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An Impact of Expenditure on Irrigation on Some Economic Indicators of Agriculture Sector in Haryana

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Abstract: In this present study, an attempt is made to examine the impact of rainfall on agriculture sector in Haryana State for last two decades. Secondary data and simple statistical tools are used for the analysis. There is deficient rainfall in the state during the study period, with the exception of some years. Study found, high correlation between Rainfall and Production of various crops. In spite of 92 percent irrigated area of total cropped area in state, cropped area, production and yield for primary crops declined over the study period which creates doubts regarding the quality, sufficiency and efficiency of available irrigation facilities of the state. Consequently, average growth rates of Gross State Domestic Product from Agriculture and share of agriculture in state income declined over the study period. Poverty level and Consumer Price Index also increased rapidly in rural sector of the state. Farmers migrated from agriculture to other sectors, especially to non-manufacturing sector instead of manufacturing and service sector, for the job and better earnings. On the basis of findings, it may be inferring that climate change adversely affected the livelihood of the farmers in agriculture sector in various manners in Haryana state, in spite of availability of irrigation facilities at large scale as claimed by state.

Keywords: Climate Change, Agriculture Sector Haryana, Rainfall, Economic Aspects, Farmers.

1. INTRODUCTION

Haryana is one of the smallest and prosperous states in India which is located in Northern area of the country. Haryana established on 1st November, 1966, former it was the part of East Punjab. The state has an area of 44.212 Sq. Kilometer covering only 1.3 percent of the total geographical area of the country (India). Population of Haryana is 25.35 million as per 2011 Census Report. In 2019-20 (RBI), its Per Capita Net State Domestic product at current prices was Rs. 2,47,628, which has been highest among all general category

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states and union territories of India except Goa (Rs. 4,35,959), Delhi (Rs. 3,76,221) and Chandigarh (Rs. 3,30,015). Agriculture is the main occupation of this state. 65.12% (Statistics of Haryana) of the total population resides in rural area. Around more than 50 (NSSO) percent of the total population is engaged in Agriculture and Related Activities. Dairy farming is an essential source of livelihoods in rural economy especially for women. Buffalos, Cows and goats are main animals for sources of dairy products. Dairy products are very common components of the local diet. Wheat, Rice, Sugarcane, gram, jawar and bajra are the major crops grown in the state. Haryana is self-sufficient in the production of food grain. It is the second largest state to India's central pool of food grains. Haryana performed greatly during the Green Revolution in India in the 1970s. Consequently, country as a whole became self-sufficient in food production and imports for food grains declined rapidly. Continuous development of the agriculture is necessary for the development of whole state economy. In spite of increase in availability of irrigation and other facilities, to some extent production of agriculture sector still depends on climate conditions like rainfall, snowfall, temperature level, ground water level, fertility of soil or soil erosion of that particular area etc. If climate conditions are according to the agricultural requirements impact will be favorable whereas, unfavorably climate condition not only adversely affect the agriculture sector but also eliminate the positive effects of human efforts to the agriculture sector. Climate conditions in form of agriculture sector, determines the various economic issues in state economy, especially in rural area. **World Bank (2008),** pointed out in their study that, Agriculture still affected by climate change in most of the areas of all over the world in spite of having modern equipments or facilities for agriculture. Agriculture contributes on an average 10 percent of GDP. To reduce impact of climate change on agriculture, countries need to raise its involvement in international trade to enhance their techniques for agricultural environment and activities which they are unable to provide adequately themselves. In addition of this, government of respective countries should work on their development policies also like by providing credit to agriculture sector, improving marketing system, irrigation facilities and availing advices of experts to the farmers etc. **Raymond Guiteras (2007),** studies the impact of climate change on Indian agriculture by using panel data for 40 years covering over 200 districts and found impact negatively and statistically significant. Study found that, climate change adversely effected agriculture sector in Indian economy. To avoid the impact of climate changes, it is necessary to strengthen agriculture sector by adopting informative & capital availability policies and capital-intensive techniques.

2. OBJECTIVES OF THE STUDY

In the light of above, the **main objectives** of the present study are to analyses:

(i) The impact of climate change on Agriculture Productivity, employment, poverty and purchasing power of Farmers (rural sector), and

(ii) How much available irrigation facilities, which are provided by government of Haryana, are capable to handle the adverse climate conditions, on agriculture sector and on its various aspects?

3. DATA SOURCES AND METHODOLOGY

The present study is descriptive and based on secondary & time series data. Simple ratios and percentages are used for analyses. The period covered is from 2000-01 to 2019-20. Estimated figures are available after the year 2020-21; but only for a few variables. If these data are used, inferences drawn may be different from the reality. For this reason, we covered the period only till year 2019-20. There are many variables of climate like temperature, rainfall, quality of soil, ground water level etc., may be taken to study their impact on agriculture but this study includes only Rainfall as a climate variable to examine the impact of climate on agriculture sector this may be taken as limitation of the study. Data collected from the following sources:

(i) Statistical Abstract of Haryana, Various Issues,

(ii) Report of the Expert Group to review the Methodology for measurement of Poverty, GoI, Planning Commission, June 2014,

(iii) NSSO, 61st Round Survey (2009-10),

(iv) Haryana Meteorological Centre Chandigarh, Monsoon Report 2013, and

(v) Economic Survey of Haryana, Various Issues.

(vi) From Internet, Changes on Poverty Estimates 2011-12 to 2020-21.

4. IMPACT OF CLIMATE CHANGE ON AGRICULTURE SECTOR

Table 1 shows that, share of income from agriculture in GSDP declined continuously by following declining pattern of expenditure on Agriculture and Allied Activities. This may not necessarily point to cause and effect; as with development of the economy, decreasing contribution of agriculture in total income of any economy is quite usual. Rapid growth of industries and service sector may overtake the growth of agriculture sector which may reduce its share in total income of state. Hence, to examine the impact of expenditure on irrigation and increased irrigated area, on agriculture sector, per hectare productivity, yield and cropped area of primary crops may be considered as a better variable.

Per hectare revenue expenditure on irrigation increased from Rs. 62 in 2000-01 to Rs. 247 in 2019-20) whereas, capital expenditure also increased, in absolute amount, by very low growth rates. No doubt, ratio of Gross Irrigated Area to Gross Cropped Area increased to 92 percent by the end of the study period. But as a matter of fact, growth in gross irrigated area is not commensurate with the growth in capital expenditures, as can be seen that share of Gross Irrigated Area in Total Cropped Area has been constant from year 2017-18 at 92 percent. Around 8 percent of cropped area still remains from the availability of irrigation facilities implies depends on Rainfall for irrigation. There seems a little potential/scope for the improvement of irrigation facilities by state government. Capital expenditures on irrigation should be resulted in increasing coverage of irrigated area.

On the other hand, condition of rainfall has not been sound very good in Haryana from more than last two decades. From 1990-91 to 2013, except years 1990, 1994, 1995, 1996, 1998, 2003 and 2010 in all other remaining years there has been deficient monsoon in Haryana state (Haryana Meteorological Centre Chandigarh, Monsoon Report 2013). Rainfall in Haryana was deficient in year 2019 making it 7th deficit monsoon year in last decade (since 2011) with normal rainfall in year 2011 and 2018 only (India Meteorological Department).

High correlation found between rainfall and production of various crops, for Rice (0.8), for Wheat (0.55), Sugarcane (0.92), Pulses (0.83) and cotton (0.57) (Calculated). Deficient rainfall during the study period adversely influenced the production of various crops.

Government doesn't seem to work on irrigation projects seriously. The Bharat Nirman programme, which was initiated in 2005 for the development of rural infrastructure, also targeted to cover about 10 lakh hectare potential irrigation areas. For this purpose, it started to work in two ways: - Firstly, it worked on various new water development and management projects and secondly, it also finances for the renovation and technically upgradation of existing minor water sources. For minor sources, main focus of the scheme was on unutilised ground water resources. After achieved said target, its objective was to cover additional 10 lakh hectare of potential areas especially from minor sources. The unutilised ground water resources could have been used for this purpose" (Haryana Development Report (2009). These targets could not be achieved. Still there is need of strong efforts by the state government to raise irrigation facilities in Haryana. No efforts to explore irrigation potential at large scale has been made by the state government from 2000-01 to the end of the study period. Although government is running many major irrigation projects like: Agra Canal, Gurgaon Canal,

Table 1: Agriculture Sector in Haryana

Year	*Per Hect. Revenue Exp. on Irrigation (in Rs.)*	*Percentage share of Gross Irrigated Area in Gross Cropped Area*	*AAGR of Gross Irrigated Area*	*AAGR of Capital Exp. on Irrigation*	*AAGR of Per Hect. Exp. on Agriculture*	*AAGR of per Hect. Pro of Wheat*	*AAGR of GSDPa*	*Percentage share of GSD Pain GSDP*
2000-01	62.3	85.4	1.9	2.9	7.7	-1.4	6.4	31.1
2001-02	80.0	84.1	1.7	10.0	6.1	-0.1	5.9	27.7
2002-03	91.2	86.2	-2.1	-35.7	9.6	-1.2	2.2	25.5
2003-04	78.0	83.6	2.7	-1.8	-2.9	-2.9	12.1	25
2004-05	82.0	84.6	1.7	17.1	9.0	-0.9	4.3	23.1
2005-06	119.4	84.9	0.7	20.0	22.9	-1.5	3.4	21
2012-13	95	85.5	0.9	-25.26	-3	-1.7	4.5	18
2014-15	177.3	89.1	-0.61	6.3	23.43	1.5	1.1	18.3
2015-16	213.6	89.6	0.83	-9.2	179.45	8.4	5.5	17.1
2016-17	215.0	88.9	-2.94	5.7	9.89	0.1	11.5	16.8
2017-18	223.4	91.5	0.33	5.2	-2.23	1.7	13.4	16.6
2018-19	222.7	91.5	-4.23	30.8	25.39	-5.53	9.9	16.7
2019-20	246.9	91.2	**N.A**	11.0	29.13	**N.A**	8.7	16.4

Note: GSDPa: – Gross State Domestic Product of agriculture, AAGR: Annual Average Growth Rate,

N.A : Not Available

Source: Statistical Abstract of Haryana, Various Issues.

Bhakra Nangal, Major Irrigation projects Haryana, Jui, Rewar, Loharu, Nanagal Lift Irrigation Project, etc.., but effective and adequate result doesn't seem.

However, in spite of increasing expenditure on irrigation, annual average growth rates of per hectare productivity, cropped area and yield of wheat (principal crop of Haryana), not only declined but has been negative also (implies reduction in production and productivity) during the study period (Table 2), indicates some unproductive capital expenditure on irrigation. Consequently, share of agriculture sector in total income of state i.e., GSDP also declined over the study period.

Table 2: Annual Average Growth Rates of Various Crops in Haryana During (1990-91 to 2012-13)

Year	*Rice*			*Wheat*			*Total cereals*		
	Area	*Prod-uction*	*Yield*	*Area*	*Production*	*Yield*	*Area*	*Production*	*Yield*
2000-01	27	45.9	14.9	19.4	32.6	11.1	17.3	35.7	-
2005-06	-0.7	18.5	19.3	-2.2	-8.4	-6.4	-1.7	-2.3	-
2010-11	18.7	8.2	-8.6	8.7	30.8	20.3	9.9	27.3	-
2011-12	-0.7	8.7	9.2	1.1	13.3	12.1	-1.5	11.3	-
2012-13	-2.3	4.9	7.4	-1.3	-15.3	-14.1	-5.2	-12	-
2016-17	2.4	7.5	5.0	-0.5	9.1	9.6	2.4	10.1	-
2017-18	2.7	9.6	6.5	-1.3	-1.0	0.4	-0.4	0.2	-
2018-19	1.8	-7.4	-8.8	0.9	2.5	1.6	0.2	0.5	-
2019-20	7.7	15.1	6.8	-0.7	-5.5	-4.8	3.3	1.1	-

Cont… Table 2: Annual Average Growth Rates of Various Crops in Haryana During (1990-91 to 2012-13)

Year	*Total Pulses*			*Total Sugarcane*			*Total Cotton*			*Oil Seeds*		
	Area	*Prod-uction*	*Yield*	*Area*	*Prod-uction*	*Yield*	*Area*	*Prod-uction*	*Yield*	*Area*	*Prod-uction*	*Yield*
2000-01	-65.1	-77.8	-	-0.7	1.2	1.7	-14.9	7.7	-	-32.2	-28.1	-
2005-06	24.2	12	-	-9.8	1.7	12.8	5.2	8.6	3.1	77.8	46	-
2010-11	-9.7	36.6	-	-34.1	-27.3	10.3	-15.6	16.3	16.7	-29.2	17.4	-
2011-12	-30.1	-30.1	-	11.8	15.1	3	22.1	50	44.9	4.8	-21.8	-
2012-13	-39	167.3	-	6.3	7.1	1.5	-1.5	-9.3	-	4	28.5	-
2016-17	6.6	369.3	-	8.9	17.6	9.1	-7.2	105.1	2.2	-0.8	15.6	-
2017-18	-16.1	-29.7	-	12.9	17.2	11.0	17.2	-20.3	-	7.1	15.2	-
2018-19	50.9	-18.5	-	-5.1	-11.7	-12.6	6.0	25.0	-	12.0	15.5	-
2019-20	-13.0	-30.0	-	-11.9	-9.1	2.6	2.0	22.2	-	5.6	-10.3	-

Source: Calculated on the basis of Data from Statistical Abstract of Haryana, Various Issues.

Table 2, show the average growth rates of area cropped, production and yield of various crops of agriculture of Haryana. It may be observed

that production and yield of most of the crops attained declining and negative growth rates implies slow increase and decrease productivity of the various crops in agriculture sector respectively. For wheat, sugarcane, pulses and oil seeds production (in absolute amount) decreased by end of the study period, exhibits failure of existing irrigation system available at large scale in the absence of adequate rainfall in the state. In this condition, data regarding irrigation facility also seems doubtful implies insufficient availability of water supply for 92 percent cropped area. Definitely, other climate variables may be the reason for this & to which extent, is not the subject of study here, may be taken as a ***limitation of the study*** as said earlier also.

Consequently, being a high per capita income state, still there is around 10 percent poverty in rural Haryana (Table 3). Although in comparison of India this is lower but still it is high whereas, Haryana is one of the highest per capita income states of India. During last five years of previous decade, 10 percent of working population migrated from the agriculture sector to other sectors for employment (Table 4). This migration to manufacturing and service sector has been lower whereas most of the agriculture working population migrated to non-manufacturing sector like towards small shops, transports etc. With these kinds of Structural Changes in the state economy, responsibility of agriculture increases more in terms of availing essential agriculture products to manufacturing sector and other sectors as a raw material and food material, so that prices may be stabled.

Table 3: Poverty in Haryana

Year	*Haryana*			*India*		
	Rural	*Urban*	*Total*	*Rural*	*Urban*	*Total*
1993-94	28.02	16.38	25.05	37.27	32.36	35.97
2004-05	24.8	22.4	24.1	41.8	25.7	37.2
2009-10	18.6	23	20.1	33.8	20.9	29.8
2011-12	11.6	10.3	11.2	25.7	13.7	21.9
2020-21	9.7	12.4	11.1	21.9	17.9	19.9

Source: Report of the Expert Group to review the Methodology for measurement of Poverty, GoI, Planning Commission, June 2014 and from Internet on Changes on Poverty Estimates from 2011-12 to 2020-21 (data found only for 2020-21)

Table 4: Occupational Structure in Haryana

Year	*Agriculture*	*Manufacturing*	*Non- Manufacturing*	*Service*
2004-05	54.8	12.2	7.8	25.2
2009-10	44.8	15.4	11.9	27.9

Source: NSSO, 61st Round Survey (2009-10).

The Consumer Price Index (rural) of Food Group and General Group moved invariably at the same pace till 2009-10. Thereafter, Food Group moved more rapidly during the period 2010-11 to 2020-21 as compared to the General Group. The Index of General Group moved by 84.56 percent whereas that of Food Group increased by 86.96 percent from the year 2009-10 to the year 2020-21. Year wise CPI of rural Haryana from 2009-10 to the year 2020-21 is presented in Table 5. Migration of Labour from agriculture sector to other sectors to much extent has been responsible for the rapid increase in Consumer Price Index, especially for Food Index, on the one hand and reduction in agriculture products with increasing costs due to arrangements of private irrigation arrangements on the other hand. Food Index and General Price Index increased more rapidly during last two years due to Covid-19 Pandemic also, when manufacturing and service sector fully closed and depended on Agriculture sector for food and other basic necessities.

Table 5: Consumer Price Index (Rural) of Haryana
(Base year 1988-89 = 100)

Year	*Food Index*	*General Index*	*Year*	*Food Index*	*General Index*
2009-10	491	460	2016-17	766	711
2010-11	537	496	2017-18	787	733
2011-12	586	537	2018-19	829	767
2012-13	638	580	2019-20	889	811
2013-14	682	620	2020-21	918	849

Source: Economic Survey of Haryana, Various Issues.

5. CONCLUSION AND POLICY IMPLICATION

In nutshell, it may be inferred that there has been deficient rainfall during the study period that adversely influenced the production and productivity of various major and principal crops in agriculture sector, in spite of increasing revenue and capital expenditure on irrigation facilities in Haryana. State claims around 92 percent of cropped area as an irrigated area. Data regarding irrigation facility seems **doubtful** implies insufficient availability of water supply for 92 percent cropped area in the absence of adequate rainfall. Declining income from agriculture and its contribution in state income i.e., GSDP, adversely affected the poverty, occupational structure and purchasing power of the rural people and their livelihoods.

Detailed examination of issues those raised above would clearly demands for the redesigning of priorities and systemic corrections in the development policies of the government to derive full benefit from public expenditure on irrigation facilities.

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