

# Politics, Science and Agricultural Transformation in Kashmir (1948 - 1980)

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**Abstract:** Agriculture in Kashmir witnessed significant transformation after 1948, partly due to the restructuring of agrarian relations through the programme of land reforms and partly due to the adoption of scientific and technological innovations. There was considerable increase in food production and entitlement of the cultivating community to the produce from land also registered significant improvement. However, in comparison to the plains of India especially Punjab the increase in productivity and production of food crops in Kashmir was only marginal and its dependence on outside markets for food items could not be reduced to any considerable extent. In fact, the region could not witness what in true sense may be called 'Green Revolution'. Based on a wide range of official and non - official sources this paper attempts to identify and analyse the reasons which impeded the process of Kashmir agricultural transformation and resulted in low productivity, shrinking of arable land, and the failure of the state to devise appropriate strategies to harness the vast potentialities of hill agriculture. This paper also explores the complex mutual interactions among science, politics and agricultural transformation in Kashmir.

**Keywords:** Agrarian relations, Technological innovations, Green revolution, Agricultural revolution

## 1. Introduction

For centuries, agriculture in Kashmir remained entrenched in subsistence farming and primitive techniques, resulting in consistently low yields. Despite the overarching focus on food grain production to meet the region's demand, persistent deficits prevailed, leading to frequent episodes of starvation and famines in various areas. The historical record on agricultural output in Kashmir, including yield rates and productivity, lacks certainty. However, it is undeniable that until the mid - 20th century, traditional farming methods dominated the agricultural landscape, contributing to recurrent food shortages even during periods of political stability and normal climatic conditions.

As of 1947, Kashmir's agricultural practices were predominantly traditional, characterized by subsistence farming, and peasants had limited awareness of scientific cultivation methods. The use of chemical fertilizers was minimal, and the widespread reliance on inferior quality seeds persisted. This technological backwardness of Kashmir agriculture had a lot to do with the 'relations of production' existing in the valley. In fact, as ... argues 'the technological progress is considerably influenced by the motivation which a particular set of 'relations of production' provide for investment<sup>1</sup>. The incentive for investment in technology, *ceteris paribus*, is greater in a system where the class which appropriates the economic surplus pays the direct producers a fixed quantum than in a system which provides sharing of gross produce in a certain fixed proportion<sup>2</sup>. Therefore, in Kashmir where the mode of appropriation was based on the sharing of the gross produce in fixed proportion, it is not astonishing to see that there was almost no initiative from the peasantry and landlord towards investment in technology. Thus the technological

bottlenecks notwithstanding, the agriculture was backward because of the institutional depressants. The peasant happened to cultivate with traditional seeds and outdated techniques and had to bear the heavy burden of taxation<sup>3</sup>.

## I. Towards increasing production: Grow More Food Programme and Irrigation

The position of the state's agriculture can be well understood from the fact that despite the cropping pattern of the state was predominately in favour of food crops, it had to import large quantities of food. The import of food in the pre - 1947 days is depicted in the following table:

**Table 1:** Year - wise Import of Food Grains into the State of Jammu and Kashmir

S. No	Food Year	Total Imports of Food Grains [in '000 quintals]
1	1942 - 43	7.46
3	1943 - 44	92.94
5	1945 - 46	78.01
6	1946 - 47	69.42
8	1948 - 49	187.74
9	1949 - 50	260.52

**Source:** State Statistics Digest, J&K, 1965 - 66, p.143,

Immediately after assuming power in 1947, the new government started taking initiatives to release agriculture from the shackles of stagnation. In order to address the pressing problem of feeding its growing population the state adopted certain measures as were likely to assist in the extension of area under cultivation and help in increasing the productivity of the presently cultivated land. The "grow - more - food" campaign of 1948 was one among such measures which resulted in an increase of nearly 200, 000 mounds (about 7500 quintals) in the annual production of food. This however only marginally improved the situation

<sup>1</sup> Pradhan H Prasad., *Institutional Reforms and Agricultural Growth*, p-3. Social Scientist, Vol.14, No.6 (jun., 1986) pp.3-19

<sup>2</sup> Ibid.

<sup>3</sup> Javeed ul Aziz, *Economic History of Modern Kashmir with Special reference to Agriculture (1947-1989)*, unpublished PhD thesis, Department of History, University of Kashmir,

and self-sufficiency in food grains remained a distant dream. The mightier initiative towards agricultural development came in the form of the radical restructuring of agrarian relations. Besides abolishing the various feudal privileges and securing the position of the tenants the state enacted laws to liquidate landlordism and transfer the land to the actual tiller with a bundle of rights without any compensation to the expropriated landlord<sup>4</sup>. This not only relieved the state from its obligations to a parasitic class but also secured the position of the peasant, thereby, motivating him in making efforts towards the development of agriculture. This radical agrarian restructuring was however not free of political considerations and was guided by the state's interest to stabilize the countryside by defusing its most explosive grievances on account of the skewed agrarian relations. Also the pressure from 'below' regarding the implementation of much hyped *Naya Kashmir Manifesto*<sup>5</sup> was also gaining momentum and the state was extremely concerned about galvanizing public support to win the plebiscite<sup>6</sup>. The success of this radical restructuring of agrarian relations in terms of its political motives can be gauged from the fact that it not only created a huge political constituency in rural Kashmir in favour of the Sheikh Mohammad Abdullah, who was the central figure in the politics of Kashmir and was more inclined towards the accession of Kashmir with India, but it also silenced the possibilities of violence against the dominant rural class, thereby contributing to the stability of the countryside. Here it is important to mention that whatsoever it's political underpinnings this institutional reform proved a key instrument of the agricultural transformation characterised by redistribution of land followed by investments in agriculture by the empowered peasantry leading to vibrancy in the agricultural sector.

However, in spite of all these steps the agricultural production in the state could not be improved much and the dependence of state on food imports continued. To redress the problem the state embarked upon the programme of complementing the institutional reforms<sup>7</sup> with technological developments. Accordingly the state made efforts to supply of improved seeds and fertilizers to the farmers, sulphate of ammonia were distributed on subsidised and deferred payments and also as free gifts. The distribution is given as under:

**Table 2:** Distribution of Fertilizers in Jammu and Kashmir between 1954 and 1956

Year	On subsidies & deferred payments	Free gifts
1954 - 55	12900	8000
1955 - 56	44,000	24,000
1956 - 57	29,331	29,000

Source - Administration Report, J&K 1953 - 54

However, on the technological front the most significant contribution of the state during the first three plan period was the development of irrigation infrastructure,<sup>8</sup> which not only helped in expanding agriculture to the hitherto uncultivated lands but also proved as an edifice for the new agricultural technology adopted in late 1960's. However, despite being the priority of the state in terms of fund allocations the increase in the net area under irrigation over the years had not been impressive. Between 1950 - 52 and 1971 - 72 there was only an increase of 15.7% in the net irrigated area whereas the all India increase during the same period was about 53%<sup>9</sup>. It may not be out of place to mention that together with its explicit goal of revitalizing the agriculture, the development of irrigation infrastructure was also underlined by the political interest of creating support base in areas which lagging behind in economically on account of the absence of adequate infrastructure to harness its potential<sup>10</sup>. The prioritizing of areas for irrigation development was therefore politically motivated. However, there is no denying the fact that the increase in food production in Kashmir prior to the adoption of new technological innovations was largely the result of the investments in irrigation.<sup>11</sup>

#### **Towards increasing the productivity: Use of Modern Technologies**

In the late 1960's even after the introduction of agrarian reforms of a very radical nature and huge investments in irrigation pushing agriculture almost to its physical limits the production and productivity problems of Kashmir agriculture could not be eradicated altogether and the state's dependence on food imports increased instead. The government realised that mere development of irrigation

<sup>4</sup> Big Landed Estates Abolition Act, 1950. See; Javeed ul Aziz, Economic History of Modern Kashmir with Special reference to Agriculture (1947-1989), unpublished PhD thesis, Department of History, University of Kashmir,

<sup>5</sup> Ibid.

<sup>6</sup> Pradhan H Prasad., *Institutional Reforms and Agricultural Growth*, p-3. Social Scientist, Vol.14, No.6 (jun., 1986) pp.3-19

<sup>7</sup> It was thought that such changes would secure the position of the peasant, increase private investment in cultivation and would thus help in increasing agricultural production. Therefore, the main thrust was on legislation regarding agricultural property and social relations in the countryside. For more details, see the chapter on Agrarian reforms in unpublished Ph. D thesis "Economic History of Modern Kashmir with Special Reference to Kashmir 1947-1989.

<sup>8</sup> Irrigation had been one of the main pre-occupations of the state since antiquity. The inclined terrain of the valley provides tremendous potential for terrace irrigation and it is therefore not surprising to see that a broad network of private canals had evolved in Kashmir. One comes across a number of references of canal construction in Rajtarangani, which otherwise is barely a political narrative [see Waheed] However, the phenomenal development in canal building occurred during the reign of Zain-ul-abidin (1420-1470 A.D). According to Jonaraja, the court chronicler of Zain-ul-abidin, "there was not a piece of land, and not a forest, where the king did not excavate a canal." [Rajtarangani of Jonaraja, translated by J. C. Dutt, p.140] Under the rule of the Mughals, Afghans, Sikhs, there was almost no progress in the development of irrigation infrastructure in the state. Irrigation remained a neglected economic activity during the early Dogra rule but received attention of the state during the reign of Maharaja Pratap Singh who established a separate Department of Irrigation in 1923.

<sup>9</sup> Government of Jammu and Kashmir, Development Committee Report, 1975. P 6

<sup>10</sup> Oral History interview with Gh. Mohammad Wani, Anantnag, Kashmir

<sup>11</sup> Government of Jammu and Kashmir, Land Commission Report of Kashmir, 1968, p. 10

infrastructure would not suffice for making the state self sufficient in food production and, therefore, from the early 1960s started searching for the potentialities of intensive agriculture and the possibilities of harnessing them. It was widely accepted by the government and the experts that in order to increase agricultural production, the productivity of the land has to be increased. The further motivations/pressures for the shift to technological changes came from the fact that even those countries which had carried out more far - reaching land reforms also had to follow the path of making modern technological improvements in agriculture to keep up their growth rates –Japan took the lead in this direction and China followed suit even after successfully experimenting with structural changes and mobilization of a growing labour force for capital formation. Nevertheless, the shift towards intensive cultivation became even more necessary in light of the fact that cultivation was already extended to marginal lands and further extension was not possible. The *Techno - Economic Survey Report*, 1969 concluded;

“ . . . . . in order to sustain itself the farming community has already extended cultivation of food grains to marginal lands so that further extension is not possible. ”<sup>12</sup>

Subsequently greater emphasis was laid upon the use of modern methods of production<sup>13</sup> and it was realised that the transformation of traditional agriculture was possible only through the strong injection of modern technology and the use scientific techniques on a massive scale. Moreover, ‘by the mid - 1960s, the institutional change via land reforms had failed to transform agriculture due to the oligarchy’s manipulation of change to benefit themselves.’<sup>14</sup> Therefore, the ‘New Agricultural Strategy’ which aimed at rapid and spectacular increase in the food grain production was adopted in the state in 1968 - 69.<sup>15</sup> It is important to mention here that the ‘New Agricultural Strategy’, which was the name given to a set of technological innovations – scientifically evolved exotic seed varieties called high yielding varieties - transferred to the under - developed countries from the developed world through the sophisticated mechanism of the institutionalization of research and adopted in India in 1966 - 67, had so rapidly changed the agriculture of India, Pakistan, Turkey and Philippines, that William S. Gaud of the US Department of Agriculture in 1968 used the phrase ‘Green Revolution’ to refer to such changes.<sup>16</sup>

<sup>12</sup> Techno-Economic History, Government of Jammu and Kashmir, 1969, p-164

<sup>13</sup> Government of India, Planning Commission in 4<sup>th</sup> Five Year Plan, 1074, pp. 34-76.

<sup>14</sup> Siddhart Prakesh, Political Economy of Kashmir Since 1947, in *Economic and Political Weekly*, jan.10, 2000. P. 2054. The shift from institutional to technological change in agriculture seems to be guide by similar factors. According to Bipan Chandra, by the late fifties and early sixties the benefits from land reforms had begun to peak and the possibilities of agricultural growth based on extension of agriculture, that is, bringing more area under cultivation, were also reaching their limit. For more details see, Bipan Chandra, *India Since Independence*, Penguin, New Delhi, 2008, p.572.<sup>14</sup>

<sup>15</sup> Gupta

<sup>16</sup> T C Sharma, *Technological Changes in Indian Agriculture: A Regional Perspective*, Sunrise, New Delhi, 2009, P.303

However, in Kashmir the ‘new agricultural strategy’ remained almost confined to the use of high yielding varieties of seeds and fertilizers as the topography of the state in general and that of Kashmir in particular was not conducive for large scale mechanisation of agriculture. Also vitally important to mention is that the task of developing appropriate technology for hilly regions like Kashmir was extremely difficult in comparison to plains because there was a substantial diversity in the micro - environment over a relatively short distance owing to variations of topography, temperature, rainfall, and length of frost periods

Kashmir’s traditional crop varieties have been evolved over several centuries in order to withstand droughts, floods, and the severe cold. Rice was the most extensively cultivated crop of the valley. About ninety varieties of rice were grown in Kashmir the important being *Kunjidanyi*, *Basmat* and *Chogul*. These varieties continued to be used by the peasant, almost unmodified, till the very end of the Dogra rule. Though the importance of distribution of the quality seeds for agricultural production was recognised in India for the first time in the year 1926, through the establishment of the *Royal Agriculture Commission* but sincere efforts towards the development of improved seeds in the state were taken only after the end of the Dogra rule - on systematic basis the seed production programme for improved material of seeds including hybrids started as late as 1963 with the establishment of a ‘National Seed Corporation’. In 1949, under the guidance of the Indian Council of Agricultural Research [ICAR] the government of the state launched the ‘Rice Research Scheme’ primarily with the objectives of<sup>17</sup>: a) to evolve suitable high yielding types of improved quality of paddy by: i) pure line selection among the predominately grown varieties of the valley; ii) introduction of foreign varieties both Indian and exotic; iii) Hybridization and b) to evolve suitable strains of paddy which would do well both in the plains and on hills. The scheme succeeded in acclimatizing some Chinese varieties viz. *China 1039*, *China 988*, *China 1007* and *China 972*, which not only had more outturn per acre than local varieties – their yields per acre were more than highest yielder local variety, the *Begum* - but they were also resistant to diseases and more responsive to nitrogen fertilizers.<sup>18</sup> *China - 1039* was released as the best variety on the ground of its early maturity, suitability for rotation, high yield potential besides being resistant to diseases especially blast *Rai*. The variety became most popular as, besides other characters its sheath was pigmented which resembled one of the best local varieties, *Begum* and locally came to be called as *Begum China*.<sup>19</sup> Research on rice continued with more vigour after the establishment of *Rice Research Station Khudwani [1954 - 56]*. The main focus of the station was to evolve varieties with high yield, response to heavy fertilization, easy threshing character, resistance to diseases and pests with special reference to ‘blast’ besides other desirable plant characters, suitable for the agro - climatic conditions of the state. Around the same time research was initiated on other

<sup>17</sup> Report on the Rice Research Scheme Jammu and Kashmir state 1949-50. State Archives Srinagar, P1-2.

<sup>18</sup> Ibid. p 5-7.

<sup>19</sup> This information is based on a discussion with old peasants of district Pulwama.

agricultural sectors through the establishment of *Maize Research Farm [1952 - 54]*, *Vegetable Research Station Shalimar [1959]*, and *Wheat Research Station R. S. Pora* with a sub - station at Shalimar.

By the end of the Third Plan Period though only 1/5<sup>th</sup> of the area under cereals was covered with improved seeds but paddy and maize registered good progress. In fact the programme remained almost confined to paddy and maize - the china 1039 being quite prevalent in Kashmir in 1960s.<sup>20</sup> However, it is important to mention that during the first three Five Year Plans, 'the state government tried to concentrate efforts on agricultural development on the pattern of schemes followed in the rest of the country'.<sup>21</sup> To tackle the local problems, techniques were borrowed from other parts of India. However, as the physical and climatic conditions of the state of Jammu and Kashmir were vastly different from other states of India, therefore, the borrowed techniques could not provide any long - lasting solution to the local problems.<sup>22</sup> The state agriculture continued to face problems with regard to the use suitable varieties of seeds, fertilizer requirements, pest control, and introduction of new crops. The shift from China - 1039 to local varieties in late 1960's was a result of the same problem. China - 1039 was shedding and matured two or three weeks later than the local variety, hence it was likely to get damaged if winter would set early.<sup>23</sup> Moreover, major part of the requirement of the improved seeds was met through imports from outside the state.<sup>24</sup> It was, therefore, strongly suggested that the state should heavily invest in research to evolve location specific varieties in the state.

The use of high yielding varieties came under more focus after 1966 when the Mexican varieties were used in India and the limitations of the extensive cultivation had become clearly visible.<sup>25</sup> However, as already explained the HYVs adopted in India could not be as such used in the valley owing to certain climatic constraints, therefore, efforts had to be made to modify the varieties and develop suitable strains for the state, which was a research intensive and long drawn process. It is worth to mention that location specific strains were more essential for Kashmir than Jammu as the latter, because of its climatic proximity, could procure Hybrid and High yielding Varieties from other similar regions of the India.<sup>26</sup> Nevertheless, most of the regions of Jammu cultivated wheat for which the Mexican varieties *Lerma Rao* and *Sanora - 64* could comfortably be used. Therefore, for a long period of time Kashmir continued with varieties especially that of rice, which were no match to those under use in the Indian plains especially Punjab.

It was with the development of several high yielding, cold resistant and early maturing strains of rice in late 1970s at the *Rice Research Station Khudwani*, Anantnag that the production of paddy received impetus. The new strains called *K - 78 [Barakat]*, *K - 332*, *K - 333*, *K - 39* were immune to pests and low temperature and helped in extending farming to lands ranging between 1500 meters to 2, 280 meters which had hitherto not been brought under farming<sup>27</sup>.

Notwithstanding that a number of research activities were going on in the state since 1950s but on account of lack of proper coordination between the different schemes and absence of higher direction the research base was weak even in 1970s and the achievements were very meagre.<sup>28</sup> The different research programmes and schemes had become highly individualistic and hence static by content, context and facilities. There was hardly any interdisciplinary interaction or coordination<sup>29</sup>. Regarding the development of agricultural research base in the state of Jammu and Kashmir, the Development Review Committee remarked<sup>30</sup>: 'research work done in the agricultural universities in the country may not be wholly relevant to the state particularly Kashmir valley and Ladakh and some parts of Jammu region which have different agro - climatic characteristics. In this background it is recommended that all the research activities in agriculture and allied sectors should be brought under the umbrella of an institute of Agriculture research and education which should have its out stations in various agro - climatic zones of the state'. It was towards this end that a team of experts from Indian Council of Agricultural Research visited the state and recommended for the establishment of an agricultural university. Consequently, Jammu and Kashmir University of Agricultural Sciences and Technology was established in the year 1982 which was later on renamed as Sheri - Kashmir University of science and technology [SKUAST]. The University used the earlier findings as base material and conducted research on different agricultural issues; however, fresh perspectives were given to generate technologies to address the specific problems peculiar to overall agricultural development of various regions of the state.

It is often argued that the redistribution of land in Kashmir through the radical land reforms of 1950s impeded the use of HYVs, by reducing the size of holdings, and thus retarded the pace of modernization of agriculture. But in light of the fact that the HYVs were neutral to scale -because both the seeds themselves and the resources required to complement them were infinitely divisible across all ranges of output - the argument holds little ground. Not only was the use and impact of HYVs not dependent on the size of the landholding but the new seeds were land augmenting as well - they increased yield per unit of land.<sup>31</sup> Nevertheless, it is a fact that land reforms made the small peasants more receptive to the new technologies because they made the

<sup>20</sup> Techno-Economic survey, p.34.

<sup>21</sup> Ibid.

<sup>22</sup> Ibid.

<sup>23</sup> Ibid.

<sup>24</sup> Ibid.

<sup>25</sup> J.I.K Jalali, *Agriculture in Kashmir, State Archives Srinagar, 1939, p. 56; Kashmir Today, Vol.4, May-June, 1960. No.7. Pp.37-38*

<sup>26</sup> See proceedings of one day seminar Agricultural Renewal in temperate and cold Arid regions of Jammu and Kashmir, Directorate of Agriculture in Kashmir

<sup>27</sup> Times of India, 31 August, 1978.

<sup>28</sup> Dev rev committee

<sup>29</sup> Masoodi. *Agriculture in Jammu and Kashmir: A perspective*, City Books, Srinagar, p-285.

<sup>30</sup> Ibid p-15

<sup>31</sup> Ibid.p216.

peasant the direct beneficiary of the positive changes in agriculture. However, it is pertinent to mention that though the high yielding varieties were neutral to scale, they were not neutral to resources. High yields could only be obtained under certain optimum conditions: optimal irrigation; intensive use of fertilizers; pest control using chemical pesticides<sup>32</sup>.

Towards the diffusion and transference of the HYV to the farming community a number of initiatives were taken by the government which included the extension programmes like *National Demonstration Project* and *Lab to Land Programme*. Through such measures the peasants were made to believe in the economics of the new varieties and were also motivated to adopt the same. Moreover, the zeal to see the state self sufficient in food grains –which the state believed could be achieved by increasing acreage under HYV -, accelerated the efforts of the government to extend the new varieties to the maximum. It is an established fact that all the Five Year Plans upto the 7<sup>th</sup> plan had self sufficiency as a priority item.<sup>33</sup> Therefore, in the succeeding Five Year Plans the area, under high yielding varieties and improved seeds of various cereal crops, was proposed to be raised to increase the production of food. However, in order to make the programme a success it was required to keep the quality seeds available in time and, therefore, initiatives were taken to produce the seeds locally to decrease the dependence of the state on imports.

A perceptible change in HYV area since 1968 - 69 had taken place and area under HYV paddy, maize and wheat recorded an annual compound growth rate of 6.15%, 19.39% and 11.47% respectively for the reference period 1968 - 69 to 1983 - 84<sup>34</sup>. The area under High Yielding Varieties of important food grains in Jammu and Kashmir is shown in the table below:

**Table 3:** Area under High Yielding Varieties of Important Food grains in J and K State [Area in 000 hectares]

Year	Paddy	Maize	Wheat	Total	%, Change over previous year
1968 - 69	114.93	2.43	36.02	153.58	
1970 - 71	108.45	12.14	56.66	177.25	7.88
1971 - 72	109.26	15.38	59.89	184.53	4.11
1972 - 73	139.61	16.19	96.72	252.52	36.84
1974 - 75	165.00	20.00	124.00	309.00	7.29
1975 - 76	180.00	25.00	140.00	345.00	11.65
1977 - 78	200.00	35.00	165.00	400.00	6.95
1978 - 79	250.00	40.00	180.00	425.00	6.25
1979 - 80	199.50	25.20	180.00	404.90	- 4.73
1981 - 82	229.00	44.00	178.00	451.00	- 0.88
1982 - 83	235.00	50.34	188.16	473.72	5.04
1983 - 84	243.85	57.25	175.20	475.30	0.33

**Source:** computed from different issues of Digest of Statistics, Directorate of Economics and Statistics, Department of Planning, Government of J and K.

The table depicts that there was a tremendous increase in the area under HYV between 1968 - 69 and 1983 - 84. However, while as the area under HYV paddy increased from 114.93 thousand hectares in 1968 - 69 to 243.85 thousand hectares in 1983 - 84, the percentage it constituted of the total area under HYV's had decreased from 74.93% in the base year to 51.09% in 1983 - 84. There was an increase in the contribution of wheat and maize to the area under HYV. This trend can be explained on the basis of the fact; that the state of Jammu and Kashmir had dearth of the HYV strains of paddy suitable to the climatic conditions of the valley; that the HYVs used in Punjab could successfully be used in the Jammu region which was predominately wheat cultivating –needless to say that Green Revolution in India in true sense was *wheat revolution*. The marginal increase in the area under HYV in case of maize in comparison to other two major cereals was that maize was mostly cultivated under un - irrigated conditions - though with adequate irrigation it was known to be as responsive to fertilizers as the other two cereals.<sup>35</sup> This was one of the factors which prohibited the state from witnessing the so called green revolution in case of maize. The area under HYVs of principal crops had gone upto 4.50 lakh hectares during 1989 - 90.<sup>36</sup>

## 2. Impact of Technological Interventions

Notwithstanding that the agrarian structure of the state of Jammu and Kashmir on eve of the introduction of new technologies was far less skewed than in the rest of India - land distribution in Kashmir was much favourable as the land reforms in Kashmir were far more radical than elsewhere in India - but nevertheless, the impact of the new technological changes in the state was not as path - breaking as it was in other states of India especially Punjab. A multitude of factors viz. dearth of location specific HYV seeds, low consumption level of fertilizers, lack of awareness of the cultivator regarding the requirements of the new seeds etc were responsible for the slow rate of success of the new technologies. Despite these limitations, however, the new technologies made an impact on the agriculture of the state. Besides other things the cumulative impact of the new technologies - both biochemical and mechanical - on Kashmir agriculture can be analysed on the basis of their impact on production and productivity of food grains<sup>37</sup>, changes in cropping pattern and effects on rural income distribution.

The lack of improvement in the productivity and production of the food crops was primarily because of the inability of the cultivator to simultaneously bring all the land that had been brought under the HYV programme under assured irrigation, which happened to be the pre - requisites for the proper functioning of the new varieties. The percentage of area irrigated to the area sown in 1973 - 74 was only 43.83 which substantiates the above argument. It was for this reason that the development of irrigation infrastructure

<sup>32</sup> Bernard Glasser, *The Green Revolution Revisited: Critiques and Alternative*, 1981, pp.1-2.

<sup>33</sup> See Government of India, 7<sup>th</sup> Five Year Plan, 1990, p.11.

<sup>34</sup> Report of the Committee on Economic Reforms for Jammu and Kashmir, 1998, p. 23

<sup>35</sup> JK file No 312/16, State Archives Srinagar

<sup>36</sup> State Development Report, op. cit., P.63.

<sup>37</sup> The new technologies remained almost confined to certain food grains like wheat, rice and maize.

received fresh attention in the state and large scale projects were taken up.

Here it is important to mention that the increase in production in irrigated belts was not clearly felt because of the low yield per acre in the rain - fed belts. Although the productivity witnessed steady increase, hence increasing the production, but the increase in production of food grains could not keep pace with the population growth rate and the gulf between food grain requirement and production widened. This resulted in the continued dependence of the state on other states for the import of large quantities of food. It is equally important to mention that the conversion of land under cereal crops into non - cereals and the shrinkage of productive areas through rapid urbanization further aggravated the problems thereby making it virtually impossible for the state to achieve the target levels of food production. Furthermore, the new technology had no programme for the agricultural development of those regions which were rain-fed, 40% of the valley falls in the rain - fed zone. Another shortcoming of the new technology in Kashmir was the inability of the state to adopt paddy - wheat rotation due to un - availability of suitable varieties that could be fit in the rotation.

It is widely accepted that the technological changes in agriculture had led to more skewed income distribution in most of the states of India especially Punjab. The green revolution technology, being capital intensive, suited rich farmers much better than small and marginal farmers because the rich farmer alone had adequate resources to afford that technology of production, and that expensive inputs were within the reach of only more affluent farmer; therefore, the latter was better placed to derive its benefits. However, owing to transformation of land relations via land reforms and other institutional changes the income distribution had not been that skewed in the state of Jammu and Kashmir<sup>38</sup>. Although the degrees of acceptability of the new technologies vary from cultivator to cultivator, depending upon the level of exposure, access to other complacent outputs especially fertilizers, and credit facilities but in case of Kashmir, the size/scale neutrality characteristic of the technologies played key role in spreading the technologies to all categories of the farmers - small, marginal and large. Nevertheless, the overall yield - rates as well as productivity per acre were not in any way positively correlated to farm - size<sup>39</sup>. The gains of the new agricultural strategy were found to be size neutral<sup>40</sup>. It was observed that the new technology instead of increasing inequality led to the overall decline of the same among the progressive farmers. The inequality in farm income distribution, if any, was in line with the inequality in farm size distribution.

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<sup>38</sup> Ibid.

<sup>39</sup> Analysis of the material costs (i e, expenditure on seeds, manure and fertilisers, maintenance of bullocks, diesel and electricity, repair and maintenance of implements) has shown that in all the three regions, expenditure on material inputs per acre of cropped area was inversely related to farm-size. This is likely to create an impression that green revolution measures/ inputs have truly benefited the small and marginal farmers more than the rich

<sup>40</sup> Ibid.

Since the technological changes made agriculture capital intensive, therefore, the cultivator was forced to cultivate remunerative crops. More acreage was brought under crops like Apple, saffron, vegetables and lately under black Zeera. It is important to mention that the new technology helped in creating conducive conditions for double cropping but the traditional rotation of crops in which a soil exhaustive crop used to be followed by a soil enriching crop had also been given up.