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Impact of Irrigation on Agricultural Productivity of Lidder Valley

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Abstract:- An attempt has been made to study the impact of irrigation on agricultural productivity of Lidder valley. Irrigation refers to the artificial way of providing water to plants. The intensity of irrigation plays an essential role in the enhancement pf agricultural productivity. Irrigation is essential for crop utilization and better yield, especially in areas where rainfall is uncertain. During agricultural operations irrigation has become recognized only an insurance against the uncertainties of rainfall and drought. But with the adoption of high yielding seeds and fertilizers, irrigation has become the most important factor in increasing productivity. The relationship between the agricultural productivity and irrigation displays that irrigation plays an important role in increasing the productivity levels of the valley.

Keywords*:- Productivity, Irrigation, Agriculture, Rainfall, Lidder Valley.*

I. INTRODUCTION

Rapid growth of world population poses a major challenge to the agricultural sector due to the rising demand for food over coming decades (Hubert et al 2010).Higher growing season temperatures can significantly impact agricultural productivity, form incomes and food security (Battisti and Naylor 2009).Agricultural productivity is a multi-dimensional concept, which includes technological advancement, effective management of available resources and organizational set up for the agricultural production. These factors in turn affect relative production in any region (Shafi, 1984). The agricultural productivity not only helps to increase the food supply for the growing population, but also helps to raise the standard of living of the people. The agricultural productivity of a region depends on several factors like fertility and water holding capacity of the oil, intensity of rainfall, depth of water table, and method of cultivation and irrigation facilities. Among several social factors contributing to low productivity the lack of irrigation is the important factor and among physical factors affecting crop production rainfall is the most important one.

Introduction of technology factors, especially application of irrigation, fertilizers and seed technology in the process of agricultural yield is considered to have far greater impact on agricultural yield increase compared to its natural growth. It means that a plant gains comparatively better environmental conditions for its seed germination, growth and production when suitable and required application of irrigation and fertilizer dozes are given. Lidder valley in the production of food grains has made a grand progress during the past two decades. The area under food grains varies in different geomorphic regions because of variation in intensity of irrigation and topography.

II. MATERIAL AND METHODS

The study is based on a detailed mapping of 1271 km2 of the area on the scale of 1:50,000. Results are based upon extensive field observation and intensive laboratory work. TheLidder valley is primarily a mountainous region covering a total geographical area of 1272km2 out of which 84% is under mountains; hence it is not used for agricultural purposes. From the remaining 16% of the reported area only 9% is under cultivation of crops. The data used in the present work have been taken from the unpublished revenue records of revenue and agriculture departments supplemented with field study.Bhatia's (1966) model has been used for measuring the agricultural productivity of the study region. The formula for Bhatia methods is given as:

$$IJ = \frac{\sum Yij\ Cij}{\sum Cij}$$

Where IJ is the productivity index of area j and cij is the proportion of area under Ith crop to total cropped area in the jth area.

$$Yij = \frac{Eij}{Ei}$$

Where Eij is the yield of the ith crop in the jth area and EI the yield of the ith crop in the region as a whole.

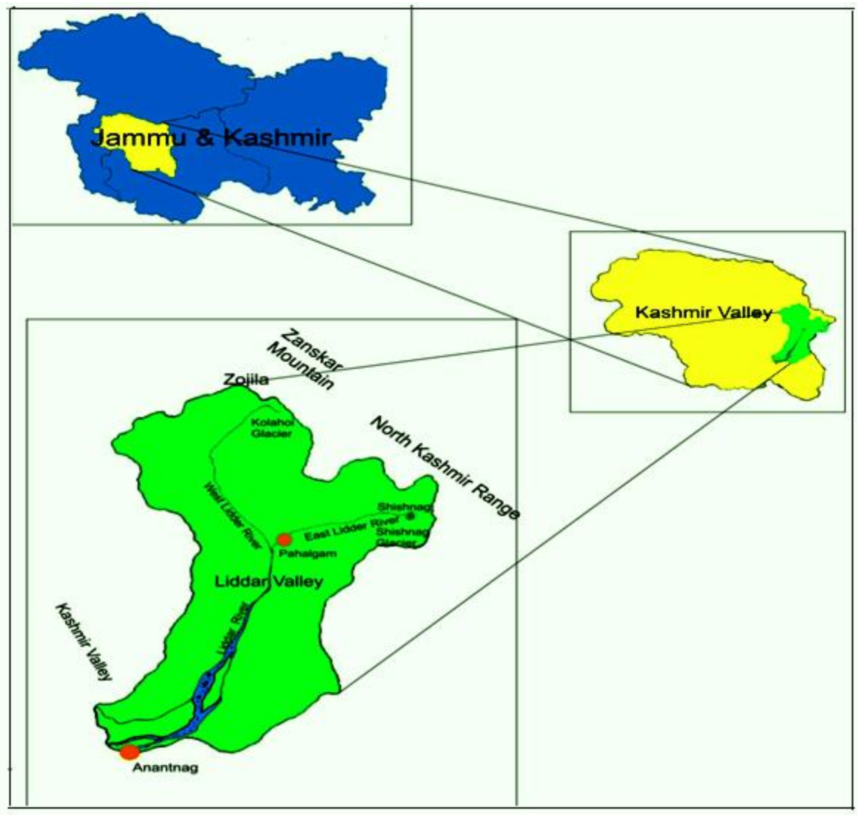

Fig .1: Locational Setting of Lidder Valley

III. LOCATIONAL SETTING

The Lidder valley lies between 33º48/ to 34º15/ North latitude and 75º5/ to 75º33/ East longitude. It comprises whole Pahalgam Tehsil and some villages of Bijbehara and Anantnag Tehsil of Anantnag District. The valley is 40 km away from the capital city Srinagar. It occupies the southeastern part of the giant Kashmir Himalayan synclinorium and forms part of the Middle Himalaya. The valley lies between the Pir Panjal range in the south and southeast, the north Kashmir range in the main Himalayan range in the northeast and Zanskar range in the northwest (Fig.1). The study region is surrounded by Saribal-Katsal ridge on the east, the Wokhbal on the west and Kazimpathbal on the north.

The study region begins from the base of the Kolahoi and the Shishnag glaciers. The two main upper streams the Kolahoi River and Shishnag River originate from these glaciers and join near Pahalgam.

IV. METEOROLOGICAL OBSERVATIONS

It is vital to monitor the climatic conditions of the mountainous regions because these areas are considered to be the early indicators of climatic change. The location of the Lidder valley at higher altitude and enclosed with mountain ranges gives distinctive characteristics within its own climatic peculiarities. The atmospheric conditions of the valley are controlled by altitude, latitude, complex terrain, vegetation and western depressions which visit the valley during the winter months. The valley experiences diverse climatic conditions ranging from cold arctic in the north, moist sub humid in the mid valley and humid climatic condition along the plain region. Wide variations are observed in temperatures at different altitudes of the valley. January and February are the coldest months whereas June, July and August are the hottest months. The heavy snowfalls in winter months are common phenomena in the higher reaches of the valley and the agricultural activities therefore remain suspended. March is the rainiest month of the year and the highest amount of rainfall and rainy days are observed in this month.

V. TEMPERATURE

As far the study of climate of an area is concerned, the temperature holds a key position, because it determines the character of local weather. In the study region, the climatological data of four stations have been obtained to study the temperature conditions of all months. The study area experiences very low temperature as compared to plain areas of Kashmir. January is the coldest month of the year. In this month the mercury falls down up to -18ºC on a particular night. The mean monthly temperature of January & February varies between -13.2ºC to 6.4ºC. From March, the temperature values start increasing progressively. This condition continues up to June. The month of June, July and August are considered as the hottest months of the year. The average mean monthly maximum temperature in these months ranges between 24.4ºC to 25.4ºC and the mean minimum temperature of the coldest months fluctuates between -7.4ºC to -1.4ºC at Pahalgam. In the study region there is an increasing trend of night temperature from April to August. From August both the maximum and minimum temperature starts decreasing. The highest extremes of temperature in the study region occur in the months of June, July and August and the lowest extremes of temperatures occur in the month of January and February. The highest extreme value of temperature in the region is 32.6ºC, which was recorded on 2nd of August 1990. The lowest value of temperature in the region is -18.6ºC which was recorded on 11th of January 1986. The variability in extremes of temperature ever recorded during the past two decades has been due to extreme western disturbances that cause cold wave conditions in the study region due to its mountainous terrain. According to India Meteorological Department, Kashmir valley has shown rise of 1.45ºC in average temperature and maximum temperature has increased by 0.5ºC per-year in Kashmir valley. The temperature in Kashmir during winters, as per official figures, now happens to be above average weather temperature, with the Valley recording lesser snowfall even in hilly areas. During the past several decades the Lidder valley has shown rise of 1ºC in average temperature.

VI. PRECIPITATION

The study region receives precipitation throughout the year. The rainfall shows a regular increasing trend from southern flood plain to the northern mountainous area. This is mainly due to variation in altitude, topography and vegetation and the western depressions which frequently visit the valley during the winter months. The mountains are the major topographic obstacles to weather systems and prevent the regular air flow between the low land and high land areas of the region and leads to the difference in moisture content. The agricultural activities remain suspended during the winter season due to snowfalls. The peak precipitation events in the study region in basin floor ranges between 34.2 - 137.53 mm, as against to 25 -75 mm in the flood plain. The tendency of precipitation leads to large number of storms each year, sometimes with intensive rainfall episodes have considerable geomorphic significance, especially in terms of production of debris flow and catastrophic mudflow in the Lidder valley at higher altitude. The high precipitation during the winter is dominated by the western disturbances in the vicinity of Pahalgam and in the higher reaches of the Lidder valley. The winter and spring are the rainy seasons. The rainfall recorded during these seasons at Pahalgam has been 72 percent of the annual rainfall, whereas the Anantnag receives 68.4 percent of annual rainfall in these seasons.

VII. SOILS

Soils of the region can be conveniently divided into glacial soils, immature mountain soils, basin floor soils, and soils of flood plain. Mountain soils are mostly confined along the highland of the region. These soils are deficient in bases and are mostly acidic. This is primarily attributed to extensive weathering caused by thermal variation. The highlands have developed a very thin soil profile and soils are very immature. In the highlands there are small valley basins where the thick soil layer is developed due to high humus content. The soils of this group are mostly sandy in nature produced by sesoxide and are skeletal in nature. Glacial soils extend from the present day snout of Lidder glaciers to post terminus of glaciers. These soils are primarily composed of morainic matter having unassorted sediments ranging from clay to boulder. Most of the morainic soil has stabilized during Pleistocene time and have produced two types of soils meadow soils and alpine humus soils. The morainic soils are found within the main valleys as well as hanging valleys of the mountain. The morainic material is heterogeneous in nature with sand, silt and clay as fine particles and large boulders and pebbles as coarse sediments. The meadow soils are mainly confined near the tree line and have produced large pasture lands rich in nutrient content most favourable for cattle grazing in summer season, such type of soils are further helped in their growth by organic matter. The basin floor soils are Pleistocene and post Pleistocene deposits. The soils of this group are classified as udalfs and orchrepts. These soils have medium fertility status and are yellowish brown to very dark brown in colour. The valley contains a wide variety of textural classes. The dominant in the basin floor are silt clay loam, clay loam and silt loam. The flood plain area is the largest fertile stretch of low land confined within the elevation of 1591 to 1750 m. The soil of this physiographic region is mostly transported which have been brought down by the principal Lidder River and deposited in the plains.

S. No	Agricultural zones	Percentage of irrigated area		Change in percentage
		2003-04	1993-94	1993-2004
1.	Batkot	32.04	31.31	0.73
2.	Aushmuqam	72.25	72.01	0.24
3.	Wularhama	57.63	57.04	0.59
4.	Salia	64.94	64.45	0.49
5.	Mattan	88.50	86.88	1.62
6.	Srigufwara	86.29	81.99	4. 3
7.	Zirpora	77.15	73.05	4.1

Table 1: Net irrigated area in Lidder Valley(Percentage of net area sown)

Source: Unpublished revenue records

Agricultural Zones	Rice		Maize		Oilseeds		Pulses				Productivity Inde= ∑YC/Cx 100
	Y	C	Y	C	Y	C	Y	C	∑YC	∑C	
Batkot	0.762	0.401	1.058	0.693	0.836	0.281	1.082	0.065	1.343	1.44	93.26
Aushmuqam	0.932	0.623	0.977	0.322	1.044	0.331	0.793	0.018	1.253	1.294	96.83
Wularhama	0.898	0.48	1.055	0.423	0.94	0.581	1.082	0.069	1.497	1.55	96.2
Salia	0.932	0.613	0.977	0.353	1.044	0.385	1.01	0.01	1.326	1.361	97.42
Mattan	1.186	0.854	0.977	0.099	1.044	0.646	1.01	0.014	1.796	1.613	111.34
Srigufwara	1.186	0.854	0.977	0.099	1.044	0.684	1.01	0.028	1.85	1.665	111.11
Zirpora	1.186	0.756	0.977	0.069	1.044	0.016	1.01	0.59	1.575	1.431	110.06

Table 2: Agricultural Productivity Index of Lidder Valley

VIII. RESULTS

The percentage of net irrigated area in the region is more than that of the Kashmir valley and Jammu and Kashmir, which have 55.82 percent and 41.28 percent of irrigated area respectively. The percentage of net increase in irrigated area in the valley is 0.82 percent, which is more than that of the J&K (0.52 percent) during 1993-2004.

On the basis of the above method, it is found that there is a significant variation in the productivity within the region. The variation ranges from a minimum of 93.26 in the Batkot agricultural zone to a maximum of 111.34 in the Mattan agricultural zone (Table 2).

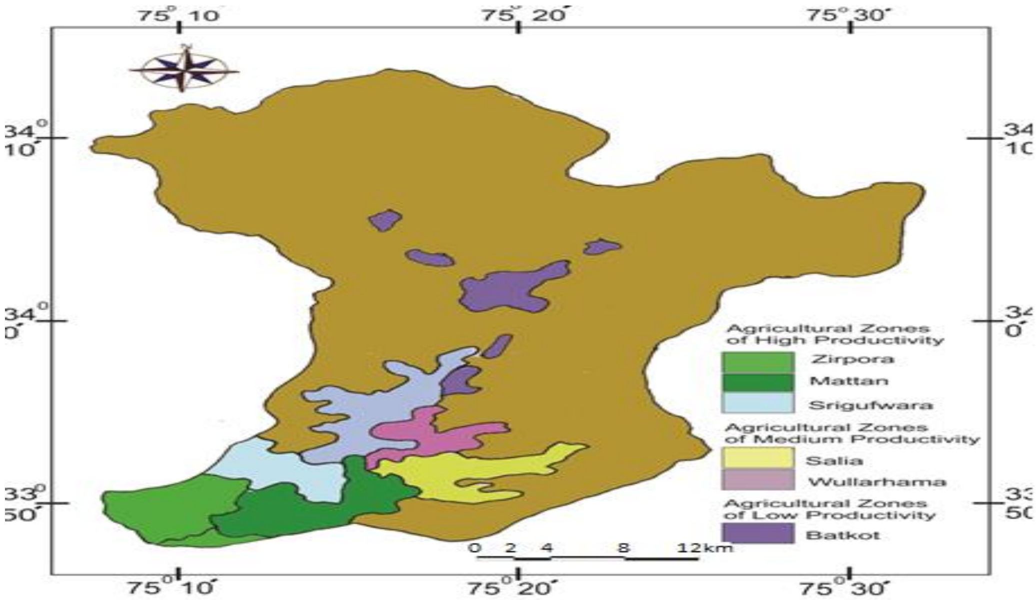

Fig. 2: Agricultural Productivity of Lidder Valley

The higher productivity levels in the study region have been displayed by the agricultural zones of Mattan, Srigufwara and Zirpora (Fig. 2). The productivity index in these agricultural zones ranges between 110.06 to 111.34. All these agricultural zones are located in the southern section of the valley. The agricultural productivity in the valley decreases from south to north. The high productivity index in the above mentioned agricultural zones is mainly due to their location in the flood plain, high fertility status of the soils, high water table, well-organized irrigation facilities and high agricultural land capability. The highest percentage of irrigated area is displayed by the Mattan zone, where 88.50 percent of the net sown area is irrigated followed by Srigufwara zone which has 86.29 percent of cropped area under irrigation during the past two decades. The high percentage of cropped area under irrigation in these zones is mainly due to their presence in the flood plain region having rich alluvial soils & efficient network of canals.

The agricultural zones of medium productivity levels in the region are Salia Aushmuqam and Wularhama (Fig 2). The agricultural productivity in these zones ranges between 96.2 in Wularhama zone to 97.42 in the Salia zone. The medium productivity index in these agricultural zones is mainly due to extension of irrigation facilities, favourable climatic conditions, use of high yielding varieties and their location in basin floor having moderate slope. The irrigated area in these zones varies between 64.94 percent in Aushmuqam to 77.15 percent in the Zirpora zone of the region during 2003-04. The moderate category of the irrigated area in the Aushmuqam and Salia agricultural zones is due to their location in the basin floor where some portion of the land having steep slope is left without irrigation. In Zirpora zone farmers have devoted some portion of the land for horticulture and nurseries of popular trees. This has made the Zirpora zone less irrigated than the bordering plain areas.

The low productivity in the valley is observed in the Batkot agricultural zone of the mountainous region (Fig. 2). The productivity index in this zone is 93.36. The low productivity observed in the Batkot is mainly due to its location at the higher altitude having limited irrigation facilities, unfavourable climatic conditions and the problem of soil erosion. The Batkot and Wularhama agricultural zones located in the mountainous and basin floor regions respectively show this type of category. The Batkot zone showed 32.04 percent of irrigated area and Wularhama zone showed 57.63 percent of area under irrigation during the period of 2003-04. An inadequate irrigation facility in Batkot zone is due to its location in the mountainous region having undulated topography.

The Srigufwara and Zirpora zones show high increase of irrigation intensity in the study region. The high increase of irrigated area in these zones ranges between 4.1 percent in the Zirpora to 4.3 percent in the Srigufwara zone during the past two decades (Tab.1). Both of these zones are located in the extreme southwestern part of the Lidder valley. The high percentage of change in these zones is due to modernization of canals and their presence in the flood plain, having efficient network of the government and private canals.

The low increase of irrigated area is displayed in five agricultural zones of the study region during 1993 to 2004. The increase in irrigated area in these zones ranges from 0.24 percent to 1.62 percent. The low increase in irrigated area of Mattan, Aushmuqam, Salia and Wularhama is due to the fact that these zones have already made progress in the irrigation facility and the Batkot zone being located in the mountainous region having undulated topography and hence the further extension of irrigations is not possible in this agricultural zone.

IX. CONCLUSION

In the valley the different productivity levels show a close relationship with high and low intensity of irrigation in agricultural zones. The progress in productivity of agricultural practices is the main concern for policy makers, governments and non-government organizations and agricultural communities. During agricultural operations irrigation has become recognized only an insurance against the uncertainties of rainfall and drought. But with the adoption of high yielding seeds and chemical fertilizers, irrigation has become the most important factor in increasing productivity. In traditional agriculture irrigation has become recognized only an insurance against the vagaries of rainfall and drought. But with the adoption of high yielding seeds and chemical fertilizers, irrigation has become the chief factor in increasing productivity. The Lidder valley has displayed a significant increase of 1.87 percent in the arable land during the past two decades. Therefore, the Lidder valley enjoys a very comfortable position as regards the agricultural development. The net irrigated area has increased from 71.61 percent in 1993 to 72.41 percent in 2004. The high percentage of irrigated area is located in the flood plain followed by the basin floor of the study region. The improvement in the productivity of different food crops of the Lidder valley has been mainly due to the modernization of government and private canals.

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