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# A Study of Development in Agriculture in Jammu Province of Union Territory of Jammu and Kashmir

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## ABSTRACT

The importance of agriculture in the Union Territory of Jammu and Kashmir can be gauged from the fact that it contributes about sixty five percent of the revenue to the economy which also depicts the dependence of the people of Jammu and Kashmir on agriculture. The article is a very generous effort to explore the inequalities in the development of agriculture in Jammu Province. The study analyzed Primary Census Abstract and Regional Digest of Statistics for the year 2016-2017 to calculate main agricultural work participation rate, agricultural intensity and irrigation intensity. Finally Composite Standard Score was computed for the nine indicators to categorize the districts of entire study area into three categories in development of agriculture. Generally, it is found that the high level of agricultural development as per composite index is found in South-Western part; followed by medium level of agricultural development in the middle part and low level of agricultural development in Northern and North-Eastern part of the province of Jammu. The calculated level of agricultural development is in complete correspondence with uneven and rugged topography due to which the major part is quite inaccessible and equally make difficult for the application of modern agricultural techniques and inputs that are required for agricultural development. This study can have important policy implications concerning directing the resources to those districts of the region which falls under low level of agricultural development.

**Key words:** Agricultural development, Cropping intensity, Irrigation intensity, Policy implication

The major objectives of study are to analyze the patterns of cropping intensity, irrigation intensity as well as variations in the levels of agricultural development. Since our study area of Jammu province is one of the provinces or divisions of the Union Territory of Jammu and Kashmir, it is crucial for this study to have a detailed discussion on topography, economy and agro-climatic conditions prevailing there influencing directly or indirectly agricultural development in Jammu province. The Union Territory of Jammu and Kashmir is situated in the great North-Western complex of one the loftiest mountain that is Himalayan ranges having snowcapped summits, complex geological structure and rich flora and fauna [1]. Jammu and Kashmir is a symbol of national integration and unity which has a unique geographical identity. It is well endowed with renewable-natural resources [2]. Geographically it is divided into two agro-climatic zones (previously three) that are temperate Valley of Kashmir and subtropical and humid province of Jammu having their own specific geo-climatic conditions. Rice and wheat are the two major crops of Kashmir and

Jammu province respectively [3]. These two provinces suffer from land degradation processes in different magnitudes. The province of Jammu also contains foothills of Himalayas, named as Siwaliks, stretching from Kathua District to Rajouri District and cover about 12 percent of its total area. This belt is also known as Kandi belt characterized with dry and arid conditions [4]. Generally speaking, the agricultural development and allied processes are directly controlled by the prevailing physical and socio-cultural milieu like tenancy, temperature, precipitation, terrain, soil, etc. and Jammu province is not an exception. There is also high degree of variations in agricultural dynamics of Jammu province because it is characterized with uneven topography, erratic nature of rainfall etc. [5]. The rate of growth of economy can be greatly determined by the degree of agricultural development. The development of agriculture acts as a catalyst to improve the per capita income of the farmers which in turn will pave the way for improvement in their quality of life [6].

The recent studies suggest that the agriculture is of paramount importance for the economy of Jammu province. About eighty percent of the population earns their livelihood directly or indirectly from agriculture. The economic growth of the study area largely depends on it due to the under development of secondary sector [3] has stated that. Jammu province also possesses rural economy where out of the total

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population 82.70 per cent live in rural area and depend on agriculture [7]. Another study made by [8] also suggest the importance of agriculture and its allied sectors in Jammu and Kashmir. The Regional Digest of Statistics 2016-2017 also highlights that 414883 hectares of area is net cultivated under field crops in the study area whereas about 748707 hectares contributes to gross cultivated area. Jammu province has the maximum cropping intensity in the Union Territory of Jammu and Kashmir about 180.46 percent. The production of the food grains in the region is 13180193 quintals. Also talking about the irrigation, the net irrigated area of the region is 124002 hectare and the irrigation is mainly carried out by the way of canals, wells and various other sources. The irrigation intensity accounts for 29.01 percent of the total area sown. A total of 677930 hectares of the area has been brought under the HYV seeds and the distribution of fertilizer sums to 37091.40 million tones.

The present study is a generous attempt towards the analysis of the development of agriculture in Jammu province district-wise. The three levels of agricultural development have been assessed using nine parameters. Jammu province is one of the two divisions of the Union Territory of Jammu and Kashmir extending between 32° 20' N to 33° 10' N latitude and 74° 45' E to 75° 55' E longitude. The region of Jammu constitutes the southernmost part of the Union Territory of Jammu and Kashmir having 37 tehsils and 10 districts.

## MATERIALS AND METHODS

The data were collected from the secondary sources. The relevant data for the study were obtained from Primary Census Abstract 2011 (PCA) and Regional Digest of Statistics (Jammu & Kashmir) for the year 2016-2017.

### Mathematical and statistical tools

**Main Agricultural Work Participation Rate (MAWPR):** This is important measure to determine the actual main workers engaged in agricultural sector excluding the marginal workers. Mathematically:

$$MWPR = \frac{\text{Total Main Agricultural Workers}}{\text{Total Population}} \times 100$$

### Agricultural intensity

$$\text{Agricultural intensity} = \frac{\text{Gross or Total cropped area}}{\text{Net cultivated area}} \times 100$$

**Irrigation intensity:** Obtained with the help of following formula:

$$\text{Irrigation intensity} = \frac{\text{Total irrigated area}}{\text{Gross or Total cropped area}} \times 100$$

**Degree of association:** The statistical tool of Correlation was employed in order to know the degree of association between suitable indicators.

**Standard Score and Composite Standard Score (CSS)** was computed with the help of following formulae:

$$Z = \frac{x - \mu}{\sigma} \quad \text{and} \quad \text{CSS} = \frac{\sum Z}{N}$$

Where:

Z = Standard score,

x = Observed value,

$\mu$  = mean of the sample

$\sigma$  = Standard deviation of the sample

N is the number of variables

**Software used for preparing choropleth maps:** The data pre-processing and preparation, data analysis, editing and output generation were performed using the ArcGIS 10.5.

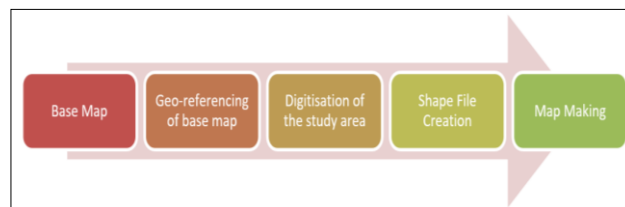


Fig 1 Flow chart, showing steps in map making using ArcGIS 10.5.

## RESULTS AND DISCUSSION

The first two important indicators used for assessing the agricultural development were Cropping Intensity and Intensity of Irrigation. The Cropping Intensity is defined as the extent to which the net area sown is resown and simply means raising number of crops from the same field in one agricultural year. It in other words, it referred to the number of crops raised on a field during an agricultural year in a region. Mathematically it can be expressed as a ratio between the net sown area and total cropped area [9].

The cropping intensity is good yard stick for land use planning and the land efficiency and the cropping intensity are complementary to each other [10]. Cropping intensity depends on soil fertility, chemical fertilizer, irrigation, use of new technology, land ownership, size of holdings. Several scholars have expressed their views regarding the estimation of the cropping Intensity, which is primarily related to the regional agro-climatic conditions. [11] have used the term agricultural intensity in place of cropping intensity while [12] has used word land uses efficiency for cropping intensity [13].

On the other hand, *Irrigation Intensity* means the percentage ratio between the net areas irrigated to net area sown. Irrigation is indispensable for agricultural production and defined as application of water to agricultural fields for raising crops. Irregular, uncertain and unevenly distributed rainfall in time amount and space is not sufficient for growing certain crops as these conditions make irrigation essential and indispensable for the successful crop production [14]. [15] also stressed on the importance of irrigation as it supply artificial water for farming operation.

Irrigation in our study area division was carried out by way of canals, wells and various other sources. According to data available in Regional digest of statistics 2016-2017, against availability of 415000 hectares area, only 124000 hectares of net area sown was brought under irrigation, which constituted 30 per cent of the net area sown.

Data reflected in (Table 1) gives a clear picture of the regional patterns of the cropping intensity as well as the irrigation intensity. The total cropping intensity of Jammu province was 180.46 percent whereas the irrigation intensity of the same was around 29.01 percent. Kathua District of Jammu province had the highest cropping intensity (i.e., 199 percent) followed by Samba, Udhampur, Rajouri and Jammu due to good agricultural inputs in terms of HYV seeds, fertilizers, Irrigation facilities etc. whereas the lowest for Ramban and Kishtwar (124.83 percent) as the topography of

these districts was highly uneven and the agricultural inputs were fairly low compared to the other districts.

Table 1 Regional patterns of cropping intensity and irrigation intensity

Districts	Cropping Intensity (in percentage)	Irrigation Intensity (in percentage)
Jammu	183.75	59.52
Samba	198.25	32.14
Kathua	199.00	35.72
Udhampur	189.76	14.34
Reasi	174.16	5.76
Ramban	127.23	5.91
Kishtwar	124.83	15.98
Doda	166.90	6.82
Rajouri	189.33	8.27
Poonch	163.62	13.19
Total	180.46	29.01

Source: Computed by the author on the basis of data available from Regional Digest of Statistics (2016-2017)

In case of irrigation intensity, Jammu District had the

highest share of irrigation intensity i.e., 59.52 percent followed by Kathua and Samba as these districts lied in the plains of Jammu province which had navigable river system and the irrigation was done through canals, tube-wells etc. whereas Reasi, Ramban and Doda were the districts with less share of irrigation intensity due to its rugged terrain and inaccessibility.

*Degree of association between cropping intensity and irrigation intensity*

From (Table 1) it is quite clear that there is a positive value for the Pearson Correlation Coefficient ( $\rho=0.43$ ) between cropping intensity and irrigation intensity. The increase in cropping intensity simultaneously leads to increase in irrigation intensity and vice-versa.

*Computation of composite standard score and regional patterns of agricultural development*

The (Table 2) provides the glimpse of nine selected Indicators against different districts for assessing the Agricultural Development.

Table 2 Health of selected indicators for agricultural development

Districts	Net sown area (%)	Total area sown (%)	Area under food crops (%)	Cropping intensity (%)	Irrigation intensity (%)	Production of total food grains (qtls.)	Distribution of fertilizers (in million tonnes)	Area under HYV (%)	Percentage of agricultural workers to total workers
Jammu	44.90	82.51	96.38	183.75	59.52	4323486	13453.6	84.16	20.74
Samba	39.28	77.88	91.07	198.25	32.14	1078443	2537.9	86.99	24.86
Kathua	22.22	44.22	92.05	199.00	35.72	2281137	5173.3	98.63	45.45
Udhampur	17.50	33.21	97.79	189.76	14.34	1718842	2281.6	77.41	51.06
Reasi	13.78	24.00	95.09	174.16	5.76	445425	1178.1	107.26	69.18
Ramban	17.54	22.32	100.00	127.23	5.91	399208	2943	76.31	57.57
Kishtwar	14.62	18.25	99.39	124.83	15.98	264858	785	92.03	66.97
Doda	15.91	26.55	96.39	166.90	6.82	513401	684.6	80.39	54.07
Rajouri	21.17	40.08	97.60	189.33	8.27	1483817	5848	100.25	55.19
Poonch	23.77	38.89	94.91	163.62	13.19	671576	2206.3	112.88	53.19
Total	23.10	41.68	95.64	180.46	29.01	13180193	37091.4	90.55	44.72

Source: Regional Digest of Statistics (2016-2017)

The standard and composite standard score of the following nine indicators was computed:

X<sub>1</sub>: Net Sown Area

X<sub>2</sub>: Total Area Sown

X<sub>3</sub>: Area under food crops

X<sub>4</sub>: Cropping Intensity

X<sub>5</sub>: Irrigation Intensity

X<sub>6</sub>: Production of total food grains

X<sub>7</sub>: Distribution of Fertilizers

X<sub>8</sub>: Area under HYV seeds

X<sub>9</sub>: Percentage of agricultural workers to total workers

Table 3 Standard score and composite standard score

Districts	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>	X <sub>7</sub>	X <sub>8</sub>	X <sub>9</sub>	CSS
Jammu	2.06	1.86	0.11	0.45	2.27	2.41	2.54	-0.59	-1.83	1.03
Samba	1.53	1.65	-1.72	0.99	0.71	-0.19	-0.31	-0.36	-1.57	0.08
Kathua	-0.08	0.15	-1.39	1.02	0.91	0.77	0.38	0.55	-0.28	0.23
Udhampur	-0.52	-0.34	0.59	0.67	-0.31	0.32	-0.37	-1.12	0.08	-0.11
Reasi	-0.87	-0.75	-0.34	0.09	-0.80	-0.70	-0.66	1.23	1.22	-0.18
Ramban	-0.52	-0.82	1.36	-1.65	-0.79	-0.74	-0.20	-1.20	0.49	-0.45
Kishtwar	-0.80	-1.01	1.15	-1.74	-0.22	-0.84	-0.76	0.03	1.08	-0.35
Doda	-0.67	-0.64	0.11	-0.18	-0.74	-0.65	-0.79	-0.88	0.27	-0.46
Rajouri	-0.18	-0.03	0.53	0.66	-0.66	0.13	0.56	0.68	0.34	0.23
Poonch	0.07	-0.08	-0.40	-0.30	-0.38	-0.52	-0.39	1.67	0.21	-0.01

Source: Computed by the author on the basis of data available from Regional Digest of Statistics (2016-2017)

After calculating the standard score (Table 3) of different indicators of agricultural development of all the districts, the composite standard score was calculated which

was the highest for Jammu district followed by Kathua, Rajouri and Samba whereas it was the lowest for Doda, Ramban and Kishtwar. After the analysis of composite

standard score, the agricultural development was categorized into high, moderate and low levels which is being discussed in the following sub-section. The three categories of Agricultural

development levels for all the districts have been portrayed in (Table 4).

Table 4 Composite standard score and levels of agricultural development

Districts	Composite Standard Score	Levels of Agricultural development
Jammu, Kathua and Rajouri	0.21 to 1.00	High
Samba, Poonch and Udhampur	-0.16 to 0.20	Moderate
Reasi, Doda, Kishtwar and Ramban	-0.50 to -0.15	Low

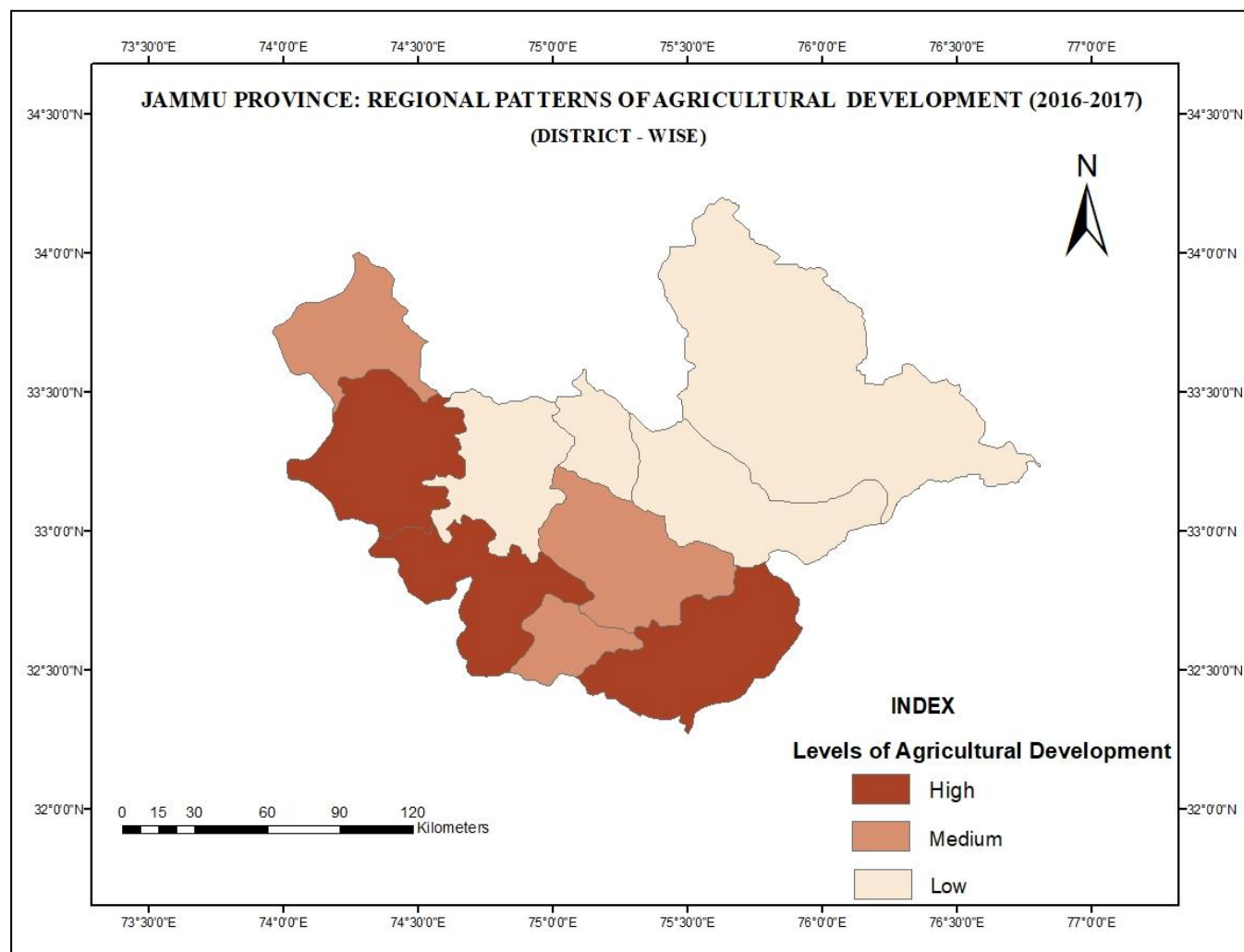


Fig 2 Regional patterns of agricultural development (2016-17)

It is clear from the (Fig 2) that the districts lying towards the west and extreme South East of Jammu province had high level of agricultural development whereas the districts in North East and Northern parts had low level of agricultural development. Also, the districts towards North-West and Central part showed moderate or medium level of agricultural development.

#### *Districts with high level of agricultural development*

Jammu and Kathua were the districts having high level of agricultural development as these districts had high share of cropping intensity, irrigation intensity, production of total food crops, distribution of fertilizers, area under HYV and agricultural workers. In addition, the plain topography and suitable climate of these districts resulted in high level of agricultural development. Rajouri district also lied in this category as cropping intensity is high due to the use of

fertilizers and agricultural workers were also present in good numbers. Moreover, the intensity of cropping and intensity of irrigation were positively correlated and vital for agricultural growth.

#### *Districts with moderate level of agricultural development*

Samba, Poonch and Udhampur had moderate level of agricultural development as the agricultural inputs required were fairly good. Distribution of fertilizers, HYV seeds and sufficient amount of agricultural workers resulted in high production of food grains which in turn resulted in the development of agriculture in these districts.

#### *Districts with low level of agricultural development*

Reasi, Doda, Kishtwar and Ramban lied in this category. The major factor contributing to low level of agricultural development was the uneven or rugged



topography due to which the major part of these districts was inaccessible and the agricultural inputs that were required for development were not evenly distributed or not availed in an efficient manner.

## CONCLUSION

It has been concluded through the study that there is a direct control of physical, environmental and socio-cultural milieu on agricultural processes of Jammu province. The analysis revealed that the study area possesses wide spread disparities in regional development of agriculture. Jammu and Kathua have high level of agricultural development as these districts have suitable physical and climatic conditions along with high share of cropping intensity, irrigation intensity, production of total food crops, distribution of fertilizers, area

under HYV etc. On the other hand, the poor health of selected indicators has posed threat to agriculture of some of the districts. The thrust area of importance lies on the indicators i.e., total sown area, use of HYV seeds, distribution of fertilizers along with implementation of modern technology which are responsible for the backwardness of the districts namely Doda, Ramban, Kishtwar and Reasi in agricultural sector. Jammu province has staunch need of further agriculture restructuring in sustainable manner. The Kandi area must be provided with more irrigation facilities. Agricultural mechanization and promotion of cereal crops is also needed in target districts of north and north-eastern part of Jammu province. Thus, this study can have important policy implications concerning directing the resources to those districts of the region which falls under low level of agricultural development.

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