-	-	-	1	-	1

Source: Field Survey, 2005.
Note: B.I = Before Irrigation, A.I = After Irrigation

Conclusions

The present research was carried out in Shreepur VDC of Kanchanpur District for the evaluation of impact of irrigation on socio-economic condition of people.

In the tube well irrigated areas, there is high crop intensity, income level is also higher than that of before irrigation facility. The impact of irrigation in this area is directly positive. The economic status of people of this area is also increased after irrigation resulting in positive direction in education as well as in overall standard of living.

The impact of irrigation can be found in canal irrigated areas too. However, it is not so effective as in tube well irrigated areas. It is because of the availability of sufficient water supply anywhere at anytime in these areas. Most of the households are unable to take advantages of irrigation to

increase their production. It is, because of larger family size. Therefore, within the area, there is not much improvement as compared to other modes of irrigation facilities areas.

On the whole, the changes which were found in canal irrigated and tube well irrigated areas, are found in both irrigated areas. However, both irrigation facilitated areas are made up of mixed society. The socio-economic status of both irrigated areas is higher than that of canal irrigated areas, but lower than that of tube well irrigated area. Similarly there was only one toilet before irrigation but after irrigation its number increased to 11. Before irrigation due to low standard of living, people didn't have any vehicles but later on they possess vehicles e.g. Motorcycle, tractor etc. The impact of irrigation on all types of irrigated areas are the baries (unrrigated) that were used to produce mustard, gram, maize as chief crops are changed into khets (irrigated) and they are recently used for the production of paddy, wheat and sugarcane. Before the irrigation facilities the areas under khets (irrigated) were very small but after the availability of irrigation facility the areas of the khets (irrigated) have been enlarged. Due to the impact of irrigation, the areas of paddy, wheat and sugarcane have been increased.

Overall the current agriculture productivity is positive compared to that of before irrigation in the surveyed households. The increase in production resulted higher food sufficiency status, higher use of agriculture inputs such as fertilizer, hybrid seeds, insecticides, pesticides as well as modern agriculture tools such as tractor, power tillers and threshers. Now because of availability of markets farmers are attracted to varieties of crop production and vegetable production too for extra income. The change of agricultural practices from monoculture to multiple cropping is also one of the remarkable impacts of irrigation in the area.

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