

# Spatial Differentiation in Agricultural Development in Jammu and Kashmir: A Geographical Approach

Harmeet Singh & Rafiq Hussain Andrabi

Department of Geography & Regional Development  
University of Kashmir, Srinagar-J&K  
harmeetgeo@gmail.com

**Abstract:** Regional imbalances in agricultural development of Jammu and Kashmir are the major structural constraints to the equitable rural development of the state, which needs to be overhauled through spatial planning approach. In this approach, the systematic identification of levels of development is the pre requisite. This paper attempts to find out the inter-district disparities in agricultural development in Jammu and Kashmir. With innovative quantification, efforts have been made to analyze the inter-district variations in the level of agricultural development. The agricultural processes of the region are directly controlled by the prevailing physical environmental conditions (temperature, precipitation, terrain, soil etc.) and the socio-cultural milieu (land tenancy, size of holding, technology, workforce, family requirements, irrigation, power, roads, marketing, aspirations of the growers, etc.). Keeping in view the geo-ecological conditions of Jammu and Kashmir, fourteen variables relating to agriculture development have been analyzed by using Z- score technique. The study reveals that Pulwama and Kathua districts are the highly developed region while as Anantnag, Srinagar, Jammu, Budgam, Udhampur, Baramulla and Kupwara fall in medium category group and Doda, Leh, Udhampur, Rajouri, Kargil and Poonch are the least developed regions.

**Key words:** Composite score, correlation Matrices, Sustainable agricultural development, Regional inequality, Agricultural productivity, Economic development.

## I. INTRODUCTION

Development is defined as the upward movement of the entire social system (Myrdal, 1968). Economic development does not take place uniformly in all regions and hence, regional disparities emerge and persist (Kalantri, 2001). Regional inequality is a serious structural constraint to equitable rural development which needs to be corrected through spatial planning approach (Boudeville, 1966). Economic development of any region depends upon the pace of development in different sectors of the economy. Agriculture, one of the important sectors of the state economy plays a very prominent role in the rural development. Agricultural development is unquestionably a multi-dimensional concept which mainly includes development in a real strength of cropped land, improvement in farming practices/ systems, improved farm implements, irrigation system and irrigated area, high yielding varieties of seeds, chemical fertilizers, insecticides and pesticides, intensity of cropping and specialization and commercialization of agriculture (Mohammad, 1981). Jammu and Kashmir is essentially a mountainous state in which only about 30 per cent of the reported area is under cultivation (Anonymous, 2011-12). Around 70 per cent of the population in the state gets livelihood directly or indirectly from agriculture and allied sectors (Anonymous, 2012-13). Agriculture is the most important sector of the economy of Jammu and Kashmir, as it contributes about 65 per cent of the state revenue which explains the overdependence of the state on agriculture (Husain, 2000). The agriculture and allied sectors contribute about 38 per cent to the state gross domestic product of which 11 per cent, 9 per cent and 7 per cent are contributed by livestock, crop, and horticulture sectors, respectively (Economic Survey, 2007). To provide, nutritional diet of plants and animal products about 0.5 hectares of crop land per capita is needed (Lal, 1989). In spite of increase in food grain production from 4.52 lakh tonnes in 1950-51 to 15.21 lakh tonnes, the demand is still deficit by 38 per cent. The deficiency in cereals

is nearly by 40 per cent, 70 per cent each in pulses and oil seeds and 30 per cent in vegetables (Economic Survey, 2008-09). The state still meets its demand by procuring large quantities from other states even after 6 decades of independence. The state is also confronted with negative production growth rates of -2.55, -0.48, -3.36 and -0.44 per cent and -0.44 per cent in maize, wheat, cereals, millets and food grains respectively. In the region it is also found that negative productivity trends of -2.55, -0.48, -3.36 and -0.44 per cent is found in case of rice, wheat and total food grains respectively (Economic Survey, 2008-09).

The agricultural processes of the region are directly controlled by the prevailing physical environmental conditions (temperature, precipitation, terrain, soil etc.) and the socio-cultural milieu (land tenancy, size of holding, technology, workforce, irrigation, power, roads, marketing, aspirations of the growers, etc.). Characterized with mountainous and undulating terrain and micro-level variations in temperature, precipitation and soils, the state of Jammu and Kashmir has a high degree of variations in cropping patterns, crop combination and crop diversification (Husain, 2000). In the state of Jammu and Kashmir, 58 per cent of the area under agriculture is rain fed and remaining 42 per cent is irrigated. In the state 11.28, 92.72, 56.99 and 96.15 per cent area under rice, maize, wheat and barley, respectively is cultivated as rain fed crop which attributes to low productivity and production as compare to national yields (Anonymous, 2030). The state comprises of the three regions namely Jammu, Kashmir and Ladakh having distinct geographical outlook and agro-climatic zones. Each zone having its own characteristics that largely determines the cropping pattern, productivity of crops. Paddy is the main crop of Kashmir valley followed by maize, oilseeds, pulses, vegetables, fodder and wheat. In Jammu region, wheat is the predominant crop followed by maize, paddy, pulses, oilseeds, fodder, vegetables and other crops, while in Ladakh, barley is the major crop followed by wheat and fodder crops. The estimated percentage contribution of Agriculture and allied sectors was 21.19 per cent in 2011-12 (Economic Survey, 2012-13).

The present study is an attempt towards accelerated agricultural production in the state of Jammu and Kashmir through the analysis of cropping pattern and levels of agricultural development at district level. The degree of agricultural development determines greatly the rate of growth of economy. Agricultural development denotes the quality of agricultural system of region in terms of productivity, diversification and commercialization consistent with desired state of agrarian relation and ecological balance (Krishna and Reddy, 1998). Agricultural development will help in enhancing social and cultural development due to increase in per capita income, with the increase in per capita income there will be improvement in the quality of life which gets expression in the level of education, health care, better housing and so on. Cultivators will be able to make use of technology and go for the improved methods of farming.

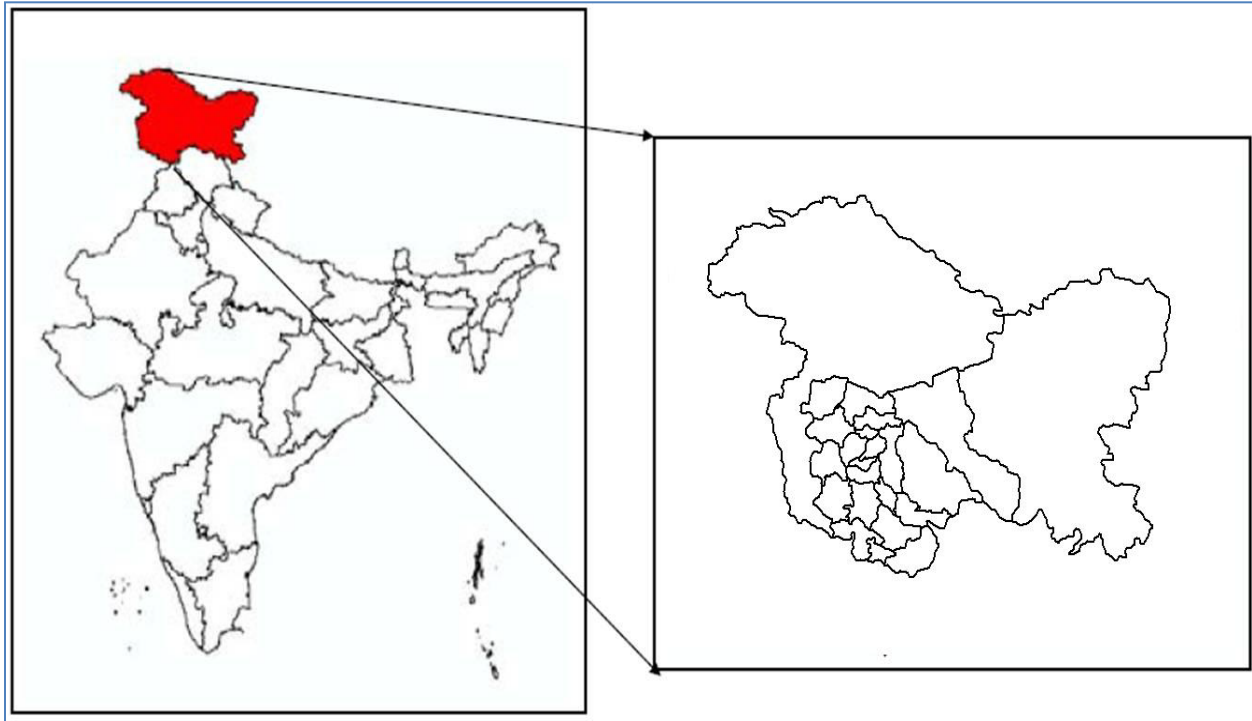
## II. OBJECTIVES OF THE STUDY

The present study is intended to fulfill the following objectives:

1. To find a suitable index of agricultural development of the state of Jammu and Kashmir and to map the regional disparities in a quantitative form.
2. To find out the interrelations of these variables which influence the levels of agricultural development in the state of Jammu and Kashmir.

## III. STUDY AREA

Jammu Kashmir stretches between 32° 17' N to 37° 6' N latitude and 73° 26' to 80° 30' longitude. It comprises of the division of Kashmir Valley, Jammu and Ladakh. The total area of Jammu Kashmir is about 2.23 lakh sq kms out of which about 1.39 on this side of the line of control. The main part of the state consists of the western section of the Himalayas which contains mainly lofty mountain range ranges from an elevation of 3000 to 6000 meters. The Pir Panjal range separates valley of Kashmir from Jammu and the Zaskar range separates Kashmir valley from Ladakh region.



**Fig.1.1 Location Map of Jammu and Kashmir**

IV. DATA BASE AND METHODOLOGY

The very basis requirement in analyzing regional variation is the selection of suitable indicators. For standardization, these indicators are then dealt statistically to delineate the districts according to their levels of development. For the assessment of agricultural development secondary data have been used for the period of 2011-12 from the Digest of Statistics, Financial Commissioners’ office and Sher-i- Kashmir University of Agricultural Sciences( SKUST).For determining the levels of agricultural development the following variables have been used (Table1.1 ).

**Table 1.1: Indicators of Agricultural Development**

<b>Variables</b>	<b>Definition</b>
<b>X1</b>	Net sown area to total Gross Cropped area.
<b>X2</b>	Cultivable area per cultivator, hectares.
<b>X3</b>	Intensity of cropping (gross sown area /net sown area)
<b>X4</b>	Area Under HYV/Gross cropped area.
<b>X5</b>	Intensity of irrigation (gross irrigated area/net irrigated area)
<b>X6</b>	Area sown more than once as percentage of net area sown.
<b>X7</b>	Agricultural Crop Productivity Index.
<b>X8</b>	Area under commercial crop as percentage of gross cropped area.
<b>X9</b>	Area under fruits and vegetables as percentage of gross cropped area.

<b>X10</b>	Parentage of holdings above one hectare.
<b>X11</b>	Percentage of villages electrified.
<b>X12</b>	Fertilizers consumption per unit of gross cropped area(Kg/Hectare)
<b>X13</b>	Road length per 100 Sq. Kms of area.
<b>X14</b>	Rural literacy rate.

**Source:** Digest of Statistics, (2011-12), SKUST, Financial Commissioners’ Office, Srinagar.

The values of these variables are not quite suitable for simple additions in combined analysis. Hence variables are transformed and standardized and their standardized values are used to build up the composite index of development. To determine the overall levels of agricultural development and its uneven distribution in the study area the data of all variables have been transformed into indices using Z score technique. The formula is

$$Z_i = \frac{X_i - X}{SD}$$

Where  $Z_i$  = standard score for  $i$ th observation,  $X_i$  = original value of the  $i$ th observation,  $X$  = mean of all the values of  $X$ ,  $SD$  = standard deviation of  $X$  observation.

Further, the result of standard score obtained for the different indicators was aggregated by Composite Standard Score (CSS) so that the regional disparities in the levels of agricultural development of the districts may be obtained on a common scale. This is expressed as:

$$\text{Composite Standard Score (CSS)} = \frac{\sum Z_i}{N}$$

Where, CSS is the composite standard score,  $Z_i$  is the standard scores of  $i$ th districts and  $N$  is the number of variables. Thus, composite indices have been obtained for agricultural development for different districts of the state. The data was subjected to statistical analysis using Statistical Package for Social Sciences (SPSS) software, version 16.0.

**Table 1.2: Composite standard Scores of Aerial Differential of Agricultural Development in Jammu and Kashmir District Wise (2011-12)**

District	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	Z score
<b>Anantnag</b>	.76	-.30	.43	.42	.74	-0.34	0.36	.57	-1.01	.83	-.54	-.44	.74	0.55	2.97
<b>Pulwama</b>	.34	0.43	.54	.34	.45	.66	.47	.45	-.68	0.8	.66	-0.27	.45	.12	4.18
<b>Srinagar</b>	.41	0.16	-0.26	.29	.95	-0.44	.58	.80	-1.53	0.4	0.75	-0.67	.34	.45	2.24
<b>Budgam</b>	.88	.39	-	.69	.18	-.93	.25	.75	-.99	.47	0.75	-.91	.18	0.22	1.90

			0.35												
<b>Baramulla</b>	.85	.73	-.33	.31	-.59	-.44	.78	1.05	-.71	-.22	.23	-0.97	0.59	.99	2.27
<b>Kupwara</b>	.56	-.08	-.45	-.20	-0.78	-.41	.26	.88	-.91	.36	.05	-.64	-.02	.76	-.62
<b>Leh</b>	-.11	-.099	-.43	-.44	1.29	-.70	-1.08	-.75	-.50	1.34	-0.17	-1.1	-.83	.21	-4.26
<b>Kargil</b>	.39	-.69	-.97	1.82	.09	-1.02	-.91	-.51	-0.16	-.24	-1.03	-.93	0.09	.34	-3.69
<b>Jammu</b>	-.62	.28	.41	0.37	0.34	0.25	-.79	.22	.54	-.83	0.44	0.24	0.26	0.46	1.57
<b>Udhampur</b>	-0.58	-.86	0.87	-.55	-0.42	.71	.72	-.84	.65	-0.14	-.96	.35	0.47	1.01	1.73
<b>Doda</b>	-0.58	.95	.35	-.22	-.56	-.33	-.72	-.79	.15	-0.88	-.33	-.30	-.56	-.12	-3.65
<b>Kuthua</b>	-.73	.73	1.04	.45	1.05	1.01	-.49	.34	.93	-.81	-.12	0.68	1.05	1.01	4.01
<b>Rajouri</b>	-1.06	-0.82	.07	-.16	.13	0.66	-.88	1.53	-.99	-.49	2.10	.13	-.87	.98	-1.81
<b>Poonch</b>	-.91	-1.47	.7	-1.17	-.22	.54	-.65	-.86	.36	-.59	-.74	1.18	-.22	.82	-3.86

Source: Digest of Statistics, 2010-2011, Financial commissioner’s office Srinagar

#### V. LEVELS OF AGRICULTURAL DEVELOPMENT

Agricultural development is a multidimensional activity. It is a key element of the rural development. The primary objective of the agricultural development is to increase growth of agricultural output to provide the livelihood to the growing population. Regional imbalance is a crucial aspect of overall development process, which is to be analyzed systematically. This type of analysis of levels of development bears strategic relevance specifically in understanding the dynamic of rural development. To assess the general level of agricultural development in Jammu and Kashmir all the 14 variables have been aggregated. The Z-score value of all the fourteen variables transformed and combined with the help of Z-score and composite score was prepared (Table1.3). The value of composite score varies between 4.78 in Pulwama district to -4.26in Leh district. On the basis of Z-score values the state of Jammu and Kashmir has been divided into three levels of agricultural development regions i.e. High, Medium and Low categories.

**HIGH LEVEL OF AGRICULTURAL DEVELOPED REGIONS**

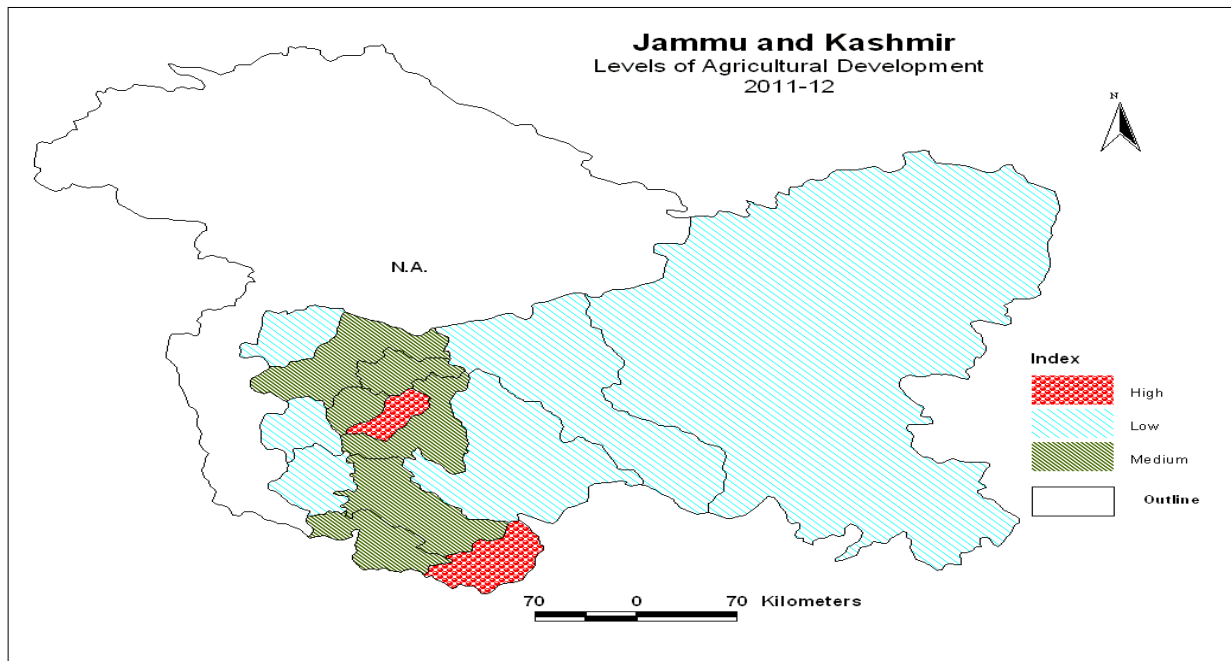
The high level of agricultural development in the state of Jammu and Kashmir has been witnessed in the districts of Pulwama and Kuthua. Both these regions have favorable geo-ecological conditions for crop farming. These districts have vast tracts of fertile low lying areas and a long cropping season which supports double cropping. In addition to this the districts have adopted modern methods of crop farming and the progressive farmers have diversified the agriculture .The application of improved farming technology, use of high yielding varieties, herbicides , pesticides , chemical fertilizers, assured irrigation facilities and post –harvest technology has resulted into high level of agricultural productivity per unit area and per worker in these districts. Healthy co-operative movement, availability of credit, increasing trend of mechanization, close network of communication and transportation , overall awareness of farmers, effective market organization have all contributed to agricultural development

**Table 1.3: Levels of Agricultural Development of Jammu and Kashmir**

	Z- Score Value	Levels of Agricultural Development	Districts
1	Above 4	High	Pulwama, Kuthua
	1 – 4	Medium	Anantnag, Baramulla, Srinagar, Budgam, Udhampur Jammu,
3	< 1	Low	Leh, Poonch, Kargil, Rajori ,Dada, Poonch

Source: Digest of Statistics, (2011-12), Financial Commissioners’ office, Srinagar, SKUST

**Fig 1.2: Jammu and Kashmir: Levels of Agricultural Development (2011-12)**



Source: Digest of Statistics, (2011-12), Financial Commissioners’ office, Srinagar, SKUST

**MODERATE LEVEL OF AGRICULTURAL DEVELOPED REGIONS**

The moderately agricultural developed districts of the state are Anantnag, Budgam, Baramulla, Srinagar and Jammu and Udhampur. These regions of the state fall partially in mountains and plains. Most of the area of these regions fall in the Kandi belt i.e. rainfall scarcity region and is maize and pulse dominated area of the state. The agricultural productivity from per unit of land, area under double cropping is low and the farmers have not adopted diversification of agriculture on large scale.

**LOW LEVELS OF AGRICULTURAL DEVELOPED**

Low level of agricultural development spreads over at least six districts of the state. The districts of the state which fall in this category are Leh, Kargil, Poonch, Rajori, and Doda Poonch. Kargil and Leh districts fall in the cold arid region and have harsh climatic conditions and for more than six months the region has the temperature below 0°C and thus agricultural activities remain suspended. The regions agricultural sector is heavily dependent on rainfall which has been erratic. The physio- social set up of the regions not favorable for the development of agriculture. The region also lacks in infrastructural development. These regions are under developed and needs suitable measures to promote agricultural development. The other districts such as Rajori, Poonch, and Doda fall in the sub-tropical region of Jammu division. These districts have the rugged topography. The bio-physical conditions such as low soil fertility, combined with more frequent extreme event such as droughts, caused by climatic variability and change, further exacerbate the regions susceptibility.

**VI. CORRELATION COEFFICIENT ANALYSIS**

In the present analysis the correlation matrix Table (1.4) reveals inter- correlation of 14 variables related to agricultural development of all the districts of Jammu and Kashmir State. The net sown area (X1), is positively correlated with intensity of cropping (0.57), cultivable area per cultivator (0.44), area under HYV seeds to total cropped area(0.55),agricultural crop productivity index(0.75),percentage of holdings above one hectare(0.28),percentage of villages electrified (0.60),fertilizers consumption per unit of gross cropped area. This indicates that net sown area to cropped area is the key factor in determining agricultural development in the

**Table 1.4 -Correlation Matrix Showing Relationship between variables and Agricultural Development (2011-12)**

Correlation	X1	1.00													
	X2	.44	1.00												
	X3	.57	-.17	1.00											
	X4	.55	.35	.65	1.00										
	X5	-.09	.33	.51	-.11	1.00									
	X6	-.50	.08	.93	-.60	.55	1.0								
	X7	.75	.30	-.36	.28	.09	-.30	1.00							
	X8	.77	.41	-.58	.37	-.17	-.52	.84	1.00						
	X9	-.85	-.35	.62	-.42	.09	.58	-.72	-.79	1.00					
	X10	.28	.48	.31	-.27	.46	.39	.48	.29	-.28	1.00				
	X11	.60	.42	-.53	.67	-.07	-.50	.61	.67	-.69	.26	1.00			
	X12	.64	.65	-.27	.24	.02	-.10	.55	.56	-.63	.62	.61	1.00		
	X13	-.38	.15	.50	.03	.52	.59	-.45	-.62	.64	-.08	-.42	-.36	1.00	
	X14	-.57	-.23	.56	-.64	.17	.37	-.39	-.44	.39	-.05	-.48	-.30	-.04	1.00



mountainous state of the Western Himalayas.

It has also shown negative correlation with intensity of irrigation (-0.09), area sown more than once (-0.50), area under fruits and vegetables (-0.85), road length per 100 sq. Kms (-0.38) and rural literacy rate (-0.57). Cultivable area per cultivator (X<sub>2</sub>) has positive correlation with area under HYV seeds/ gross cropped area(0.35), intensity of irrigation(0.33), area sown more than once(0.08), agricultural crop productivity (0.30), area under commercial crops (0.41), percentage of holdings above one hectare(0.48), percentage of electrified villages (0.42), fertilizer consumption(0.65), road length (0.15) and have negative correlation with intensity of cropping (-0.17), area under fruits and vegetables (-0.35) and rural literacy rate 0-.23). Intensity of cropping (gross sown area /net sown area) has a positive correlation with net sown area(0.57), intensity of irrigation(.51), area sown more than once(0.62), area under HYV seeds(0.65), holding size above one hectare (0.31), road length(0.50) and rural literacy rate(0.56) and has negative correlation with crop productivity(0.36), area under commercial crops(-0.58), percentage of villages electrified(-0.53), fertilizers consumption(-0.27). The correlation analysis reveals the fact that the level of agricultural development is an outcome of the integrated impact of various parameters.

## VII. CONCLUSION

The agricultural processes of the state of Jammu and Kashmir are directly controlled by the prevailing physical environmental conditions such as temperature, precipitation, terrain, soil etc. and the socio-cultural milieu which includes land tenancy, roads, marketing, aspirations of the growers, technological and institutional development. The foregoing analysis reveals that the state of Jammu and Kashmir has witnessed regional disparities in the levels of agricultural development. The analysis presented clearly shows the factors which have hindered the progress of some districts in agriculture sector which are mainly due to lack of basic infrastructural facilities. Even in those districts where agricultural development is high also needs the basic institutions and organizational facilities. High level of agricultural development regions comprises two districts of the state which are favorably endowed with physical, institutions and organizational factors. Although the intensity of cropping, area under commercial crops, area under HYV seeds, and intensity of irrigation are main factors which have played an important role in the development of agricultural development and are highly correlated. The low agricultural districts of the state of Jammu and Kashmir are Leh, Kargil, Rajori, Dada, Poonch and Kupwara. These districts of the region have most of area in the mountains and have rugged topography, high rainfall and snowfall variability, lack of irrigation facilities, low intensity of cropping, low percentage of net sown area and very less area double cropped, poor adoption of mechanization and persistence of subsistence economy are the major constraints for agricultural development. Thus, for the development of this sector in the state both natural and extent of local problems, suitable measures should be adopted to utilize agricultural potential of the region. The development of irrigation in the Kandi areas and cultivation of short duration crops in the Valley of Kashmir may enhance the double cropped area substantially thereby making agriculture a more remunerative occupation.

## REFERENCES

1. Anonymous (2009), Digest of Statistics, Directorate of Economics and Statistics, Planning and Development Department, Jammu and Kashmir Government(India) pp.98-110.
2. Anonymous (2010), Annual Report-2009-10, Sher-e-Kashmir University of Agricultural Sciences and Technology, Kashmir (India) pp. 33.
3. Anonymous (2011), Annual Report-2009-10, Sher-e-Kashmir University of Agricultural Sciences and Technology, Kashmir(India) pp. IX. 4. C.
4. Anonymous, SKUST Vision, 2030, Sher-E-Kashmir University of Agricultural Sciences and Technology of Jammu. Pp.23-40.
5. Bhattacharya, B.B. and S. Sakthivel, (2004) "Regional Growth and Disparity in India: Comparison of Pre and Post-Reform Decades" Economic and Political Weekly, March 6, pp. 1071-1077.
6. Boudevile, J.R., (1966), Problems of Regional Economic Planning, Edinburg university press, Edinburg.p.35
7. Ghosh, B. S. Marjit and C. Neogi (1998), "Economic Growth and Regional Divergence in India: 1960-1995, Economic and Political Weekly 33(26): 1623-30.
8. Govt.of Jammu and Kashmir (2008-09), Economic Survey, Directorate of Economic and Statistics.pp.50-55.



9. Govt.of Jammu and Kashmir (2012-13), Economic Survey, Directorate of Economic and Statistics. Pp.205-224.
10. Hirschman, A.O, (1958), the strategy of Economic Development in Developing Countries, Yale University press, USA.pp.60-75.
11. Husain.M.,( 2000). Systematic Geography of Jammu and Kashmir, Rawat publications, New Delhi.pp.100-110
12. Husain, M., (1996). Systematic Agricultural Geography, Rawat publishers, Jaipur, India.pp.23-35.
13. Kalantri, K., 2001, Regional Development Planning: Theories and Techniques, Khoshbin Publications, Tehran Iran, p.290.
14. Krishna, A. and Reddy, R. (1998), Regional Development and Planning, edited by Mahaptra and Jayant, Rawat Publication, New Delhi.pp.25-38.
15. Mohammad, N., (1981), Dynamics of Agriculture Development, Vol.7, Concept Publishing Company, New Delhi, pp.17-19.
16. Lal, R., (1989). Land Degradation and its Impact on Food and other Resources “in Food and Natural Resources, Pimentel et, al (eds), New York.pp.12-16.
17. Myrdal, G., (1964). Economic Theory and Under-developed Regions. London: Methuen and Co.Ltd.pp.18-40.
18. N. V., Nguyen. (2006), Challenges to ensure food security through rice: CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources,2006 1No.06.
19. Osmaston, p and Denwood, l., (1995), Recent Research on Ladakh, Proceedings of the Fourth &fifth International colloquia on Ladakh, published by Jainendra press, New Delhi.pp.45-50.
20. Sen, A and Himanshu, (2005). Poverty and inequality in India, MacMillan India, New Delhi.
21. Suri, K.C. (2006) - “Political Economy of Agrarian Distress”, Economic and Political Weekly, April, 22