Agricultural Economics Research Review
Vol. 27 (No.2) July-December 2014 pp 243-257
DOI: 10.5958/0974-0279.2014.00028.7

Imperatives for Sustenance of Agricultural Economy in the Mountains: A Prototype from Jammu & Kashmir[$]

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Abstract

Different facets of agricultural economy of Jammu & Kashmir (J&K) have been investigated in a broader policy perspective to arrive at imperatives for its sustenance. The study has revealed that public investment in agriculture has increased in absolute terms, though its intensity is lower than of the non-agricultural sector in the state. Also, there is a wide demand-supply gap in institutional credit to agriculture which is more pronounced in the cold-arid agro-climatic zone. Though the road network has expanded in the rural areas, a good proportion of villages still remain to be connected to the nearest towns. The electricity consumption in agriculture constitutes only 5 per cent of total electricity consumption in the state. A decline in the number of cooperatives, poor seed replacement rate, wide technological gaps, stagnant irrigation capacities and shifting agricultural land, all of which have long-term implications for agricultural growth, are some of the vital observations made in the study. Moreover, the inefficient /unorganized existing marketing system deprives the farmers of real benefits in most of the marketing channels. The study has concluded that the carrying capacity of available land resources in the state is poor tosustain human and livestock population.

Key words: Agricultural economy, agricultural growth, sustenance, hill agriculture, Jammu & Kashmir

JEL Classification: Q13, Q12

Introduction

Endeavours to jump directly to modernized industrialization, neglecting agriculture in the early stages of economic development, tend to result in failure in economic growth and poverty alleviation (Gulati *et al*., 2005; Rottso and Torvik, 2003). A number of empirical studies have concluded that the multiplier effects of agricultural growth on the economic growth process are usually high (Haggblade *et al*., 1991; Delgado *et al*., 1998; Fan *et al*., 2000; 2002). It is argued that a development strategy ostensibly focused on small/marginal farmers shall generate rapid, equitable and geographically-dispersed growth due to labour-intensive linkage of farming with rural non-farm sector (Johnston and Kilby, 1975). Contrary to this, Indian economy is gradually transforming from agricultural to non-agricultural sector, with its share in gross domestic products rising from 57 per cent in 1980-90 to 72 per cent in 2000-10. However, it was not accompanied by as much rise in the share of employment generation since 1980s, thus calling for rampant growth of agricultural enterprises, generation of human capital and new agri-business/business opportunities in rural India to transfer surplus labour

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§ The paper is based on the work done under major research projects sponsored by UGC (on "Rural credit and its impact on agricultural growth and sustainable livelihood in J&K"), ICSSR (on "Transformation of rural economy in J&K") and HTM (on "Fruit economy linkages and role in employment generation and rural upliftment in J&K").

from primary agriculture. New policies that stimulate structural transformation of agricultural economy to reconcile with the interests of producers and consumers are therefore, most demanding. To this effect an inclusive understanding of different facets of agriculture becomes imperative for producing required deliverables specific to geographical locations.

The geographical attributes of any region determine not only the production system and its performance but the extent of agricultural growth as well, which varies across region sowing to the differences in resource endowments, infrastructure, agro-climatic conditions and policies. Jammu and Kashmir (J&K), a north-western Himalayan agrarian state, claims to have diverse agro-climatic conditions with poor infrastructure for industrial expansion and therefore, the onus to provide income and employment opportunities rests on the agricultural sector. In this backdrop, this study has analysed different pointers of agricultural growth in Jammu & Kashmir to arrive at imperatives required for the sustenance of agricultural economy in the state.

Status of Agricultural Economy and Need for its Sustenance

The state gross domestic product (SGDP) in J&K demonstrated a 5-fold increase from ‘1218 crore to ‘5808 crore during 1980-90 to 2000-10 (Table 1). During 1980-90, the primary sector contributed 43.3 per cent to SGDP, mostly from the agricultural activities. The share of agriculture steadily declined to an average of 28.3 per cent in 2000-2010.The percentage of people employed in agriculture declined rather slowly than its declining share in GDP. On the other hand, the share of non-agricultural sector in SGDP increased drastically, from 56.9 per cent to about 72 per cent, of which the tertiary sector contributed 45 per cent. Looking at the sectoral growth rate, it seems that the economy of state grew in an unbalanced and volatile manner, indicating a peculiar disarticulation between the primary and secondary sectors.

The agricultural productivity (AgGDP/ha) in the state is low, even though it has increased from ₹ 5148/ha (1980-90) to ₹ 14746/ha (2000-10). This coupled with significant growth in the non-agricultural sector led to the increase in per capita income from ₹ 1834 to ₹ 5231 per annum, which helped reduce poverty, which still exists and is concentrated more in the rural areas (Table 2). Therefore, complete eradication of poverty and upliftment of weaker sections of society require development of all economic sectors, particularly agricultural sector in view of its great potential in providing livelihood opportunities.

Institutional Interventions in Agriculture — Encouraging or Discouraging!

Government Schemes for the Development of Agriculture

A number of state and central governments sponsored schemes have been launched from time to time to put agriculture on the trajectory of steady

Table 1. Change in agricultural domestic product at 1980-81 prices

(in crore ₹)

Economic sector	1980-90		1990-2000		2000-10	
	Amount	%	Amount	%	Amount	%
Agriculture including livestock	428	35.1	773	33.2	1341	23.1
Forestry	92	7.6	97	4.2	269	4.6
Fishing	5	0.4	14	0.6	35	0.6
Total agriculture & allied activities	525	43.1	884	37.9	1645	28.3
Mining & logging	2	0.2	4	0.2	8	0.1
Primary sector	528	43.3	888	38.1	1653	28.5
Secondary sector	174	14.3	365	15.7	1532	26.4
Tertiary sector	516	42.4	1077	46.2	2622	45.2
Total non-agricultural activities	692	56.9	1446	62.1	4163	71.7
Total	1218	100.0	2329	100.0	5808	100.0

Source: Compiled by authors using data collected under ICSSR funded project (Baba and Wani, 2012c)

Table 2. Agricultural productivity, per capita income at 1980-81 prices and incidence of poverty, 1980-2010

Period	AGDP (₹/ha)	Per capita income (₹/annum)	Poverty (%)		
			Rural	Urban	Overall
1980-1990	5148	1834	27.80	17.81	25.59
1990-2000	8235	2638	20.65	7.49	17.44
2000-2010	14746	5231	15.24	6.75	12.91

Source: Compiled by authors using data collected under ICSSR funded project (Baba and Wani, 2012c)

growth. Among these schemes, National Watershed Development Project for Rainfed Areas (1990-91) was launched with the major objective of conservation/ sustainable management of natural resources, their use and enhancement/sustenance of agricultural productivity in the fragile rainfed ecosystems. In 2002-03, the state was declared 'Agri-export zone' for apple and walnut.

The Macro Management of Agriculture scheme was implemented successfully with the beginning of 10th Five-Year Plan to increase the production and productivity of cereals by promoting HYVs, improve soil health, seed multiplication, and HRD, etc. The law enforcement wing was formed in 2002-03 to ensure the availability of seeds/planting material of reliable pedigree progeny and to keep vigil over the distribution of sub-standard seeds, insecticides and fertilizers in the state. During 2003-04, National Technology Mission and Technology Mission for Post-harvest Management, Marketing and Exports were implemented primarily for establishment of marketing infrastructure for post-harvest management, marketing/ export and for Integrated Development of Horticulture, including supporting activities such as development of water resources through community tanks, developing quality planting material of high-yielding cultivars, polygreen houses, human resource development, etc.

A central government sponsored Integrated Scheme for Development of Oilseeds, Pulses, Oil Palm and Maize (ISOPOM) was launched in the year 2004-05. Agriculture Technology Management Agency (ATMA) was sponsored by the central government to provide support to the State Extension Programme for extension reforms in the year 2005. Following these, RKVY, a centrally sponsored scheme, is under implementation in J&K with effect from 2009-10. This scheme aims to achieve 4 per cent annual growth in the agriculture sector by ensuring a holistic development of agriculture and allied sectors. The National Mission on Saffron Development was sanctioned by the Ministry of Agriculture, Govt. of India in 2010 for rejuvenation/replanting of the existing saffron area for improving productivity and development of supporting activities. Besides,seed village, vegetable development initiative for urban clusters, mass media support to agricultural information, etc. are few other schemes that are underway in the state. Although most of these schemes have shown a good progress, non- or untimely-availability of funds has restricted their efficient functioning.

Public Investment in Agriculture

The public spending on agriculture has steadily increased from about ₹ 4650 lakh in 1980-90 to ₹ 6151 lakh in 1990-2000 and further to ₹ 9315 lakh in 2000-10 (Table 3). The investment on all the items of agriculture has gone up in absolute terms during 1980-81 to 2009-10 (Baba and Wani, 2012c).The agricultural investment constituted 22.8 per cent of the total state expenditure during the period 1980-90, but this proportion has gone down to just 13 per cent during 2000-10. Contrary to this, there has been 4-fold increase in non-agricultural investment during 1980-81 to 2009-10 and its share in total government spending has gone up to 87 per cent which could be in consonance with the rising income from these sectors.

The government intervention in terms of public agricultural investmentconstituted about 8.3 per cent of agricultural gross domestic product (AGDP) in 1980-81, and about 10 per cent during early-1990s (Table 4). But, subsequently its intensity declined to just 6.8 per cent in 2009-10. On the other hand, the intensity of non-agricultural investment was more than double the intensity of agricultural investment in 2009-10. The

Table 3. Period-wise public investment in agriculture and other sectors at 1980-81 prices

(in lakh ₹)

Particulars	1980-90		1990-2000		2000-10	
	Amount	%	Amount	%	Amount	%
Agriculture & allied sector	1528	7.5	2011	5.3	2845	3.9
Animal husbandry	391	1.9	643	1.7	593	0.8
Forestry	562	2.8	1326	3.5	1431	2.0
Fishery	53	0.3	99	0.3	248	0.3
Major irrigation	871	4.3	800	2.1	1429	2.0
Minor irrigation	763	3.7	779	2.1	1843	2.5
Command area development & flood control	481	2.4	492	1.3	926	1.3
Agriculture	4650	22.8	6151	16.3	9315	12.9
Community development & corporation	182	0.9	507	1.3	4191	5.8
Power	3854	18.9	9304	24.7	12246	16.9
Industries	1245	6.1	2106	5.6	1890	2.6
Road & transport	2170	10.6	3738	9.9	10508	14.5
Social services	6000	29.4	10918	29.0	21074	29.1
Others	2286	11.2	4899	13.0	13125	18.1
Non-agriculture	15737	77.2	31472	83.7	63034	87.1
Total	20387	100.0	37623	100.0	72349	100.0

Source: Compiled by authors using data collected under ICSSR funded project (Baba and Wani, 2012c)

Table 4. Intensity of public investment in agriculture relative to non-agricultural sector

(% of state domestic product)

Year	% age share in GDP of		Investment intensity			Investment
	AGDP	NAGDP	Agriculture	Non-agriculture	Total	(₹/ha)
1980-81	47.0	53.0	8.3	23.1	16.1	421
1990-91	43.2	56.8	9.8	31.5	22.1	543
2000-01	32.9	67.1	7.7	14.5	12.3	906
2009-10	22.5	77.5	6.8	15.4	13.5	1087

Note: AGDP =Agriculture domestic product and NAGDP = Non-agriculture domestic product
Source: Baba and Wani (2012c)

declining intensity has also been observed under different items of agricultural investment towards 1995-2009, which need to be debated to form a well-directed agricultural policy to improve investment intensity in the agricultural sector of the state.

Outstanding Institutional Credit to Agriculture

The banking sector in the state has undergone a phenomenal expansion both horizontally and vertically to advance credit through network of its Scheduled Commercial Banks (SCBs)that include State Bank of India and its Associates (SBI&A), Nationalized Banks (NBs), Regional Rural Banks (RRBs) and others (that include private sector banks, especially Jammu & Kashmir Bank). The number of branches of all SCBs has increased from 426 in 1980-81 to 984 in 2010-11 with annual growth rate of 1.64 per cent (Table 5); however, the number of RRBs branches has gone down from 261 to 256 during 2005 to 2010. During 1980s, about 65 per cent of total bank branches were in the rural areas and 24 per cent were in the urban areas.

Table 5. Growth in branches of scheduled commercial banks in Jammu & Kashmir

(No.)

Year	SBI	NB	RRB	Others	Rural	Semi-urban	Urban	All
1980-81	89(20.9)	68(16.0)	66(15.5)	184(43.2)	275(64.6)	47(11.0)	104(24.4)	426(100.0)
1985-86	108(15.4)	116(16.6)	229(32.7)	247(35.3)	491(71.4)	62(9.0)	134(19.6)	700(100.0)
1990-91	116(15.1)	133(17.3)	259(33.7)	261(33.9)	554(72.3)	67(8.7)	145(18.9)	769(100.0)
1995-96	122(15.1)	135(16.7)	271(33.6)	277(34.4)	573(71.3)	76(9.4)	155(19.3)	806(100.0)
2000-01	122(14.9)	138(16.8)	265(32.3)	296(36.0)	580(69.5)	83(10.0)	171(20.5)	821(100.0)
2005-06	121(14.0)	144(16.6)	261(30.2)	339(39.2)	567(64.1)	114(12.9)	204(23.1)	865(100.0)
2010-11	141(14.3)	167(17.0)	256(26.0)	420(42.7)	550(53.0)	207(19.9)	281(27.1)	984(100.0)
CGR (%)	0.95*	1.74*	1.93*	1.91*	1.19*	3.90*	2.49*	1.64*
Standard error	0.09	0.22	0.52	0.10	0.27	0.34	0.14	0.19

Note: Figures within the parentheses indicate percentage of all bank offices; *indicates significance at 05 per cent or better level, SBI= State Bank of India and associates, NB = Nationalized Bank, and RRB = Regional Rural Bank

Source: Baba *et al*. (2012b)

The number of rural bank branches has declined since 2000-01, while the number of semi-urban and urban branches has shown a consistent increase over the years. The decline in branches in rural banks, especially RRBs needs to be arrested in view of their establishment with the prime objective of enhancing reach to farming community.

The total credit advanced to the agricultural sector in J&K constitutes about 11 per cent of the total credit outstanding during 1980-90through SCBs (Table 6). The credit outstanding in agriculture had increased gradually up to 2000-01, but owing to the banking reforms of early-2000s, a spurt was witnessed after 2004 and there was a three-fold increase from 2005-06 to 2009-10 (Baba *et al*., 2012b). Though in absolute terms the agricultural credit outstanding has increased five-fold since 1980s, its percentage share in total credit outstanding has gone down from 10.7 per cent to 5.10 per cent. This declining proportion of credit outstanding to the agricultural sector needs to be reversed considering the emergence of small/marginal farm categories and increasing prices of inputs.

The institutional credit to agriculture as percentage of agricultural GDP increased sharply from 2.6 per cent in 1980-81 to 5.8 per cent in 1985-86, witnessed fluctuations during 2005-06 and later increased to 12 per cent of AGDP in 2009-10 (Table 7). The share of direct and indirect agricultural credit from institutional sources in total AGDP also grew between these periods, though the intensity of direct agricultural finance still constituted a higher proportion compared to indirect credit outstanding to agriculture. One striking aspect

Table 6. Average credit outstanding to agricultural sector at 1980-81 prices

(in lakh ₹)

Particulars	1980-90 Amount	1990-2000 Amount	2000-10 Amount	Fold increase in 2000-10 compared to 1980-90
Direct agricultural credit	1989 (10.7)	2861(6.2)	10011(5.1)	5.0
Total agricultural credit	2280 (12.3)	3521(7.7)	11586 (5.9)	5.1
Non-agricultural credit	16310 (87.7)	42268 (92.3)	185019 (94.1)	11.3
Total credit	18590 (100.0)	45789 (100.0)	196605 (100.0)	10.6

Note: Figures within the parentheses indicate percentage of total credit

Source: Compiled by authors on the basis of data collected under UGC funded project (Baba *et al*., 2012b)

Table 7. Intensity of agricultural credit outstanding in Jammu & Kashmir: 1980-2009

(% of gross domestic product)

Year	As % of AGDP		As % of Non-AGDP	As % of GDP
	Direct agricultural credit	Total agricultural credit	Non- agricultural credit	Total credit
1980	2.3	2.6	16.0	9.7
1985	4.8	5.8	24.7	17.0
1990	3.3	4.1	28.1	17.7
1995	3.1	3.3	23.7	16.0
2000	3.1	3.2	27.3	19.4
2005	3.9	4.6	47.7	35.2
2009	10.8	12.1	45.1	37.7

Source: Baba *et al*. (2012b)

of this increase in intensity of credit to agricultural sector was its occurrence at a time when the share of agriculture to state GDP was witnessing a decline, indicating that the magnitude of increase in agricultural credit intensity was lower than observed. On the other hand, as high as 45 per cent of the domestic product generated by the non-agricultural sector went back as credit outstanding to this sector in 2009-10.

Though agricultural credit has increased significantly over the years, it has not reached even half of the estimated financial requirement for raising crops and livestock under the existing pattern in the state. Only 7.6 per cent of the total financial requirements were outstanding through financial institution in the state. This proportion was even lower in the cold-arid zone (2.26%) (Baba *et al*., 2012b). The state government has recently come up with favourable loan schemes for small/marginal farmers which have eased collateral/security issues, but there is a dire need to augment loan to the farmers on the basis of worthiness and land-based possession.

Decline in Number of Agricultural Cooperatives

Table 8 reveals that both absolute numbers and density of cooperatives in the state declined till 2005-06 but the number increased slightly towards 2009-10. The unprecedented decline in the number of cooperatives (Table 8) and the branch offices of PACs (Table 9) needs to be checked and new ones should be established. On the other hand, the number of offices

Table 8. Growth of agricultural cooperatives in Jammu & Kashmir: 1980-81 to 2009-10

Year	No.	Density w.r.t	
		Per lakh population	Per lakh ha net area sown
1980-81	1634	28.14	228.53
1985-86	1726	25.71	235.79
1990-91	1276	16.74	174.56
1995-96	1049	12.00	142.91
2000-01	1011	10.20	135.16
2005-06	1019	9.20	138.83
2009-10	1049	8.69	142.66

Source: Baba and Wani (2012c)

Table 9. Growth of branch offices of cooperatives in Jammu & Kashmir: 1980-2010

(No.)

Year	State cooperative banks	District central cooperative banks	Primary agricultural credit societies
1980	9	62	1536
1985	10	78	1583
1990	10	94	1081
1995	10	103	814
2000	15	113	755
2005	18	124	758
2010	18	125	754
CGR (%)	2.8*(0.3)	2.3*(0.1)	-3.44*(0.2)

Note: Figures within the parentheses indicate standard errors; Source: Baba *et al*., 2012b

of state cooperative banks (SCoBs) and district central cooperative banks (DCCBs) has doubled during the period 1980-2010, though their number was very less. The declining trend in the number of PACs in the state is a matter of concern because these societies link the apex cooperative institutions to the rural masses and thus need improvement in their number.

Poor Replacement of Traditional Inputs and Weak Extension Service Delivery

Despite consistent efforts, J&K is yet to achieve the desired level of seed replacement rate (SRR) of high-yielding varieties of major crops (33% for self-pollinated crops, 50% for cross-pollinated crops, and 100% for hybrids at the national level). Except for *kharif*-pulses and *rabi*-oilseeds, the SRR has been found lower compared to desirable SRR (25%) in all crops grown in both the seasons (Table 10). This shortfall could be attributed to the limited availability of breeder and foundation seeds (DE&S, 2012).

Table 10. Crop-wise seed replacement rate (SRR) in Jammu & Kashmir: 2011-12

(in per cent)

Crop	*Kharif*	*Rabi*
Maize	18.15	-
Paddy	22.40	-
Oilseed	7.34	41.87
Wheat	-	26.05
Pulses	42.89	9.21
Fodder	15.18	26.89

Source: DE&S (2012)

In mountains, the advent of innovations is slow and dissemination of the available ones is poor. It was observed that the field level demonstrations for dissemination of maize composites (viz., C_6, C_{14} & C_8) were still underway despite the fact that these varieties were released during early-1990s. Apart from political condition during early-1990s, inefficient extension activities are the major cause for the poor dissemination. The NSSO (2005) data has revealed that only 6 per cent farmers get information regarding agriculture from extension workers in India, and this calls for streamlining and strengthening of extension services delivery in the state.

Shrinking/Stagnant Resource Base

Shifting Cultivated Land

The growing population in the state of J&K has necessitated analysis of land-use dynamics. Of the total state area of 2416 thousand hectares, only 31 per cent is available for cultivation and the rest is either under forests or other land-use classes (Table 11). The percentage changes and estimates of growth rate have revealed that the total reported area in the state has remained stagnant. The area under forest has decreased at the annual compound growth rate of about -0.02 per cent, from 661 thousand hectares in 1980-90 to 658 thousand hectares in 2000-10. These trends are likely to cause severe ecological imbalances, including adverse agro-climatic changes and acute shortages in meeting the rising demand of fuel, fodder and timber in the state.

The area under permanent pastures and other grazing lands has shown an increase of about 2000 hectares (Table 11). The fallow land and culturable wasteland have registered a decline of over 8000 ha and 4000 ha, respectively during 1980-90 to 2000-10. The decline in these land-use classes is in consonance with the increase in the area under cultivation and barren & unculturable land. The soil-water conservation and other reclamation measures need to be implemented seriously to bring this class of degraded land under plough. The net sown area has shown an increase of about 18 thousand hectares between 1980-90 and 2000-10; though it has declined to 735 thousand hectares in 2009-10, which is less than its average figure of 2000-10. The paralytic trend in net sown area should be arrested owing to increasing food demand for the increasing population. This problem is aggravated further with fragmentations of holdings. The average holding size in the state has declined from 2.97 ha (1972) to a meagre size of 0.66 ha by 2001and it is even less (0.48 ha) in the Kashmir province. The decrease in holding size not only prevents capital formation but also affects production of food commodities emphasizing the need of a check on further fragmentation of holdings when little can be done to consolidate scattered holdings.

Stagnant Irrigation Capacities

The proportion of cultivated area irrigated in the state has remained almost stagnant at 42 per cent of

Table 11. Growth pattern of land-use class in Jammu & Kashmir: 1980-2010

Land-use class	Average ('000 ha)			Change,	1980-2009	
	1980-90	1990-2000	2000-10	%	CGR (%)	Standard error
Area according to village papers	2415	2416	2416	0.03	0.00	0.00
Area under forest	661	658	658	-0.47	-0.02*	0.01
Area not available for cultivation						
Land put to non-agricultural uses	309	291	293	-5.28	-0.25*	0.05
Barren and uncultivable land	266	292	288	8.20	0.39*	0.09
Total	575	583	582	1.27	0.07*	0.02
Other uncultivated land						
Pastures & grazing land	124	126	126	1.21	0.06*	0.03
Land under misc trees crops	82	72	70	-14.93	-0.87*	0.15
Culturable wasteland	148	140	144	-2.50	-0.08	0.08
Total	354	338	341	-3.81	-0.19*	0.05
Fallow land						
Permanent fallow	8	7	16	111.84	3.57*	0.59
Current fallow	94	97	78	-17.50	-0.90*	0.22
Total	102	104	94	-7.85	-0.30	0.17
Net area sown	723	733	741	2.46	0.10*	0.02

Note: *Denote significance at 05 or better level of probability
Source: Compiled by authors (Baba *et al*., 2012c)

Table 12. Irrigation capacities in Jammu & Kashmir: 1980-81 to 2009-10

(in per cent)

Year	Canal	Tank	Well	Others	Total*	% NSA	GIA (lakh ha)	GIA as % of TCA
1980-81	93.75	0.66	1.32	4.28	304	42.52	3.9	40.3
1985-86	93.24	0.86	1.33	4.56	310	42.30	4.2	40.9
1990-91	93.45	0.66	0.45	5.43	298	40.78	4.4	40.9
1995-96	92.92	0.84	0.46	5.78	307	41.77	4.4	41.0
2000-01	91.40	0.87	0.49	7.23	311	41.56	4.5	40.3
2005-06	92.69	1.35	0.34	5.63	312	41.56	4.6	41.6
2009-10	90.17	1.61	1.36	6.31	317	43.15	4.8	41.9

Note: * Area in '000 ha; NSA = Net sown area; GIA = Gross irrigated area; TCA = Total cropped area
Source: Baba and Wani (2012c)

net area sown in J&K. The canal irrigation constitutes over 90 per cent of net irrigated area though its proportion has shown a little decline over the years (Table 12). Tanks and other sources of irrigation are gradually gaining importance and could be more prominent under climate change regime. Although, the state has abundant surface water in the form of perennial rivers, the irrigation network does not have the desirable spread, which unveils the potential of improving crop productivity.

Rural Infrastructure

The importance of good infrastructure for agricultural development is widely recognized and government spending on rural infrastructure has significant impact on agricultural growth and rural

Table 13. Development of road network in Jammu & Kashmir: 1980-81 to 2009-10

Year	Total road length (km)	% of total road length		Density*		
		Surfaced	Unsurfaced	Surfaced	Unsurfaced	Total
1980-81	8206	68.54	31.46	23.28	10.69	33.97
1990-91	11838	79.23	20.77	38.82	10.18	49.00
2000-01	13660	82.98	17.02	46.92	9.62	56.54
2009-10	20016	84.18	15.82	65.55	13.19	82.85

Source: Baba and Wani (2012c)

Table 14. Village electrification in Jammu & Kashmir: 1980-81 to 2009-10

Year	Village electrification (%)	Electricity consumed (kWh/ha of TCA)	Pumpsets engergized (No./1000 ha of TCA)
1980-81	55.42	23.92 (5.54)	1.4
1985-85	82.58	40.39 (5.42)	2.0
1990-91	93.24	124.73 (10.13)	3.8
1995-96	95.34	262.14 (17.15)	6.5
2000-01	95.83	113.46 (4.77)	11.6
2005-06	95.86	115.90 (3.29)	11.9
2009-10	96.48	178.05 (5.01)	17.9

Note: Figures within the parentheses indicate consumption of electricity in agriculture as per cent of total consumption
TCA = Total cropped area
Source: Baba and Wani (2012c)

poverty alleviation (Fan *et al*., 2000; Baba *et al*., 2010a; 2010b). The growth performance of important infrastructure is discussed below to draw some meaningful conclusions.

Road Network

The growth pattern of road network and road density in J&K, presented in the Table 13, revealed that the total road length has increased by about 12000 km since 1980-81. The surfaced (quality) roads have shown a rapid expansion during this period. Increasing road density is a positive sign of economic development in the state. The development of roads across the districts/regions and inaccessible areas to exploit niches in the areas, could help improve the economy of the area/region.

Electricity

In J&K, only 55 per cent villages were electrified till 1980-81, and up to early-2000s electricity supply was extended to 97 per cent villages at the annual growth rate of over 1.20 per cent. However, the duration of electricity supply in the state is a matter of concern. The consumption of electricity for agricultural purposes in the state has increased significantly over the years, reaching 178 kWh/ha of TCA in 2009-10 (Table 14). However, electricity consumption in agriculture as proportion of total electricity consumption is almost stagnant at 5 per cent. Although the number of pump sets energized has increased, still only 18 energized pump sets are available for irrigating one thousand hectares of total cropped area.

Shifting Cropping Pattern and Stagnant Productivity

The total cropped area in the state has gone up by 172 thousand hectares since 1980-81, from 973 thousand ha in 1980-81 to 1145 thousand ha in 2009-10 (Table 15). Within foodgrains, area under rice has shown a decline of about 4.2 thousand ha, while area under bajra, maize, and wheat has increased, may be in consonance with the changing dietary pattern. Area under pulses has declined from 49 thousand ha to just 30 thousand ha. The cropping pattern was seen shifting towards high-value horticultural crops like vegetables and fruits and accordingly their area has increased by 38 thousand ha. The area allocated under non-food crops has also risen since 1980-81, and this increase accrued owing to more area allocation to fodder and oilseeds up to early-2000s. However, oilseed area has shown a decline in the recent decade.

Over the years, the productivity of major crops, viz. rice and maize, has remained almost stagnant, of

Table 15. Average area under different crops in Jammu & Kashmir: 1980-81 to 2009-10

('000ha)

Crop(s)	1980-81	1990-91	2000-01	2009-10	Change,% (1980-81 to 2009-10)
Rice	264	274	244	260	-4.2
Bajra	15	16	13	17	2.4
Maize	275	295	330	311	36.0
Wheat	202	245	281	289	87.0
Barely	12	8	9	14	2.3
Jower/Millets	19	14	15	4	-14.9
Pulses	49	41	27	30	-18.3
Condiments & spices	2	1	2	2	0.5
Fruits & vegetables	51	60	67	89	38.2
Sugar + other food crops	1	1	3	6	4.7
Oilseeds	53	68	74	65	12.5
Fibre	2	1	0	0	-1.4
Dyes & tanning material	0.2	4	3	3	2.5
Drugs, narcotics & plantation crops	1	0	0	0	-0.8
Fodder crops	25	38	44	52	27.5
Other non-food crops	3	0	2	0	-2.5
Total non-food crops	83	111	123	121	37.8
Total cropped area	973	1067	1115	1145	171.4
Net area sown	715	731	748	735	20.0
Cropping intensity (%)	136	146	149	156	19.6

Source: Baba and Wani (2012c)

pulses has declined sharply (Baba and Wani, 2012c), and of wheat and other cereals and millets (OC&M) has exhibited an increasing trend. The concerns of productivity improvement of major foodgrain crops demand immediate attention of R&D institutions and other concerned agencies.

Adoption of Innovations and Technological Gaps

Figures documented in Table 16 reveal that fertilizer consumption in J&K has gradually increased and reached 113.19 thousand tonnes during 2009-10 with consumption as high as 99 kg/ha. The adoption of HYVs of major cereals in state has risen to the extent of over 76 per cent by 2009-10. The poor SRR in the state has been one of the causes of lower adoption of HYVs. Further, the absolute numbers and density of tractors/power tillers were increasing at an alarming rate. Innovations in the form of region-specific machines could perform better under the hilly terrains of the state and irrigation capacities in the state also need to be augmented.

The micro studies have revealed poor percolation of package of scientific practices of various crops in different agro-climatic regimes in the state. Generally, more seeds are used in principal crops and there is less application of FYM and fertilizers when compared with scientific recommendations (Table 17). These gaps vis-a-vis potential yield level lead to lower crop productivity. On the other hand, pesticides are applied on apple significantly above the prescribed level. Farmers were found applying 70 per cent more dormant sprays, 20 per cent more fungicides and 48 per cent more acaricides/insecticides than the recommended levels (Baba *et al*., 2012a). These may have multiple and serious implications towards biodiversity and human health.

Table 16. Technology adoption in Jammu & Kashmir: 1980-81-2009-10

Year	Fertilizer consumption		HYVs adoption		Tractor/power tillers	
	'000 tonnes	kg/ha of TCA	Area ('000 ha)	% of TCA	No.	Density (No./NSA)
1980-81	20.70	21.25	432	44.36	1508	2.11
1985-86	36.10	35.05	526	51.07	2330	3.18
1990-91	42.59	39.94	658	61.71	3458	4.73
1995-96	51.01	47.55	468	43.63	5295	7.21
2000-01	62.71	56.25	775	69.47	8366	11.18
2005-06	93.90	85.29	833	75.64	12818	17.46
2009-10	113.19	98.89	844	76.34	18026	24.51

Source: Baba and Wani (2012c)

Table 17. Average technological gaps in principal crops in different agro-climatic zones

(in per cent)

Zone	Crop	Seed	FYM	Fertilizers
Intermediate zone (IMZ)	Maize, paddy, legumes	27.98	-27.26	-57.35
Sub-tropical zone (SBTZ)	Rice, wheat	38.05	-52.63	-39.07
Cold-arid zone (CAZ)	Wheat	45.33	-33.90	-64.74
Temperate zone (TMZ)	Maize, paddy, legumes	53.84	-33.19	-54.14

Source: Authors' calculations (Baba *et al*., 2012b)

Table 18. Technological gaps in fruits in different fruit farming systems in Jammu & Kashmir

(in per cent)

Items	Apple	Almond	Walnut	Cherry	Pear	Apricot
Urea	139.0	133.82	-48.96	24.13	62.0	-100.0
DAP	191.0	153.28	-100	-9.63	-12.5	-100.0
MOP	-59.0	-82.96	-97.55	-97.51	-73.0	-100.0
FYM	-77.69	-62.33	-44.97	-75.54	-41.0	-70.57

Source: Baba *et al*. (2012a)

The farmers in cold-arid Ladakh apply only FYM available from their livestock and restrain from applying any chemical fertilizer on apricot (Table 18), thus can claim organic status for this crop. In other fruit farming systems, except walnut, farmers use more urea than recommendations. Similarly, technological gap was more pronounced in DAP and MOP. The application of FYM was found far less than the scientific recommendations. The technological gaps in principal crops under different agro-climatic regimes could be one of the important reasons for lower/ stagnant productivity levels. It demands attention of R&D institutions, particularly of extension agencies to educate the stakeholders on this aspect for productivity gains.

With regard to livestock, crossbreeding of indigenous stock with exotic animals is a well-known strategy for improving the productivity of indigenous stock mainly of cattle, sheep and pigs (Kumar and Singh, 2008). In cattle, crossbreds comprised 48.72 per cent in 2007, as against only 25.94 per cent in 1992 (Table 19). During this period, the proportion of cross-bred sheep has increased from 40.59 to 59.43 per cent. The adoption of cross-bred animals has reached around 50 per cent, implying a vast untapped potential in improving output from the livestock sector in the state.

Table 19. Adoption of cross/exotic technology in Jammu & Kashmir

(in per cent)

Particulars	Census	
	1992	2007
Cattle		
Cross/exotic	25.94	48.72
Indigeneous	74.06	51.28
Sheep		
Cross/exotic	40.59	59.43
Indigeneous	59.41	40.57

Source: Authors' calculations based on livestock census data

Marketing System

Numerous Marketing Channels and Market Losses

The marketing system in the state is neitherregulated nor efficient. Contractors play an important role by maintaining temporary/permanent relationships with producers and other forwarding functionaries. However, important marketing channels are longer, wherein net price received by farmers are lower and market losses are higher in both vegetables (Baba *et al*., 2010c) and fruits (Baba *et al*., 2012a). The pooling of surplus and marketing through cooperatives would have been a better proposition to protect the interest of growers but the poor performance or decline of cooperatives has paved the way for distress sales. The resource-poor farmers have to depend largely on different intermediaries for marketing of their produce.

About 80 per cent of the total fresh fruit production in J&K is exported through unorganized marketing system to the markets outside the state. However, supplies are made in discrimination to the demands that often form glut in terminal markets resulting in losses and lower prices to the produce. Accordingly, the number of fruit boxes exported to other states of the country has increased significantly yet the average price in different markets has remained almost stagnant (Figure 1). On the other hand, the storage capacities for fruits have been found meagre. There are only 19 storage units in the state under private (15), cooperative (03) and public (01) domain. These units can house only 43 thousand tonnes of fruits (2.1% of total fresh fruit production in 2010-11). This scenario necessitates encouragement of private storage/warehouses around each production centre for a better post-harvest management and higher price to the producers.

Price Competitiveness in Global Markets and Poor Value-addition

The exportable commodities of the state are apple, walnut and saffron. The walnut and saffron exported from India are exclusively from J&K, while a part of exportable apple comes from Himachal Pradesh also. An increasing demand has been observed for value-added products of apple and walnut in the global markets (Baba *et al*., 2012a), but in value terms, the export of value-added products from India constituted only 1.44 per cent of total apple export in the world (www.fao.org). Indian apples and walnuts and their value-added products are available at a lower unit price compared to from other nations of the world (Baba *et al*., 2012a), signifying a 'margin' which can be invested on quality improvement of the product for a better price in the global markets. Under AEZ, few private

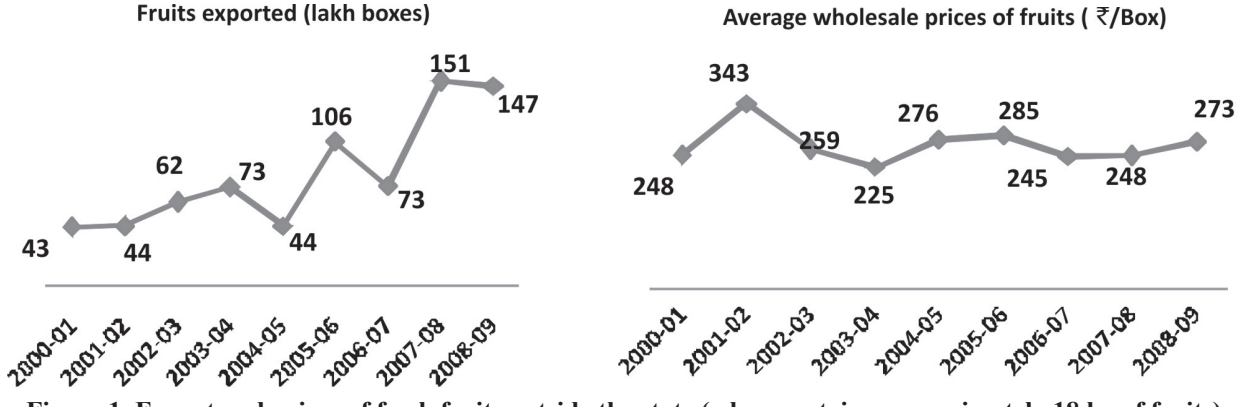

Figure 1. Export and prices of fresh fruits outside the state (a box contains approximately 18 kg of fruits)

enterprises have ventured in value addition of fruits and vegetables, but still a major proportion of surplus is sold as fresh. Encouragement of value addition at farm and upper levels withproduct development conforming global quality standards would enhance export trade in horticultural commodities, especially apple and walnut.

Sustaining Capacity of Land Resources

On comparing the total requirement of different food commodities, (as per recommendations of ICMR) with state production, it was found that the state was surplus in commodities like fruits, milk and vegetables and was deficit in cereals, pulses, meat, and eggs (Figure 2). Accordingly people depend on public distribution system (PDS) supply and private traders for their requirement of food commodities. It was projected that an additional quantity of 4.1 lakh tonnes of cereals & millets would be required by 2020 and 11.4 lakh tonnes by 2040 to feed the population of the state. By 2040, the additional requirement of 13421 lakh eggs, 0.7 lakh tonnes meat and 7.1 lakh tonnes milk has been projected for the state (Baba and Wani, 2012c). To meet this requirement, the state is poised for a greater technological transformation in agriculture. The production capacities will have to be employed more efficiently because there is little scope for bringing more area under cultivation.

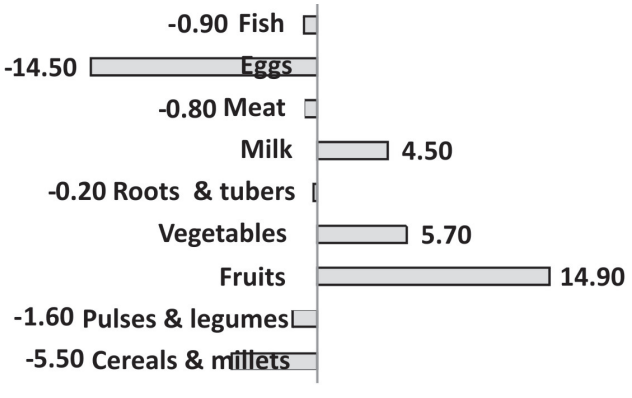

Figure 2. Food production and supply-demand gap in Jammu & Kashmir (in lakh Mt)

The carrying capacity of common property resources (CPRs) (including forest, pasture/grazing lands, barren & uncultivated land) to provide suitable production environment for livestock was analyzed. The available CPRs have carrying capacity of sustaining around 80 per cent of the existing livestock population (Baba *et al*., 2011).

Conclusions and Emerging Imperatives

Different facets of agricultural growth have been studied to explore the possibilities of sustaining its economy in the state of Jammu & Kashmir. Although there has been many-fold increase in public investment and institutional credit outstanding to the agricultural sector, their intensity is much lower compared to the non-agricultural sector in the state. The study has revealed a decline in the number of agricultural cooperatives. The land-use analysis has indicated that the proportion of irrigated area has remained almost stagnant at 42 per cent of net area sown. Although road network has been expanded across the state, many rural areas and production centres are yet to be connected. The electricity consumption in agriculture as proportion of its total consumption has been found to be only 5 per cent. There has been either stagnation or declining behaviour in the productivity of major crops owing to poor adoption rate or poor SRR. The marketing system in the state is not only unregulated but also less efficient. Marketable surpluses are pushed up to the consumers through channels in which net price received by the farmers are far lower and market losses are higher. To sum-up, the land resources including common property resources (CPRs) with the existing capacities fall short of sustaining human and livestock population. Based on findings of the study, following imperatives have emerged for the sustenance of agricultural economy of the state:

- The intensity of public agricultural investment, particularly in location-specific R&D and micro-irrigation needs to be enhanced. Maximum investment should be made in the areas/regions and sub-sector of agriculture where it is much needed on the basis of marginal impact.
- Technological gaps in different agro-climatic regimes, should be bridged through increase in seed replacement rates to the desired level (25%).The coordination of different institutions involved in dissemination of technologies is imperative.
- There is a need to exploit niches in agro-ecosystems for regional specialization of production centres in commodities based upon comparative advantage.

- Establishment of focal points with provisions of all possible infrastructures/facilities for soil/ pesticide testing, value addition, scientific packaging, quality control, etc. around the production centres is inevitable for agricultural growth.
- Strengthening of market intelligence for ensuring delivery of agricultural produce at the place of its demand with effective integration of domestic markets and diffusion of price signals is urgently required.
- There is a need to improve credibility of data through consensus on common methodological themes and public-private partnership to have better pay-off.
- Proper land-use surveys and use of GIS/RS tools may be ensured to bring more geographical area under plough to help rehabilitation of growing population with proper urban planning.
- Development of CPRs and linkages between livestock and cultivated areacould be instrumental in fulfilling the increasing demand for livestock products and reducing the undesired implications on ecology.
- The essential rural infrastructure should be created uniformly across the state.
- The cooperative societies should be revitalized by inculcating more professionalism and skilled management.

Acknowledgements

The financial assistance extended by UGC, ICSSR, and HTM for conducting this research work is thankfully acknowledged. Authors are highly grateful to the anonymous referee(s), for valuable comments.

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Received: May, 2014; Accepted August, 2014