An appraisal of infrastructural development in Jammu province of Jammu and Kashmir State

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Received: 18-03-2017 Accepted: 02-08-2017 DOI:10.18805/IJARe.A-4742

ABSTRACT
The present investigation was carried out to search importance of infrastructural items for agricultural growth in the region on the basis of secondary data on development of infrastructural facilities for the period from 1984-85 to 2013-14. The analysis of study found that there was significant increase in area irrigated by wells and tanks from 0.31 per cent and 0.33 per cent during period I to 1.41 per cent and 0.59 per cent in overall period, respectively whereas area irrigated by canals was found to be highest (86.55 per cent). As far as physical infrastructural items are concerned, development was improved considerably and substantially in the region. Surface road length and storage capacity for agricultural produce has increased by 31.02 per cent and 59.10 per cent, respectively, during the period under study. All infrastructural items have shown increasing trend in terms of percentage changes over the base period except number of godowns which decreased by 1.28 per cent over base period during the entire period. Growth rate were positive for distribution of agricultural implements, road length both surfaced and unsurfaced, number of godowns, storage capacity and tube wells/ pump sets and negative for credit disbursements and electrification of villages during overall period under study.

Key words: Credit disbursement, Growth rate, Infrastructural facilities.

INTRODUCTION
The development of the agriculture sector is not only dependent on advancement in technology but also on the improvement of agricultural infrastructure. Adequate infrastructure helps in raising production and lowering the unit cost of production activities. Infrastructure both physical and institutional such as irrigation, tube wells, machinery, roads, electricity, storage capacity and financial institutions etc. together play a key role in determining the agricultural output (Singh and Kour 2014). The benefits of commercialization and specialization to a large extent depend upon infrastructure and both have push and pull relationship (Bissa and Vyas 2014). From the strategic and development point of view the area under agriculture in the Jammu region of J&K state can be broadly categorized into irrigated and un-irrigated area which are spread over the lower sub-tropical plains, higher temperate areas and the intermediate areas. Irrigation in Jammu division is carried out by way of canals, wells and various other sources. As against availability of 397 thousand hectares area, only 109 thousand hectares of net area sown has been brought under irrigation which constitutes 27 per cent of the net area sown. Small holdings and limited irrigation facilities, makes agriculture in the region as under developed (Anonymous, 2012-13). In agriculture, road investment can increase intensity of land use (Ahmed and Hossain 1990). Rural electrification and transport facilities are an important basic infrastructure essential for agricultural modernization as it leads to the adoption of several advanced technologies. Consistent with this studies have observed that rural electrification increases sue of pump sets to harness underground water for crop cultivation because of its better reliability and controllability (Shah et al., 2006). Besides, there are other supplementary infrastructure variables like cooperation and financial institutions that improve agricultural productivity and marketing efficiency (Binswanger et al., 1993). Better road access improvement can increase the utilization key inputs with lower cost as well as contribute to the productivity enhancement especially in remote areas (Kiprono and Matsumoto 2014). Keeping these facts in view, this study was undertaken with the aim of examining the infrastructural development for agricultural growth in Jammu region and to work out the trend for infrastructural items.

MATERIALS AND METHODS
The present study made use of time-series data on different variables like irrigation, credit disbursement, agricultural machineries, road length, godowns, storage capacity, villages electrification and tubes wells/ pump sets energized in Jammu division. The period wise data on various aspects was collected from different issues of Digest of Statistics of Jammu and Kashmir, Regional Digest of Statistics of Jammu Division, Economic Survey of Jammu

**Compound growth rates:** The compound growth rates were worked out by fitting exponential function of the following type to the data for four periods, as used by Kachroo (2004).

\[ y = y_0(1+g)^t \] or \[ a(1+g)^t \]

\[ Y = ab \text{ (where } b=1+g) \]

Or \[ \log y = \log a + \log b \]

Then, compound growth rate \( r = (\text{Antilog } b) - 1 \times 100 \)

Where,

- \( Y \) = Area in hectares, production in quintals and yield in quintals per hectare
- \( a \) = Intercept
- \( b \) = Estimated regression coefficient (parameter)
- \( t \) = time period (in year)

Finally the annual rate of compound growth in area, production and productivity of the crops was worked out by using the formula

\[ r = (\text{Antilog } b - 1) \times 100 \]

The significance of the estimated compound growth rates was tested with the help of students’ t-test which is given below.

\[ t = \frac{r}{\text{S.E. } (r)} \sim t_{\alpha/2} \]

\[ \text{S.E. } = \sqrt{\frac{\sum (\log y)^2 - \left(\frac{\sum \log y}{n} - \log b^2\right)^2 \sum x_i^2}{0.43429(n - \alpha)(\sum x_i^2) \times 100}} \]

**RESULTS AND DISCUSSION**

Changes in the credit disbursement (loans advanced) through PACCS: It was revealed from the table that the credit disbursed through Primary Agricultural Co-operative Credit Society increased from Rs.1820.08 lakh to Rs.6771.27 lakh during period I to period II, while it decreased tremendously to Rs.1465.50 lakh during period III, whereas credit disbursement during overall period was found to be as Rs.3352.28 lakh. On the other hand, it has increased during period II by 272.03 per cent over the base period, whereas it had decreased by 19.48 per cent during period III. The table further revealed that decadal compound growth rate was showing non-significant negative growth rate from period I to overall period by -1.79 per cent, -4.67 per cent, -3.43 per cent and -0.56 percent, respectively. The decrease or fluctuation in case of growth revealed that the farmers of Jammu province of J&K state were not taking advantage of institutional finance for overcoming their financial needs.

An important aspect that has emerged in the last three decades is that the credit as an essential input is not only obtained by smaller and marginal farmers for survival but also by the large farmers for enhancing their income as well. It was also observed that the distribution of agricultural implements increased from 8825 numbers to 9278 numbers during the period I to overall period, thereby, showing an increase of 4.27 per cent, 4.64 per cent and 5.13 per cent during period II, III and overall period over the base period, respectively. The annual compound growth rate of agricultural implements was showing significantly positive growth rate of 1.00 per cent, 1.00 per cent and 1.01 per cent at 1 per cent level of significance during period I, period II and overall period respectively, while it recorded non-significant positive growth rate of 1.00 per cent during period III under study.

Increase of productivity in agriculture has been achieved mainly by modernization of agriculture which consists largely of using modern farm machinery such as tractors, harvesters, threshers etc. Therefore, more modern equipments are required for cultivation, sowing and harvesting.

**Changes in the development of road length:** Table 1 revealed that the length of surface road has increased from (1689 km) to (2213 km) during period I to overall period. The length of un-surface road has increased from (1826 km) to (5990 km) during period I to overall period, thereby, showing percentage changes of 6.18 per cent, 222.01 per cent and 228.03 per cent during period II, III and overall period over the base period. The Table further revealed that annual compound growth rate of surface road length was positively significant at 5 per cent level of significance during period I and III, while period II and overall period was showing non-significant positive growth rate with the value of 1.03 per cent and 1.05 per cent, respectively. The results of table has shown further that annual compound growth rate of unsurfaced road length had shown positively significant growth rate of 1.01 per cent significant at 1 per cent level of significance, 1.24 per cent and 1.26 per cent significant at 5 per cent level of significance during period I, period II and overall period, respectively, while as it was recorded non-significant positive growth rate with the value of 1.00 per cent during period III. Although on the basis of the result it is indicated that the road network in the region has been expanded but still number of places are yet to be connected by un-surfaced roadways and there is need that un-surfaced roadways to change them into surface roadway in order to facilitate access to inputs and product market by the rural farmers.

**Changes in the status of co-operative facilities:** Co-operative facilities are very essential for protection of agricultural products against disease, pests, insects and climatic factors. It provides balanced temperature for agricultural produce as well as it reduces the price risk. Table 1 revealed that number of godowns had increased from 312 to 318 during period I and II, respectively. The
Table 1: Changes in the infrastructural development for agricultural growth and their CGR in Jammu region, 1984-85 to 2013-14

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Period</th>
<th>Period I</th>
<th>Period II</th>
<th>Period III</th>
<th>Overall period</th>
<th>Decadal Compound Growth Rate (per cent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1982.08</td>
<td>6771.27(272.03)</td>
<td>1465.50(19.48)</td>
<td>3352.28(84.23)</td>
<td>-1.79</td>
</tr>
<tr>
<td>Loans advance (Rs. in Lakh)</td>
<td>1820.08</td>
<td>9202(4.27)</td>
<td>9235(4.64)</td>
<td>9278(5.13)</td>
<td>1.00*</td>
<td>1.00*</td>
</tr>
<tr>
<td>Improved agricultural implements (Nos.) (Annual CGR)</td>
<td>8825</td>
<td>1689</td>
<td>1749(3.55)</td>
<td>2124(25.75)</td>
<td>2213(31.02)</td>
<td>1.00**</td>
</tr>
<tr>
<td>Road length (Kms)</td>
<td>1826</td>
<td>312</td>
<td>318(1.92)</td>
<td>321(2.88)</td>
<td>308(-1.28)</td>
<td>1.00</td>
</tr>
<tr>
<td>Co-operative facilities</td>
<td>40223</td>
<td>40245(0.05)</td>
<td>40646(1.05)</td>
<td>6395(59.10)</td>
<td>1.06**</td>
<td>1.09*</td>
</tr>
<tr>
<td>Villages/ Hamlets electrified in Jammu division (Cumulative No)</td>
<td>6699.09</td>
<td>8081.05(20.62)</td>
<td>7758.02(15.80)</td>
<td>7513.02(12.14)</td>
<td>0.67*</td>
<td>2.76*</td>
</tr>
<tr>
<td>Tube wells/ Pump sets energized in Jammu division (Nos.)</td>
<td>3242.03</td>
<td>6167.04(90.22)</td>
<td>5670.08(74.89)</td>
<td>5026.83(55.05)</td>
<td>1.88**</td>
<td>11.11*</td>
</tr>
</tbody>
</table>

Note: Figures in parentheses indicates percentage change over the base period.
*significant at 1% los, **significant at 5% los and ***significant at 10% los.

Table 2: Changes in the Irrigation status and their CGR in Jammu region, 1984-85 to 2013-14

<table>
<thead>
<tr>
<th>Sources of Irrigation</th>
<th>Decadal Compound Growth Rate (per cent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Area in 000 ha)</td>
<td>Overall period</td>
</tr>
<tr>
<td>Canals</td>
<td>82.62(88.57)</td>
</tr>
<tr>
<td>Tanks</td>
<td>0.31(0.33)</td>
</tr>
<tr>
<td>Wells</td>
<td>0.29(0.31)</td>
</tr>
<tr>
<td>Other sources</td>
<td>9.74(10.44)</td>
</tr>
<tr>
<td>Net irrigated area</td>
<td>93.28(100.00)</td>
</tr>
<tr>
<td>Gross irrigated area</td>
<td>163.05</td>
</tr>
<tr>
<td>Net sown area irrigated %</td>
<td>25.00</td>
</tr>
<tr>
<td>Gross sown area irrigated %</td>
<td>25.26</td>
</tr>
<tr>
<td>Irrigation intensity %</td>
<td>174.79</td>
</tr>
</tbody>
</table>

Note: Figures in parentheses indicates percentage to net irrigated area.
*significant at 1% los, **significant at 5% los and ***significant at 10% los.
storage capacity for agricultural produce increased from 40223 million tons to 40646 million tons during period I to period III. In terms of percentage changes it had increased by 0.05 per cent, 1.05 per cent to 59.10 per cent during period II, III and overall period, respectively over the base period. The table further revealed that except period I annual compound growth rate of godowns had shown positively significant growth rate with 1.03 per cent and 0.97 per cent significant at 1 per cent level of significance and 0.99 per cent significant at 5 per cent level of significance during period II, III and overall period, respectively. The table further indicated that except period III annual compound growth rate of storage capacity had shown positively significant growth rate with 1.06 per cent, 1.09 per cent and 1.07 per cent during period I, II and overall period, respectively.

Changes in the villages electrified in Jammu region: The result of Table 1 revealed that villages which were electrified in Jammu division had increased from 6699.09 villages to 8081.05 villages from period I to period II, while as it decreased to 7758.02 and 7513.02 villages during period III and over all period. It was observed that electrification transfer to the villages has increased by 20.62 per cent during period II, but again it decreased by 15.80 per cent and 12.14 per cent during period III and overall period over the base period, respectively. Decadal compound growth rate of villages electrified in Jammu region had shown positive growth rate with 0.67 per cent and 2.76 per cent significant at 1 per cent level of significance during period I and period II, respectively, whereas during period III it was showing significantly negative growth rate with -15.27 per cent. However, during overall period it recorded non-significant negative growth rate with the value of -0.21 per cent. Investment in rural infrastructure, particularly electricity will therefore be required to support the anticipated growth in agriculture production.

Changes in the utilization of tube wells/pump sets energized in Jammu region: The Table 1 also revealed that number of tube wells/pump sets has increased from 3242.03 to 6167.04 from period I to period II, while as it was showing a decreasing trend with 5670.08 during period III. The decadal compound growth rate had shown significantly positive growth rate during period I and period II with the value of 1.88 per cent and 11.11 per cent, respectively, while it was observed significantly negative growth rate with -31.27 per cent during period III. However, it was recorded non-significant positive growth rate with the value of 0.14 per cent during overall period. It shows that many minor irrigation structures have been expanded in the region that could contribute to bring more land under cultivation.

Changes in the Irrigation status in Jammu region, 1984-85 to 2013-14: The irrigation status of Jammu region is presented in Table 2 Fig 1. The data in the table revealed that the net irrigated area in Jammu region has increased from 93.28 thousand hectares in period I to 103.26 thousand hectare in period III and it was 98.22 thousand hectare in overall period. As far as gross irrigated area was concerned, it had increased from 163.05 thousand hectares in period I to 192.09 thousand hectares in period III and was 173.96 thousand hectares in overall period. The percentage area under canal irrigation had marginally come down from 88.57 per cent in period I to 86.55 per cent during overall period, while as irrigated area coverage under tanks and wells had small increase from 0.33 per cent and 0.31 per cent in period I to 0.59 per cent and 1.41 per cent during overall period. Net sown area irrigated had increased marginally from 25.00 per cent to 26.16 per cent from period I to period III, but as compared to period III it come down to 25.68 per cent during overall period, whereas gross sown area irrigated increased from 25.26 per cent to 27.10 per cent from period I to period III, but as compared to period III it come down to 25.91 per cent during overall period. On the other hand, irrigation...
intensity had increased from 174.79 per cent to 177.11 per cent from period I to overall period.

Although, irrigation intensity has found to be increasing over the period of time, therefore, it is very important to ensure more ground water and surface water schemes to increase minor irrigation, this strategy could be achieved through active participation of individuals and cooperative efforts of the farmers with the help of state government. It should be mentioned that, more of the irrigation management programmes should be implemented to improve the performance and sustainability of irrigation system in Jammu region.

CONCLUSION

The result regarding infrastructural items indicated that amount of credit which was disbursed through PACCS has increased by 272.03 per cent over the base period during period II, whereas it decreased by 19.48 per cent over the base period during period III, and increased by 84.23 per cent during overall period. On the other hand, distribution of agricultural implements has increased by 5.13 per cent over the entire period. Unsurfaced road length has increased considerably and substantially in the region, while surface road length has increased by 31.02 per cent over the entire period. Number of godowns has increased by 1.92 per cent and 2.88 per cent over the base period during period II and III, whereas it has declined by 1.28 per cent in overall period. However, storage capacity has increased tremendously by 59.10 per cent over the entire period under study. Villages electrified has increased during last three decades while tube well or pump sets which was used for irrigation purposes has increased by 90.22 per cent, 74.89 per cent and 55.05 per cent during period II, III and overall period over the base period under study. There was significant increase in area irrigated by wells and tanks from 0.31 per cent and 0.33 per cent in period I to 1.41 per cent and 0.59 per cent in overall period, respectively. However, area irrigated by canals was highest 86.55 per cent and is still the largest source of irrigation, while as irrigated area coverage under tanks and wells had slight increase from 0.33 per cent and 0.31 per cent in period I to 0.59 per cent and 1.41 per cent during overall period. As far as development of physical infrastructural items were concerned, they improved considerably, substantially and satisfactory in the region which accompanied by a steady growth in agriculture.

REFERENCES