

# Public Investment and Growth of Agriculture Sector: A Comparative Study of Uttar Pradesh and Uttarakhand

**BANSH GOPAL YADAVA**

Research Scholar

Department of Economics, University of Allahabad, Allahabad (U.P.) India

## ABSTRACT

Agriculture is not only a core sector of the Indian economy but also of state level especially Uttar Pradesh economy too. Majority of economies in the world are either developing or underdeveloped nations. But these economies have low productivity in agriculture for want of sufficient production technology and capital formation despite of poor resources and low capital investment capacity of farmers. Capital is the most vital input required for achieving the much desired goal of growth. It is one of the most crucial factors, which sets the pace and pattern of economic growth in any economy. Same role can play in agriculture sector in any economy too. The study area of this paper is Uttar Pradesh and Uttarakhand. There are two objectives of the study-First, to compare the growth of agriculture sector of selected state and second, to give the suggestion for developing the growth of agriculture sector for both selected states. On the base of overall analysis and hypothesis testing, it can be said that public investment has a positive relationship with agriculture growth in both states. But, Utilization of public expenditure is less meaningful in Uttarakhand than Uttar Pradesh because Uttarakhand is a new state compare than Uttar Pradesh and it has more hilly areas than Uttar Pradesh. It needs more management in Agriculture sector. Therefore, PPP model should be applied to develop agriculture sector in Uttarakhand. The Green Revolution had highly benefitted the farming system of the plain area of the Uttarakhand State while it has neglected the hilly region.

**Key Words :** Public investment, Agriculture sector, Productivity, Efficiency

## INTRODUCTION

### About agriculture sector:

Agriculture is not only a core sector of the Indian economy but also of Uttar Pradesh and Uttarakhand economy too. It is prime pulse of Industrial sector. It has demand as inputs as well as for consumption. This sector also provides employment. An average Indian still spends almost half of his/her total investment on food, while roughly half of India's work force is still engaged in agriculture for its livelihood or about two-thirds of the population is dependent on the sector. Growth of other sectors and overall economy hinges on the performance of agriculture to a considerable extent through its backward and forward linkages. It is not only a source of livelihood and food security for a large population of

India but also has a special significance for low income, poor and vulnerable sections.

Majority of economies in the world are either developing or underdeveloped nations. But these economies have low productivity in agriculture for want of sufficient production technology and capital formation despite of poor resources and low capital investment capacity of farmers. Capital formation is the outcome of investment. As a matter of fact, investment refers to the flow of expenditure diverted to increase or maintain capital stock. Agricultural investment refers to changes in the level of all inputs that augment physical capital, enhance agricultural production capacity and the conservation of natural resources, knowledge and human capital development, rural infrastructure net-work and post-production equipment. Capital is the most vital input

required for achieving the much desired goal of growth. It is one of the most crucial factors, which sets the pace and pattern of economic growth in any economy. Economists have assigned a key role to investment in the process of economic growth due to two reasons: firstly, it creates income and secondly, it augments productive capacity of the economy by increasing capital stock (Kulshrestha, 2000). Same role can play in agriculture sector in any economy too. The study area of this paper is Uttar Pradesh and Uttrakhand. Therefore, brief description about the agriculture of both states is highlighting.

#### **About Uttar Pradesh:**

Uttar Pradesh is a state in northern India. It covers 243,290 square kilometres (93,933 sq mi), equal to 7.34% of the total area of India, and is the fourth-largest Indian state by area. Agriculture and service industries are the largest parts of the state's economy. The economy of Uttar Pradesh is the fifth-largest state economy in India with 15.42 lakh crore (US\$220 billion) in gross domestic product and a per capita GDP of 61,000 (US\$860). In terms of net state domestic product (NSDP), Uttar Pradesh is the second-largest economy in India after Maharashtra, with an estimated gross state domestic product of 14.89 lakh crore (US\$210 billion), and hence contributes 8.406% of India. The Gross State Domestic Product (GSDP) of Uttar Pradesh grew at a CAGR of around 10.24 per cent between 2011-12 and 2019-20 to reach Rs. 15.80 trillion (US\$ 226.04 billion). The Net State Domestic Product (NSDP) grew at a CAGR of around 11.24 per cent between 2011-12 and 2018-19 to reach Rs 13.76 trillion (US\$ 190.66 billion).

The economy of Uttar Pradesh entirely depends on agriculture. Number of farm workers is 66%. The efforts for multi-faceted development of agriculture sector are in full swing. Several important steps like extension of irrigation facilities, Arrangement for timely supply of fertilizers, pesticides and high yielding seeds promoting high yielding varieties of use of seeds and continuous consultancy services of experts on agricultural matters have been taken. Agriculture is the leading occupation in Uttar Pradesh. Uttar Pradesh is the largest producer of food grains in India. Food grain production in the state in 2016-17 stood at 49,903.1 thousand tonnes and 51,252.7

thousand tonnes in 2017-18. Major food grains produced in the state include rice, wheat, maize, millet (bajra), gram, pea and lentils. Pulses production in the state stood at 2,208.0 thousand tonnes in 2017-18 and production of vegetables stood 1,002.64 thousand MT in 2018-19, the state remains largest producer of vegetables in India. Wheat is the state's principal food crop and sugarcane is the main commercial crop particularly in Western Uttar Pradesh. About 70% of India's sugar comes from Uttar Pradesh. Sugarcane is the most important cash crop as the state is country's largest producer of sugar. As per the report generated by Indian Sugar Mills Association (ISMA), total sugarcane production in India was estimated to be 28.3 million tonnes in the fiscal ending September 2015 which includes 10.47 million tonnes from Maharashtra and 7.35 million tonnes from Uttar Pradesh.

#### **About Uttarakhand:**

Uttarakhand<sup>1</sup> formerly known as Uttaranchal is a state in the northern part of India. According to the 2011 Census of India, Uttarakhand has a population of 10,086,292, making it the 20th most populous state in India. It has almost all agro-geo climatic zones, which provide commercial opportunities for floriculture and horticulture. Uttarakhand has abundant natural resources due to hills and forests. Its agro-climatic conditions support horticulture-based industries. Between 2015-16 and 2018-19, the Gross State Domestic Product (GSDP) expanded at a CAGR (CAGR) of 11.55% to reach Rs. 2.46 trillion (US\$ 35.18 billion). Most<sup>2</sup> of the area of State is under forests and wastelands thus leaving only a small amount of land *i.e.* 7.41 lakh ha (about 14%) (LUS 2009-10) for cultivation out of the total reported area of 56.72 lakh ha. Out of the total, about 89% are under small and sub marginal. As large number and area is under small and marginal holdings, scale of economies cannot be availed of, and so the input cost per unit of output is higher. The soil of *tarai* region is very fertile and support to number of crops. Indiscriminate use of chemicals and over exploitation of groundwater makes the soil of this region less fertile, causing the reduction in the sustainability in productivity. On the other hand the hill region is prone to constant soil erosion due to steep slopes making it less and less fertile, which could be achieved through adoption of better management practices. In the state, farmers

1. <https://en.wikipedia.org/wiki/Uttarakhand>

2. <https://agriculture.uk.gov.in/>

adopt generally two types of agricultural practices *i.e.* the rainfed and the irrigated. Most of the agriculture in the state is rainfed. The net irrigated area of the state stands at 3.38 lakh hectares (2009-2010). The net irrigated area to net sown area for the state is 45 per cent. Being large area under hills, irrigation is available mostly in the plains and valleys. So there is a need to generate alternate sources of irrigation to increase the net irrigated area, which in turn shall also increase the cropping intensity of the state. These alternative sources can be rainwater harvesting, check dams, hydram for lift irrigation etc. Technologies like drip irrigation, sprinklers etc. can also be used for better water management.

The growth of food grain production is quite variable in different areas. As a result, agriculture scenario presents a mixed picture. (Area Production and Productivity 2010-11) Productivity of district Udham Singh Nagar, Haridwar, Nainital (plain) and Dehradun (plain) is very high, on the other side; productivity of the hilly area is very low, although the valleys are fertile. Plains and hill agriculture stand in stark contrast to each other. While productivity in plains can be compared with agriculturally developed regions of the country, productivity in hill lags far behind. Besides the threats there are ample opportunities of increasing production and productivity, especially in the field of pulses and oilseeds, availability of cultivable waste land, conservation of rain water harvesting activities. There is also a good opportunity of organic farming, diversification of agriculture, post-harvest technologies, strengthening of market interventions, and use of farm machinery to make the agriculture more profitable occupation.

### **Review of Literature:**

#### ***Related to Uttar Pradesh:***

Bathla Seema (2017) “Public Investment in Agriculture and Growth: An Analysis of Relationship in the Indian Context”, examines the relationship between investment and irrigation in 17 states during 1980-81 to 2013-14. She comes to this conclusion that significant increase in investment on irrigation in less developed states would be support for improving productivity and persuade private investment. She found variation in public investment at interstate level. She highlights the importance of physical policy in agriculture policy. Therefore she recommends increasing budgetary outlay for poorer states.

FAO (2017), “Productivity and efficiency

measurement in Agriculture”, this study provide functional relationship and measurement methods for different dimensions of agriculture productivity like farm level or aggregated, value-based, or physical, partial or multiple input. This study also assesses the relationship between productivity farm incomes and concluded that there is positive relationship between it. Author also concluded that input and output prices have impacted when sector wide productivity and farm productivity.

#### ***Related to Uttarakhand:***

Tuteja, Usha (2013), “Agriculture profile of Uttarakhand” highlights that Uttarakhand (large part of geographical area) is hilly terrain having primarily rain-fed subsistence agriculture. Its undulating topography, varied climate, scant cultivated land, overwhelming percentage of small and marginal holdings, difficult working conditions, high input costs and low returns on food grain crops, sparse settlement, soil erosion, land degradation and inadequate infrastructure like transport facilities in remote areas are serious constraints in development of agriculture. Given these circumstances, major challenge is to promote livelihoods to retain work force through local employment and income generation to enhance quality of life of the people living in rural areas of the state. This is possible through holistic development of agriculture. Quality seeds, suited to hill agriculture have to be developed for accessibility and affordability of small and marginal farmers. As soil and topography are not suitable for mono-cropping, mixed agricultural practices need be adopted. This diversified agriculture could be a healthy mix of animal husbandry including cattle rearing, poultry, fishing, beekeeping, etc. There is an urgent need to improve productivity of crops and livestock, etc. There is good potential for aromatic and medicinal plants in Uttarakhand, which remains untapped due to lack of serious efforts. It is also important to introduce organic farming practices to enrich soil and increase soil depth for sustained development of agriculture in the long run in Uttarakhand.

Uttarakhand Economic Survey, (2018-19) states that Uttarakhand has been a key player in national horticulture revolution due to its ecological and climatic advantages. The growth of horticulture has received a boost after year 2000 when financial, technical and managerial support from the State started pouring into this sector. There is a perceptible shift in horticulture practices, particularly of medicinal plants, fruits, vegetables, flowers,

organic farming, spices etc. At present about 2.83 lakh hectare of land is under horticulture. The State intends to increase this to 4.95 lakh ha by the year 2030. The annual turnover of horticulture crops in the State is approximately Rs. 2300 crores. Of the total annual production of 16.92 lakh MT, fruits contribute 6.59 lakh MT, vegetables 5.87 lakh MT, potato 3.60 lakh MT and spices and flowers contribute rest. Uttarakhand leads in the production of several fruits like Pear, Peach, Plum and Apple, Spices and Walnut in the country. However, the State needs to augment its food processing capabilities to add value and reduce wastage for the benefit of growers and strengthen its manufacturing base. The State has vast growth potential in horticulture sector by introducing modern practices, high value and high yielding varieties of crops. There is a need to vitalise the existing horticulture extension infrastructure and redeploy the personnel in mission mode to realise the envisaged State goals of horticultural development. Several structural and programmatic challenges require to be addressed to overcome growth constraints.

## METHODOLOGY

### Research topic:

Public Investment and Growth of Agriculture Sector: A Comparative Study of Uttar Pradesh and Uttarakhand is the research topic of this study.

### Objectives of the Study:

There are two objectives of the study-1) To compare the growth of agriculture sector of selected state and 2) To give the suggestion for developing the growth of agriculture sector for both selected states.

### Hypotheses of the Study:

There are two hypotheses of the study-1) No any difference of productivity and efficiency of public investment in both state. 2) No Significant correlation between Public investments on Agriculture and sectorial GDP of Agriculture in each state.

### Research Method:

Study is based on explanatory research. Casual research.

### Nature of Data:

Quantitative data is used.

### Types of Data:

Secondary data are used.

### Collection Sources of Data:

Data is collected from secondary sources such as State Finance Report-RBI & Handbook of Statistics, on Indian States-RBI 2019.

### Time Period of the Study:

2004-05 to 2019-20 time span is taken.

### Unit of Analysis:

Sectorial Gross State Domestic Product of Agriculture, Public Expenditure (Revenue and Capital Expenditure) on Agriculture and Allied activities, Rural Development and Irrigation (Minor, Major and Flood Control) are the unit of analysis.

### Economic Techniques :

Productivity of public investment (Output-Investment ratio), Efficiency of public investment (Investment –Output Ratio) and Model Building are used as economic techniques.

### Econometrics/Statistical Tools:

Arithmetic Mean, Standard Deviation, R square, t-statistic, f-statistic and Old least square model are used as econometric and statistical tools.

## RESULTS AND DISCUSSION

### Productivity of Public Investment:

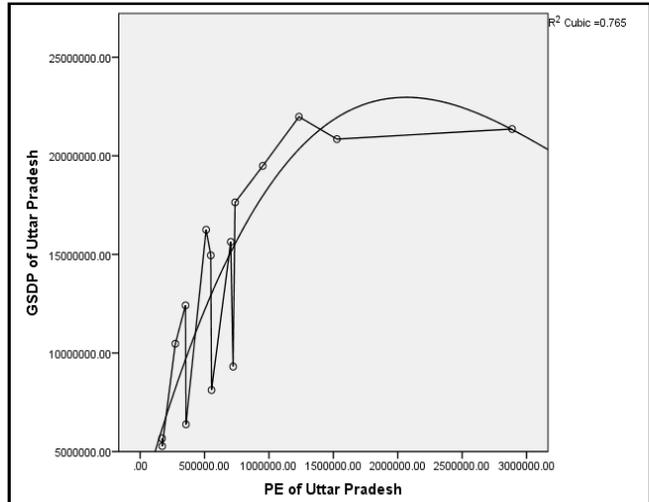
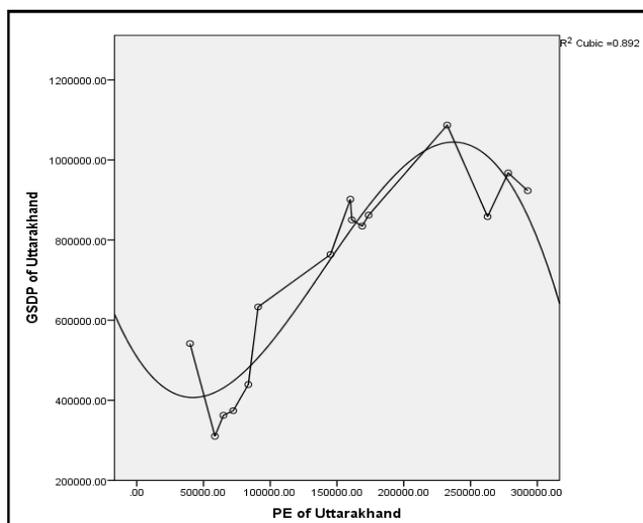
Productivity of public investment in Uttarakhand is laying between 3.15 to 6.96 (except 13.565 in 2009-10) during the period of 2004-05 to 2019-20 while it is laying in Uttar Pradesh between 12.90 to 38.32 (except 7.40 in 2017-18) during the same. It means productivity of public investment in Uttar Pradesh is greater than Uttarakhand. Variation in OCR is lower in Uttarakhand compare to Uttar Pradesh (p value of f-statistics is less than .05) (Table 1, Fig. 1, 2, 3).

### Efficiency of Public Investment:

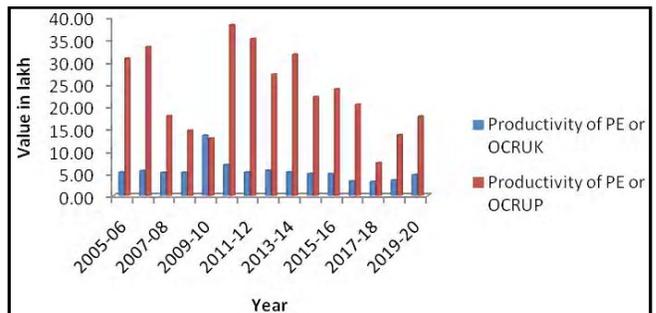
Efficiency of public investment in Uttarakhand is laying between 0.14 to 0.32 (except 0.07 in 2009-10) during the period of 2004-05 to 2019-20 while it is laying in Uttar Pradesh between 0.03 to 0.08 (except 0.14 in 2017-18) during the same. It means efficiency of public investment in Uttar Pradesh is better than Uttarakhand.

Year	Productivity of PE		Efficiency of PE	
	Uttarakhand (OIRUK)	Uttar Pradesh (OIRUP)	Uttarakhand (IORUK)	Uttar Pradesh (IORUP)
	2005-06	5.30	30.82	0.19
2006-07	5.58	33.41	0.18	0.03
2007-08	5.18	17.93	0.19	0.06
2008-09	5.26	14.65	0.19	0.07
2009-10	13.56	12.90	0.07	0.08
2010-11	6.96	38.32	0.14	0.03
2011-12	5.26	35.23	0.19	0.03
2012-13	5.64	27.25	0.18	0.04
2013-14	5.28	31.72	0.19	0.03
2014-15	4.96	22.23	0.20	0.04
2015-16	4.94	23.93	0.20	0.04
2016-17	3.27	20.47	0.31	0.05
2017-18	3.15	7.40	0.32	0.14
2018-19	3.48	13.64	0.29	0.07
2019-20	4.67	17.82	0.21	0.06
AM	5.50	23.18	0.20	0.05
SD	2.44	9.30	0.06	0.03
Variance	5.95	0.00	86.46	0.00
F Value	50.75		69.10	
P Value	0		0	

Sources: GSDP Data from Handbook of Statistics, On Indian States, Reserve Bank of India, 2019; PE Data from State finance report RBI (Various Issues)

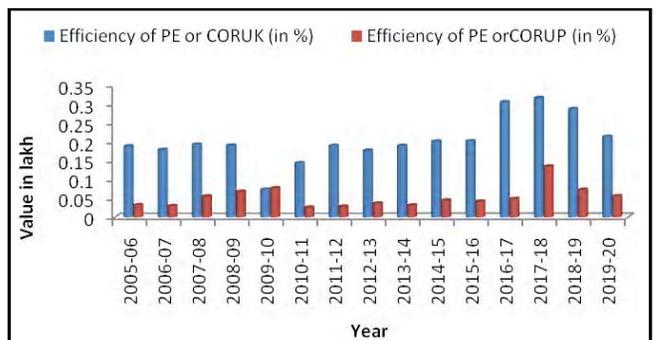


**Fig. 2 : Production function with one input (Capital) of Uttar Pradesh**



**Fig. 3 : Productivity of public investment**

Variation in OCR is higher in Uttarakhand compare to Uttar Pradesh (p value of f-statistics is less than .05) (Fig. 4).



**Fig. 4 : Efficiency of public investment**

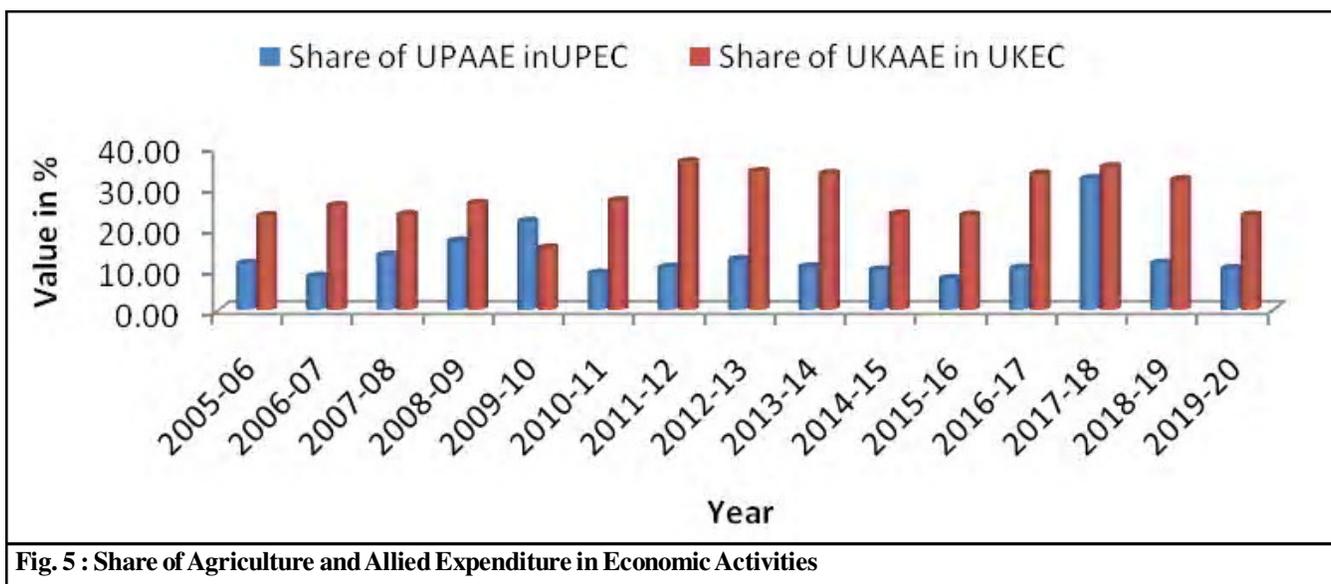
**Fig. 1 : Production function with one input (Capital) of Uttarakhand**

**Share of Major Heads of Public Investment in Economic Activities:**

Share of Agriculture and Allied Activities in

Table 2 :Share of public expenditure in Economic Activities of Uttar Pradesh and Uttrakhand						
Year	Uttar Pradesh	Uttarakhand	Uttar Pradesh	Uttarakhand	Uttar Pradesh	Uttarakhand
	Share of UPAAE in UPEC	Share of UKAAE in UKEC	Share of UPRDE in UPEC	Share of UKRDE in UKEC	Share of UPIE in UPEC	Share of UKIE in UKEC
2005-06	11.42	23.22	19.49	23.08	19.59	15.49
2006-07	8.25	25.69	12.06	14.16	20.35	18.34
2007-08	13.53	23.48	13.75	13.66	17.09	17.50
2008-09	16.95	26.24	16.03	14.50	15.87	22.33
2009-10	21.81	15.24	18.09	7.29	15.07	11.10
2010-11	9.05	26.91	22.30	16.19	19.88	18.92
2011-12	10.51	36.53	21.72	14.13	17.70	18.75
2012-13	12.42	34.09	12.85	11.33	14.42	14.82
2013-14	10.60	33.56	13.97	14.22	15.58	16.23
2014-15	9.85	23.62	15.03	29.97	12.99	15.25
2015-16	7.73	23.37	13.08	33.70	10.54	14.74
2016-17	10.27	33.53	17.36	26.66	11.37	10.54
2017-18	32.33	35.28	21.72	30.15	8.80	8.70
2018-19	11.53	32.08	26.58	34.30	8.02	7.24
2019-20	10.18	23.34	25.00	31.67	14.79	10.38

State finance report RBI



Economic Activities is very low in Uttar Pradesh during the period of 2004-05 to 2019-20 than share of Agriculture and Allied Activities in economic activities in Uttarakhand (Table 2 and Fig. 5).

Share of Rural development is also lower during 2013-14 to 2019-20 in Uttar Pradesh but during in 2004-05 to 2012-13, it is greater than share of rural development in economic activities in Uttarakhand (Fig. 6).

Share of Irrigation in economic activities is near about same in both states during 2004-05 to 2019-20 (Fig. 7).

**Model Specification:**

Four regressions are estimated for each state to assess the relationship between public expenditure and agriculture growth. Log Model is fit as best model in

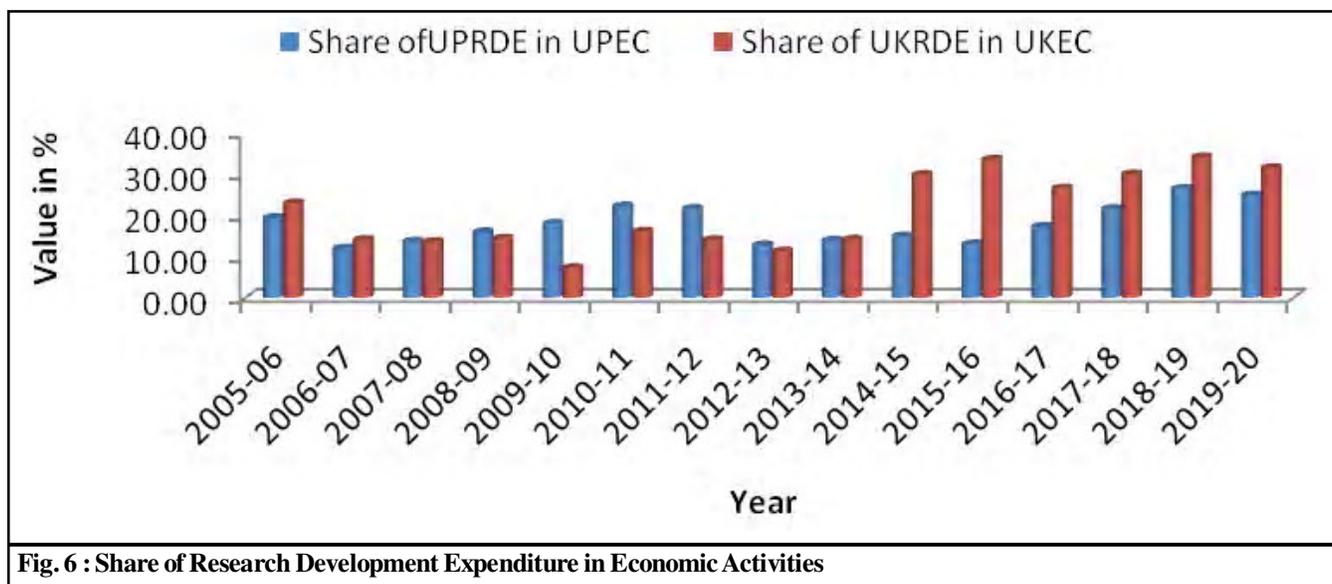


Fig. 6 : Share of Research Development Expenditure in Economic Activities

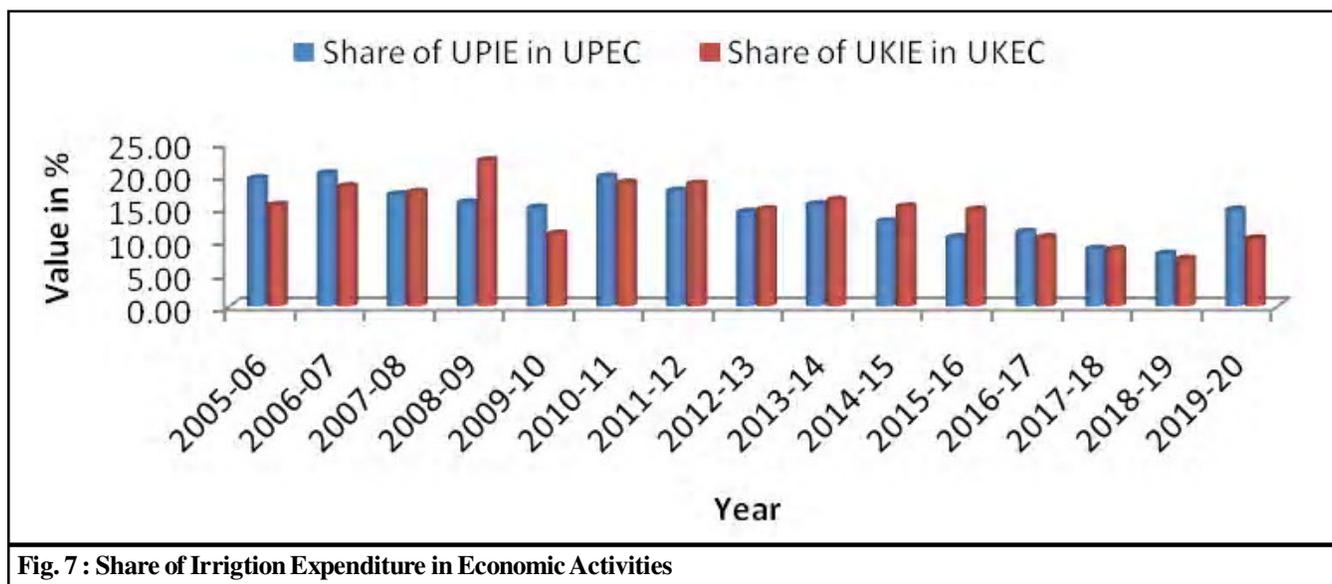


Fig. 7 : Share of Irrigation Expenditure in Economic Activities

three estimated Uni-variable regressions. These uni-variables are that are Agriculture and Allied Expenditure, Irrigation Expenditure and Rural Development Expenditure. Each independent variable is assessed with the growth of Agriculture that is taken in the form of Sectorial Gross Domestic Product in Agriculture of Uttarakhand and Uttar Pradesh respectively.

– Relationship of sectorial gross domestic product in agriculture with Agriculture and Allied Expenditure of Uttarakhand and Uttar Pradesh are estimated. Mathematically, it can be shown as follows :

$$\ln(\text{UKSGSDP}) = 0.562 * \ln(\text{UKAAE}) + 6.793 + u_1$$

$$\ln(\text{UPSGSDP}) = 0.530 * \ln(\text{UPAAE}) + 9.293 + u_1$$

The elasticity of public investment on agriculture and allied activities is 0.562 in Uttarakhand and 0.530 in Uttar Pradesh. It means agriculture and allied elasticity of agriculture output of Uttarakhand is greater than Uttar Pradesh. Statistical results are shown in the Table 3 and Table 4.

The value of  $R^2$  is 0.74 and 0.69 in Uttarakhand and Uttar Pradesh respectively, which show that independent variable cause 74% and 69% variation in the dependent variable in each state, respectively. The value of F-statistic is of the degree of freedom (1, 14) and 5% level of significance, is found 37.41 and 29.55 and its probability is 0.00 in both, which represent that

Table 3 : Results of Coefficient and Related Test for Uttarakhand				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ln(UKAAE)	0.562154	0.091903	6.116849	0.0000
C	6.793195	1.082893	6.273193	0.0000
R-squared	0.742145			
Adjusted R-squared	0.722309			
F-statistic	37.41584			
Prob(F-statistic)	0.000037			

Included observations: 15

Table 4: Results of Coefficient and Related Test for Uttar Pradesh				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ln (UPAAE)	0.530118	0.097518	5.436085	0.0001
C	9.292666	1.296630	7.166782	0.0000
R-squared	0.694484			
Adjusted R-squared	0.670983			
F-statistic	29.55102			
Prob(F-statistic)	0.000114			

Included observations: 15

model belongs to goodness of fit. Thus there is significant correlation between public investment on agricultural activities and sectorial GSDP of agriculture in both states.

– Relationship of Sectorial Gross Domestic Product in agriculture with Irrigation Expenditure of Uttarakhand and Uttar Pradesh are estimated. Mathematically, it can be shown as follows-

$$\ln(\text{UKSGSDP}) = 0.765 * \ln(\text{UKIE}) + 4.910 + u_t$$

$$\ln(\text{UPSGSDP}) = 0.986 * \ln(\text{UPIE}) + 3.084 + u_t$$

The elasticity of public investment on irrigation is 0.765 in Uttarakhand and 0.986 in Uttar Pradesh. It means irrigation elasticity of agriculture output of Uttar Pradesh is greater than Uttarakhand. Statistical results are shown in the Table 5 and 6.

The value of R<sup>2</sup> is 0.48 and 0.82 in Uttarakhand and Uttar Pradesh respectively, which show that independent variable cause 48% and 82% variation in

Table 5 : Results of Coefficient and Related Test for Uttarakhand				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ln(UKIE)	0.764895	0.219551	3.483908	0.0040
C	4.909631	2.440689	2.011576	0.0655
R-squared	0.482847			
Adjusted R-squared	0.443066			
F-statistic	12.13761			
Prob(F-statistic)	0.004037			

Included observations: 15

Table 6: Results of Coefficient and Related test for Uttar Pradesh				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ln(UPIE)	0.985563	0.127005	7.760021	0.0000
C	3.083691	1.707902	1.805543	0.0942
R-squared	0.822448			
Adjusted R-squared	0.808790			
F-statistic	60.21793			
Prob(F-statistic)	0.000003			

Included observations: 15

the dependent variable in each state, respectively. The value of F-statistic is of the degree of freedom (1, 14) and 5% level of significance, is found 12.13 and 60.21 and its probability is 0.00 in both, which represent that model belongs to goodness of fit. *Thus there is significant correlation between public investment on irrigation and sectorial GSDP of agriculture in both states.*

– Relationship of sectorial gross domestic product in agriculture with rural development Expenditure of Uttarakhand and Uttar Pradesh are estimated. Mathematically, it can be shown as follows-

$$\ln(\text{UKSGSDP}) = 0.315 * \ln(\text{UKRDE}) + 9.813 + u_t$$

$$\ln(\text{UPSGSDP}) = 0.563 * \ln(\text{UPRDE}) + 8.654 + u_t$$

The elasticity of public investment on rural development is 0.315 in Uttarakhand and 0.563 in Uttar Pradesh. It means rural development elasticity of agriculture output of Uttar Pradesh is greater than Uttarakhand. Statistical results are shown in the Table 7 and 8.

The value of R<sup>2</sup> is 0.50 and 0.82 in Uttarakhand and Uttar Pradesh respectively, which show that independent variable cause 50% and 82% variation in the dependent variable in each state respectively. The value of F-statistic is of the degree of freedom (1, 14) and 5% level of significance, is found 13.06 and 59.52 and its probability is 0.00 in both, which represent that model belongs to goodness of fit. *Thus there is significant*

*correlation between public investment on rural development and sectorial GSDP of agriculture in both states.*

Coefficients and their t test results, R<sup>2</sup>, f test (for goodness of fit) results shows that all are significant at 5% level of significance and 14 degree of freedom. The residuals are homoscedasticity and there is no serial correlation present in the residuals. Normality is tested through Jarque Bera test, serial correlation is tested Breusch-Godfrey LM test and Homoscedasticity is tested through Glejser test.

– Overall model has been estimated for both states too. Model is best fitted but results of coefficient do not very satisfy in multi variable regression in both states.

$$\text{UKSGSDP} = 2.323 * \text{UKAAE} + 3.522 * \text{UKIE} - 0.305 * \text{UKRDE} + 150153.723 + u_t$$

$$\text{UPSGSDP} = 3.730 * \text{UPAAE} + 10.229 * \text{UPIE} - 0.064 * \text{UPRDE} + 311501.762 + u_t$$

All estimated coefficients are seemed well than Uttar Pradesh than Uttarakhand.

The value of R<sup>2</sup> is 0.80 and 0.84 in Uttarakhand and Uttar Pradesh respectively, which show that independent variable cause 80% and 84% variation in the dependent variable in each state respectively. The value of F-statistic is of the degree of freedom (1, 14) and 5% level of significance, is found 15.38 and 20.53 and its probability is 0.00 in both, which represent that

**Table 7: Results of Coefficient and Related Test for Uttarakhand**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ln(UKRDE)	0.315010	0.087135	3.615183	0.0031
C	9.812828	0.997564	9.836793	0.0000
R-squared	0.501334			
Adjusted R-squared	0.462975			
F-statistic	13.06955			
Prob(F-statistic)	0.003139			

Included observations: 15

**Table 8 : Results of Coefficient and Related Test for Uttar Pradesh**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ln(UPRDE)	0.562841	0.072950	7.715475	0.0000
C	8.654266	0.996431	8.685260	0.0000
R-squared	0.820760			
Adjusted R-squared	0.806973			
F-statistic	59.52855			
Prob(F-statistic)	0.000003			

Included observations: 15

**Table 9 : Results of Coefficient and Related Test for Uttarakhand**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKAAE	2.322808	0.756869	3.068971	0.0107
UKIE	3.521805	1.849300	1.904398	0.0833
UKRDE	-0.305407	0.639279	-0.477736	0.6422
C	150153.7	118733.5	1.264628	0.2321
R-squared	0.807506			
Adjusted R-squared	0.755008			
F-statistic	15.38158			
Prob(F-statistic)	0.000299			

Included observations: 15

**Table 10: Results of Coefficient and Related Test for Uttar Pradesh**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UPAAE	3.730120	1.421707	2.623690	0.0237
UPIE	10.22928	3.414263	2.996043	0.0122
UPRDE	-0.063832	1.569346	-0.040674	0.9683
C	3115502.	1834765.	1.698039	0.1176
R-squared	0.848493			
Adjusted R-squared	0.807173			
F-statistic	20.53471			
Prob(F-statistic)	0.000082			

Included observations: 15

model belongs to goodness of fit. Coefficients and their t test results shows that some variables are significant and some variables are insignificant at 5% level of significance and 14 degree of freedom,  $R^2$  and f test (for goodness of fit) results shows that all are significant at 5% level of significance and 14 degree of freedom. The residuals are homoscedasticity and there is no serial correlation present in the residuals. Normality is tested through Jarque Bera test, serial correlation is tested Breusch-Godfrey LM test and Homoscedasticity is tested through Glejser test. *Thus there is no significant correlation between public investment on rural development and sectorial GSDP of agriculture in both states.* At last, on the base of Overall analysis, it can be said that public investment has a positive relationship with agriculture growth in both states.

### Conclusion and Suggestions:

It is just pointed out that investment in agriculture is not the only factor necessary for agricultural development. But still, it is extremely important for such a development. It must grow as the time passes. At present, its growth has become immensely important, because of at least two reasons. First is the same increase in output as it

was able to do earlier. This is yet another reason which calls for an increase in investment in agriculture. According to the Planning Commission, a critical minimum rate of agricultural growth of 4% per annum is necessary if the Indian economy is to grow at a satisfactory rate.

Therefore, it can be said utilization of public expenditure is less meaningful in Uttarakhand than Uttar Pradesh because Uttarakhand is a new state compare than Uttar Pradesh and it has more hilly areas than Uttar Pradesh. It needs more management in Agriculture sector. In this respect, government has been taken initiatives step to develop agriculture sector in Uttarakhand. Uttarakhand has become the first state in the country where the government has made a policy to lease agricultural land. In lieu of giving land on a 30-year lease, the concerned farmer will get the rent for the land. In the hilly areas of the state, the obstacles of leasing land for farming, agriculture, horticulture, herbs, off-season vegetables, milk production, tea plantation, fruit hybridization and solar energy has been removed with this step. After getting approval from the Raj Bhavan, the state government has issued its notification. Now any institution, company, firm or NGO can take farm land on

lease in villages, leasing a maximum of 30 acres of land on lease for 30 years. There is a provision to take more land in special circumstances. If there is government land around farm land, then it can be leased by paying the fee with the permission of the District Magistrate. The state government has made this policy in the wake of difficulties in the consolidation of land.

It is a wonderful step but PPP model should be applied to develop agriculture sector in Uttarakhand. The Green Revolution had highly benefitted the farming system of the plain area of the Uttarakhand State while it has neglected the hilly region.

### REFERENCES

Baba, S. H. (2006). Impact of investment of agricultural growth and rural development in Himachal Pradesh, Thesis for

doctor of philosophy in agriculture, CSK Himachal Pradesh Krishi Vishvavidhalaya, Palampur

Bathla, Seema (2017). "Public Investment in Agriculture and Growth: An Analysis of Relationship in the Indian Context," <https://www.researchgate.net/publication/320647132>

Food and Agriculture Organization (2017). "Productivity and efficiency measurement in Agriculture," United Nations.

State Agriculture Plan Uttar Pradesh (2007-2012). Department of Agriculture, Government of Uttar Pradesh, Lucknow.

Tuteja, Usha (2013). Agriculture Profile of Uttarakhand, Agricultural Economics Research Centre University of Delhi, Delhi.

Uttarakhand Economic Survey 2018-19 Vol. II, Directorate of Economics and Statistics, Government of Uttarakhand.

\*\*\*\*\*