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Changing Pattern of Economic Activities in Agricultural Sector and Role of Government Expenditure in India

Dipak Kumar Mondal and Sankar Majumder*

ABSTRACT

This paper is a modest attempt to understand the impacts of changes of government expenditure on the economic activities in agricultural sub-sectors across the states over the period 1993-94 to 2011-12. The agricultural sector has been divided into four sub-sectors, viz. crop, livestock, fisheries and forestry. Economic activities have been considered in terms of value of output and employment in these four sub-sectors. Two types of employment-Usual Principal Status and Usual Subsidiary Status employment have been considered. The share of government expenditure on fisheries sub-sector is positively related with value of output and Usual Principal Status employment. Change in government on research and education in crop sub-sector has a positive impact on value of output of crop sub-sector. Government expenditure has a positive impact on diversification of economic activities within the agricultural sub-sectors.

Keywords: Government expenditure, Expenditure on research and education, value of output, employment, diversification

JEL: H53, Q11, Q22, Q23.

I

INTRODUCTION

Government expenditure in the agricultural sector is an important determinant of agricultural development and changes in the activity-composition of the agricultural sector. Changes in the allocation pattern of government expenditures for different agricultural sub-sectors are expected to amend the development and growth of different sub-sectors within the agricultural sector. Crop production is the main economic activity contributing to livelihoods in rural areas. Presently contributions to gross domestic product (GDP) of activities in the livestock, fisheries and forestry sectors, etc. are also increasing. However, all these activities are mainly subsidiary occupations of the rural families. With the passage of time and application of science and technology in these activities, it is expected that farmers may adopt these activities as their main occupations. Growth of fish farms, poultry farms, etc. as well as growth of farm-forestry activities are indicators in this regard. This paper is an attempt (i) to understand the changing pattern of economic activities in the agricultural sector and how these activities are influenced by changes in government expenditure in the agricultural sector and (ii) to understand the effects of changes in expenditure on agricultural research and education on changes in the agricultural

*PhD. Research Scholar and Professor of Economics, respectively, Palli Charcha Kendra (Department of Rural Studies), Visva-Bharati, Sriniketan.

activities. Section II presents the methodology used for the study. Section III discusses the data sources while Section IV discusses the pattern of changes in the economic activities under different agricultural sub-sectors. The relationship between changes in government expenditure and changes in economic activities in agricultural sub-sectors are brought out in Section V. The next section discusses the extent of government expenditure on research and education in agricultural sub-sectors. The diversification of economic activities and role of government expenditure in agricultural sectors are outlined in Section VII and the final section presents the summary and study conclusions.

II

METHODOLOGY

This study has considered the economic activities under the following agricultural sub-sectors: (i) Crops, (ii) Livestock, (iii) Forestry and (iv) Fisheries. Economic activities in these agricultural sub-sectors have been discussed in terms of employment generated and value of output produced in the agricultural sub-sectors. Two types of employment have been considered: Usual Principal Status (UPS) and Usual Subsidiary Status (USS). "The activity status on which a person spent relatively long time (i.e., major time criterion) during the 365 days preceding the date of survey is considered as the Usual Principal activity status of the person. A person whose Usual Principal Status was determined on the basis of the major time criterion could have pursued some economic activity for a shorter time throughout the reference year of 365 days preceding the date of survey or for a minor period, which is not less than 30 days, during the reference year. The status in which such economic activity was pursued was the subsidiary economic activity status of that person" (NSSO 66th round Report).

There are two sources of expenditure on agricultural and allied activities: government (public) expenditure and private expenditure. In this study only government expenditure has been considered and both revenue and capital expenditures have been taken. Those expenditures by the government that lead to increase in assets or a reduction in the liability are considered as capital expenditure. On the other hand, those expenditures that do not affect the asset-liability position are revenue expenditure. Both revenue and capital expenditure are incurred under the following 12 major sub-heads in the agricultural sector: (i) Crop Husbandry, (ii) Soil and Water Conservation, (iii) Animal Husbandry, (iv) Dairy Development, (v) Fisheries, (vi) Forestry and Wild Life, (vii) Plantations, (viii) Food Storage and Warehousing, (ix) Agricultural Research and Education, (x) Agricultural Finance Institutions, (xi) Co-operation and (xii) Other Agricultural Programmes.

These expenditure heads have been regrouped under the six agricultural sub-sectors: (i) Crops (ii) Livestock (iii) Forestry (iv) Fisheries (v) Research (vi) Others. Expenditure on plantations has been included under the expenditure on crops. Expenditure on livestock includes expenditure on animal husbandry and dairy.

Expenditure on forestry includes expenditure on forestry and wild life. Expenditure on research includes research expenditures in all the above mentioned 12 major sub-heads .Other expenditure includes expenditure on food storage and warehousing, agricultural finance institutions, co-operation and other agricultural programmes. The impact of government expenditures on different sectors/sub-sectors have been analysed by considering correlation and regression analysis.

Simpson Index has been used to measure the diversification of economic activities in the agricultural sector. Some panel data regressions have been used to examine the role government expenditure on diversification of economic activities in the agricultural sector.

III

DATA SOURCES

This study is based exclusively on secondary data. Employment data has been extracted from the unit level data from different rounds of NSSO surveys on Employment over the period 1993-94 to 2011-12.These rounds of NSSO survey are: (i) 50th in the year of 1993-94 (ii) 55th in the year of 1999-2000 and (iii) 68th in the year of 2011-12. Values of output from different agricultural sub-sectors have been collected from the reports of Central Statistical Organisation. Data of value of output from all agricultural sub-sectors are not available from 1993-94. These are available only from 1999-2000. Therefore value of output from agricultural sub-sectors have been analysed only from 1999-2000. Data of value of output from all crops are only available from 1993-94, onwards. Therefore value of output from crops have been analysed from 1993-94. Data of government expenditure has been collected from *Handbook of Statistics on State Government Finances-2010*, *States Finance-A Study of Budgets, Reserve Bank of India (RBI), 2013*, *Combined Finance and Revenue Accounts of Union and State Governments*, CAG (Comptroller and Auditor General of India) and *Indian Public Finance Statistics*, Government of India.

As the continuous data of value of output from all agricultural sub-sectors is available from 1999-2000, compound annual growth rates (CAGR) of value of output of agricultural sub-sectors has been calculated for the period 1999-2000 to 2011-12. But the employment data is not available for all the years under study period; accordingly simple annual growth rate (SAGR) has been calculated during the period 1993-94 to 2011-12.

IV

PATTERN OF CHANGES IN THE ECONOMIC ACTIVITIES UNDER DIFFERENT AGRICULTURAL SUB-SECTORS

4.1 *Crop Sub-sector*

Crop sub-sector is the most important sub-sector of the agricultural sector. It provides a major share of employment and value of output among all the sub-sectors

of agriculture. Share of employment (USS and UPS) in crop sub-sector to total employment in the agricultural sector is higher as compared to its share of the value of output of crop sub-sector to value of total output of agricultural sector in almost all the states during the whole period under consideration (Table 1).

TABLE 1. STATE WISE SHARE OF VALUE OF OUTPUT OF CROP SUB-SECTOR TO TOTAL VALUE OF OUTPUT OF AGRICULTURAL SECTOR AND SHARE OF EMPLOYMENT (UPS AND USS) IN CROP SUB-SECTOR TO TOTAL EMPLOYMENT IN AGRICULTURAL SECTOR OVER THE PERIOD 1993-94 TO 2011-12

(*per cent*)

	Share of value of output of crop sub-sector		Share of UPS employment in crop sub-sector			Share of USS employment in crop sub-sector	
	1999-2000	2011-2012	1993-1994	1999-2000	2011-2012	1993-1994	2011-2012
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Major states							
Haryana	66.52	63.30	93.73	95.84	92.52	49.23	30.69
Punjab	66.10	64.51	93.95	94.03	90.06	25.48	14.94
Rajasthan	52.02	51.25	83.30	83.23	91.71	55.24	78.40
Uttar Pradesh	70.48	64.94	96.49	96.95	91.71	79.56	78.39
Andhra Pradesh	56.88	53.06	92.85	94.52	95.23	83.51	96.00
Karnataka	69.26	70.61	93.79	96.49	95.34	78.65	88.79
Kerala	61.19	56.75	90.42	91.60	82.71	72.47	77.74
Tamil Nadu	63.30	54.98	93.35	94.46	93.19	71.61	78.12
Gujarat	57.81	62.26	95.01	91.04	95.90	75.25	72.42
Madhya Pradesh	62.08	64.43	98.28	97.50	98.86	94.82	94.11
Maharashtra	63.16	66.19	95.87	97.11	98.21	85.00	95.18
Bihar	60.82	51.85	98.62	97.99	93.73	94.31	89.01
Orissa	69.41	65.79	95.90	96.67	96.81	90.75	89.66
West Bengal	63.76	60.94	95.87	97.94	97.57	83.88	90.97
Assam	78.77	73.18	98.69	99.17	98.23	91.76	98.87
Minor States							
Himachal Pradesh	49.41	55.32	94.75	90.95	90.74	70.82	82.98
Jammu and Kashmir	38.46	51.25	94.71	98.67	94.27	63.33	71.19
Delhi	40.02	31.38	66.10	93.69	100	-	
Pondicherry	40.85	35.33	96.60	90.96	87.09	47.53	11.11
Goa	61.67	50.23	92.21	83.47	98.83	81.07	100
Sikkim	74.17	49.59	98.87	98.80	98.72	100	86.00
Manipur	47.95	49.17	97.32	98.80	95.17	81.21	98.86
Meghalaya	38.42	24.00	99.07	98.91	98.84	99.06	96.08
Nagaland	61.96	48.91	99.41	100	99.62	100	92.33
Tripura	65.79	66.02	97.37	99.31	98.57	93.65	95.65
Arunachal Pradesh	23.86	35.97	99.83	99.30	97.47	64.94	74.58
Mizoram	43.87	53.22	99.41	99.91	97.11	100	99.54
All States	63.50	60.92	95.03	95.59	95.07	80.21	83.23

Source: Handbook of Statistics on State Government Finances-2010, States Finance-A Study of Budgets, 2013, Reserve Bank of India.

Share of value of output from crop sub-sector to total value of output from agricultural sector has decreased in India as a whole from 63.50 per cent in 1999-2000 to 60.92 per cent in 2011-12. Share of value of output from crop sub-sector to total value of output from agricultural sector has increased only in 4 out of the 15 major states.

Share of UPS employment in crop sub-sector to total UPS employment in agricultural sector has increased in India as a whole from 95.03 per cent in 1993-94 to 95.07 per cent in 2011-12. Share of USS employment in crop sub-sector to total USS employment in agricultural sector has increased in India as a whole from 80.21 per cent in 1993-94 to 83.23 per cent in 2011-12. Share of both UPS and USS employment in crop sector to total employment in agricultural sector has increased in 8 out of 15 major states. Share of employment (UPS and USS) in crop sector to total employment in agricultural sector remained more or less the same in all the minor states during this period. Crop sector is losing its importance over time in India.

Compound annual growth rate (CAGR) of value of output from crop sub-sector is positive in all the major states. Simple annual growth rate (SAGR) of UPS employment in crop sub-sector is positive in 9 states out of 15 major states and also in 9 out of 12 minor states. SAGR of USS employment in crop sub-sector is positive only in one major state (Rajasthan). SAGR of USS employment in crop sub-sector is positive in 4 out of 11 minor states (Table 2). All the states are experiencing growth in value of crop sub-sector output.

4.2 *Livestock Sub-sector*

Livestock related activities are important livelihood sources specifically among the lower income group people in rural areas. There are two types of livestock: high value livestock and low value livestock. Cow, buffalo etc. are high value livestock and goat, poultry etc. are low value livestock. Low value livestock rearing is very common among the landless and poor people as their livelihood source.

Share of value of output of livestock sub-sector has increased in India as a whole from 22.26 per cent in 1999-2000 to 25.56 per cent in 2011-12. Share of value of output of livestock sub-sector to total value of output from agricultural sector has increased in all the major states and also in 7 states out of 12 minor states (Table 3). Share of value of output of livestock sub-sector varied from 11.12 per cent to 38.69 per cent among the major states.

Share of UPS employment in livestock sub-sector has declined in India as a whole from 4 per cent in 1993-94 to 2.55 per cent in 2011-12. Share of USS employment in livestock sub-sector has declined in India as a whole from 18.07 per cent to 13.40 per cent during the same period. The share of employment (UPS and USS) in livestock sub-sector varied from 0.66 per cent to 18.64 per cent in the major states (except in 3 states for USS); but in the minor states the share remained at a very low level. It may be noted that the share of USS employment in livestock is higher as compared to UPS employment in all the states. Share of UPS employment in livestock has increased only in 6 out of 15 major states. Share of USS employment in livestock has increased only in 5 out of 15 major states. Thus livestock sub-sector remains mainly as a subsidiary livelihood in rural families and its employment contributions are also declining in a majority of the states (Table 3).

TABLE 2. STATES WISE CAGR OF VALUE OF OUTPUT OF CROP SUB-SECTOR OVER THE PERIOD 1999-2000 TO 2011-12 AND SAGR OF EMPLOYMENT (UPS AND USS) IN CROP SUB-SECTOR OVER THE PERIOD 1993-94 TO 2011-12

States	CAGR in value of output of crop sub-sector	SAGR of UPS employment in crop sub-sector	SAGR of USS employment in crop sub-sector
(1)	(2)	(3)	(4)
Major states			
Haryana	1.12	1.56	- 3.79
Punjab	0.57	- 1.31	- 2.36
Rajasthan	0.96	0.65	0.34
Uttar Pradesh	0.82	- 0.71	- 0.70
Andhra Pradesh	1.13	- 0.1	- 3.31
Karnataka	0.91	0.12	- 4.15
Kerala	0.41	- 1.86	- 2.59
Tamil Nadu	0.54	- 1.64	- 4.25
Gujarat	1.59	1.36	- 3.12
Madhya Pradesh	1.74	0.32	- 2.20
Maharashtra	1.74	0.61	- 1.51
Bihar	2.26	0.1	- 1.98
Orissa	0.76	-0.91	- 1.34
West Bengal	0.91	1.18	- 2.32
Assam	0.45	0.47	- 2.65
Minor states			
Himachal Pradesh	1.49	0.54	- 1.84
Jammu and Kashmir	1.32	5.37	15.43
Delhi	2.28	- 3.58	-
Pondicherry	- 0.11	- 1.97	- 5.15
Goa	1.34	- 4.67	- 5.55
Sikkim	0.83	9.23	2.56
Manipur	1.95	0.92	- 1.80
Meghalaya	1.00	0.01	3.60
Nagaland	2.43	6.84	8.62
Tripura	1.79	0.39	- 2.21
Arunachal Pradesh	- 0.25	0.13	- 2.52
Mizoram	1.78	1.68	-0.65

Source: Same as in Table 1.

TABLE 3. STATE WISE SHARE OF VALUE OF OUTPUT OF LIVESTOCK SUB-SECTOR TO TOTAL VALUE OF OUTPUT OF AGRICULTURAL SECTOR AND SHARE OF EMPLOYMENT (UPS AND USS) IN LIVESTOCK SUB-SECTOR TO TOTAL EMPLOYMENT IN AGRICULTURAL SECTOR OVER THE PERIOD 1993-94 TO 2011-12

(*per cent*)

	Share of value of output of livestock sub-sector		Share of UPS employment in livestock sub-sector			Share of USS employment in livestock sub-sector	
	1999-2000	2011-2012	1993-1994	1999-2000	2011-2012	1993-1994	2011-2012
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Major States							
Haryana	27.81	31.12	5.44	3.93	4.44	50.63	66.38
Punjab	29.49	31.3	5.71	5.94	9.49	74.52	85.06
Rajasthan	38.02	38.69	16.23	16.61	5.49	44.41	16.23
Uttar Pradesh	21.35	26.00	3.39	2.84	2.98	20.15	15.94
Andhra Pradesh	25.86	30.34	5.37	4.34	3.37	13.49	3.09
Karnataka	18.39	18.03	5.71	2.76	4.08	20.92	9.03
Kerala	19.79	19.82	3.55	5.15	9.75	26.97	18.64

(Contd.)

TABLE 3. (CONCLD.)

	Share of value of output of livestock sub-sector		Share of UPS employment in livestock sub-sector			Share of USS employment in livestock sub-sector	
	1999-2000	2011-2012	1993-1994	1999-2000	2011-2012	1993-1994	2011-2012
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tamil Nadu	23.87	31.94	5.36	4.24	3.09	27.18	16.39
Gujarat	22.18	24.58	4.84	8.70	3.67	24.45	27.24
Madhya Pradesh	22.18	22.17	1.25	0.76	0.59	2.58	1.73
Maharashtra	18.34	19.37	3.46	2.56	1.30	14.46	4.46
Bihar	22.30	32.89	0.64	1.21	0.69	4.68	6.20
Orissa	11.17	18.46	1.20	1.01	1.84	3.17	7.28
West Bengal	19.02	19.64	2.35	0.66	0.77	12.33	6.13
Assam	8.46	11.49	0.03	0.08	0.6	1.34	0.83
Minor states							
Himachal Pradesh	21.64	24.47	4.86	8.66	8.58	28.94	16.51
Jammu and Kashmir	23.19	25.14	5.14	0.82	4.69	36.30	28.81
Delhi	54.35	64.73	33.90	6.30	0	-	-
Pondicherry	19.91	31.16	3.40	6.23	1.52	47.85	88.89
Goa	11.51	10.15	7.79	6.66	1.17	18.93	0
Sikkim	12.44	10.29	0.07	1.01	0.79	0	0.1
Manipur	25.91	17.38	0.15	0	0.69	0.27	0.76
Meghalaya	17.80	12.70	0.51	0.62	0.86	0.94	3.31
Nagaland	13.97	24.29	0.54	0	0	0	3.52
Tripura	12.21	14.23	0.31	0	0.09	1.68	0
Arunachal Pradesh	7.07	17.56	0.02	0.08	0.37	0.86	0
Mizoram	25.42	17.56	0.34	0.01	2.46	0	0.46
All States	22.26	25.56	4.00	3.51	2.55	18.07	13.4

Source: Same as in Table 1.

Unlike in crop sub-sector, share of value of output of livestock sub-sector to total value of output from agricultural sector is higher compared to share of employment (except in 3 states for USS) in livestock sub-sector to total employment in agricultural sector (Table 3).

CAGR of value of output from livestock sub-sector is positive in all the states except in one minor state. SAGR of UPS employment in livestock sub-sector is positive in 6 states out of 15 major states. SAGR of UPS employment in livestock sub-sector is positive in 7 states out of 12 minor states. In case of USS employment, SAGR is positive in two major states and 3 minor states (Table 4).

4.3 *Fisheries Sub-sector*

Share of value of output of fisheries sub-sector has increased in India as a whole from 4.13 per cent to 4.55 per cent during the period under consideration. Share of value of output of fisheries sub-sector has increased in 9 major states (Table 5).

Share of UPS employment in fisheries sub-sector remained almost same in India as a whole during the period under consideration. But share of USS employment has declined from 0.70 per cent to 0.32 per cent during the same period. Share of UPS employment in fishery sub-sector has increased only in 7 out of 15 major states. Share of USS employment in fisheries sub-sector has increased only in 3 out of 15 major states (Table 5).

TABLE 4. STATES WISE CAGR OF VALUE OF OUTPUT OF LIVESTOCK SUB-SECTOR OVER THE PERIOD 1999-2000 TO 2011-12 AND SAGR OF EMPLOYMENT (USS AND UPS) IN LIVESTOCK SUB-SECTOR OVER THE PERIOD 1993-94 TO 2011-12

States	CAGR in value of output of livestock sub-sector	SAGR of UPS employment in livestock sub-sector	SAGR of USS employment in livestock sub-sector
(1)	(2)	(3)	(4)
Major states			
Haryana	1.62	0.33	-1.85
Punjab	1.31	1.81	0.66
Rajasthan	1.66	-3.65	-4.04
Uttar Pradesh	1.87	-1.08	-1.65
Andhra Pradesh	2.50	-2.21	-5.11
Karnataka	1.31	-1.57	-5.02
Kerala	0.71	5.56	-3.64
Tamil Nadu	1.47	-3.29	-4.84
Gujarat	2.39	-0.37	-2.74
Madhya Pradesh	1.88	-2.78	-3.29
Maharashtra	1.53	-3.30	-4.44
Bihar	3.33	0.84	-0.54
Orissa	2.71	1.48	4.24
West Bengal	0.87	-3.40	-4.07
Assam	1.11	119.80	-3.90
Minor states			
Himachal Pradesh	1.67	5.68	-3.75
Jammu and Kashmir	2.43	4.46	9.27
Delhi	-0.63	-5.56	
Pondicherry	1.36	-3.78	-2.32
Goa	0.60	-5.43	-
Sikkim	1.71	168.12	
Manipur	0.65	25.20	3.20
Meghalaya	1.60	3.87	27.85
Nagaland	3.21	-5.56	
Tripura	2.02	-3.78	-5.56
Arunachal Pradesh	2.78	108.33	-5.56
Mizoram	1.31	47.63	-

Source: Same as in Table 1.

TABLE 5. STATE WISE SHARE OF VALUE OF OUTPUT OF FISHERY SUB-SECTOR TO TOTAL VALUE OF OUTPUT OF AGRICULTURAL SECTOR AND SHARE OF EMPLOYMENT (UPS AND USS) IN FISHERY SUB-SECTOR TO TOTAL EMPLOYMENT IN AGRICULTURAL SECTOR OVER THE PERIOD 1993-94 TO 2011-12.

(*per cent*)

	Share of value of output of fishery sub-sector		Share of UPS employment in fishery sub-sector			Share of USS employment in fishery sub-sector	
	1999-2000	2011-2012	1993-1994	1999-2000	2011-2012	1993-1994	2011-2012
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Major states							
Haryana	0.39	0.78	0.11	0.00	0.00	0.00	0.00
Punjab	0.52	0.80	0.05	0.00	0.00	0.00	0.00
Rajasthan	0.16	0.25	0.00	0.00	0.00	0.00	0.00
Uttar Pradesh	0.74	1.17	0.02	0.02	0.03	0.16	0.02
Andhra Pradesh	9.68	11.12	0.88	0.74	1.32	1.14	0.91
Karnataka	1.84	2.16	0.27	0.65	0.47	0.08	0.00
Kerala	9.94	9.38	5.03	2.62	5.79	0.41	1.37

(Contd.)

TABLE 5. (CONCLD.)

	Share of value of output of fishery sub-sector		Share of UPS employment in fishery sub-sector			Share of USS employment in fishery sub-sector	
	1999-2000	2011-2012	1993-1994	1999-2000	2011-2012	1993-1994	2011-2012
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tamil Nadu	7.14	7.26	0.90	0.80	2.74	0.25	0.67
Gujarat	5.68	4.05	0.06	0.00	0.27	0.02	0.35
Madhya Pradesh	1.22	1.65	0.02	0.05	0.00	0.14	0.00
Maharashtra	2.43	2.05	0.59	0.28	0.18	0.30	0.10
Bihar	2.82	3.5	0.56	0.19	0.09	0.69	0.04
Orissa	5.41	5.67	1.86	1.27	0.70	1.14	0.70
West Bengal	13.58	15.27	1.21	1.32	1.48	3.07	2.08
Assam	4.48	5.55	0.84	0.66	0.39	6.44	0.05
Minor States							
Himachal Pradesh	0.69	0.56	0.00	0.04	0.23	0.06	0.00
Jammu and Kashmir	1.81	1.62	0.00	0.30	0.00	0.09	0.00
Delhi	1.66	0.27	0.00	0.00	0.00	0.00	-
Pondicherry	24.30	19.73	0.00	2.81	11.38	0.00	0.00
Goa	20.06	29.98	0.00	6.18	0.00	0.00	0.00
Sikkim	0.25	0.15	0.17	0.00	0.00	0.00	0.00
Manipur	9.53	6.06	2.32	0.48	2.05	7.29	0.00
Meghalaya	1.74	0.80	0.00	0.00	0.03	0.00	0.00
Nagaland	1.57	1.60	0.00	0.00	0.00	0.00	0.00
Tripura	9.79	9.72	1.15	0.00	0.06	0.93	0.00
Arunachal Pradesh	0.95	1.36	0.00	0.00	0.00	26.80	0.00
Mizoram	3.94	2.87	0.00	0.00	0.00	0.00	0.00
All States	4.13	4.55	0.57	0.43	0.57	0.70	0.32

Source: Same as in Table 1.

CAGR of value of output from fisheries sub-sector is positive in all the major states except in Kerala. SAGR of UPS employment in fisheries sub-sector is positive in 6 major states out of 12 states. In case of USS employment, it is positive only in two major states (Table 6).

TABLE 6. STATES WISE CAGR OF VALUE OF OUTPUT OF FISHERY SUB-SECTOR OVER THE PERIOD 1999-2000 TO 2011-12 AND SAGR OF EMPLOYMENT (UPS AND USS) IN FISHERY SUB-SECTOR OVER THE PERIOD 1993-94 TO 2011-12

States	CAGR in value of output of fishery sub-sector	SAGR of UPS employment in fishery sub-sector	SAGR of USS employment in fishery sub-sector
(1)	(2)	(3)	(4)
Major states			
Haryana	4.77	-	-
Punjab	2.58	-	-
Rajasthan	3.57	-	-
Uttar Pradesh	2.86	1.70	-5.06
Andhra Pradesh	2.36	2.39	-3.99
Karnataka	1.21	4.15	-5.56
Kerala	-0.11	-0.90	3.82
Tamil Nadu	1.1	6.43	-2.44
Gujarat	0.86	23.98	30.35
Madhya Pradesh	2.92	-4.96	-5.56
Maharashtra	0.57	-3.70	-4.40
Bihar	2.34	-4.64	-5.36

(Contd.)

TABLE 6. (CONCLD.)

States	CAGR in value of output of fishery sub-sector	SAGR of UPS employment in fishery sub-sector	SAGR of USS employment in fishery sub-sector
(1)	(2)	(3)	(4)
Orissa	1.53	-3.82	-2.92
West Bengal	1.57	2.49	-3.53
Assam	1.24	-2.78	-5.53
Minor states			
Himachal Pradesh	0.37	-	-
Jammu and Kashmir	0.15	-	-
Delhi	-8.19	-	-
Pondicherry	-1.11	-	-
Goa	2.11	-	-
Sikkim	0.97	-	-
Manipur	0.92	0.29	-
Meghalaya	-1.38	-	-
Nagaland	0.95	-	-
Tripura	1.44	-5.25	-
Arunachal Pradesh	0.78	-	-
Mizoram	0.38	-	-

Source: Same as in Table 1.

4.4 *Forestry Sub-sector*

Forestry sub-sector is an important source of livelihood for the rural people and provides food, fodder and shelter to the rural people. Rural people secure employment and output not only from production of timber and collection of non-timber forest products but also from manufacturing and processing of forest product-related economic activities. Share of value of output of forestry sub-sector has decreased in India as a whole from 10.11 per cent to 8.97 per cent. Share of value of output of forestry sub-sector has declined in most of the major and minor states.

Share of UPS employment in forestry sub-sector to total employment in agricultural sector has decreased in India as a whole from 0.40 per cent to 0.27 per cent but share of USS employment has increased from 1.02 per cent to 1.03 per cent during the period under consideration. Share of both UPS and USS employment in forestry sub-sector to total employment in agricultural sector has decreased in most of the major and minor states (Table 7). CAGR of value of output from forestry sub-sector is positive in 14 major states and seven minor states. SAGR of both UPS and USS employment in forestry sub-sector is negative in most of the major states and only in one minor state (Table 8).

V

RELATIONSHIP BETWEEN CHANGES IN GOVERNMENT EXPENDITURE AND CHANGES IN ECONOMIC ACTIVITIES IN AGRICULTURAL SUB-SECTORS

This section discusses the impacts of changes in government expenditures on crops, livestock, fisheries and forestry (excluding research and education on these sub-sectors) on the changes in value of output and employment in these agricultural sub-sectors.

TABLE 7. STATE WISE SHARE OF VALUE OF OUTPUT OF FORESTRY SUB-SECTOR TO TOTAL VALUE OF OUTPUT OF AGRICULTURAL SECTOR AND SHARE OF EMPLOYMENT (UPS AND USS) IN FORESTRY SUB-SECTOR TO TOTAL EMPLOYMENT IN AGRICULTURAL SECTOR OVER THE PERIOD 1993-94 TO 2011-12

(*per cent*)

	Share of value of output of forestry sub-sector		Share of UPS employment in forestry sub-sector			Share of USS employment in forestry sub-sector	
	1999-2000	2011-2012	1993-1994	1999-2000	2011-2012	1993-1994	2011-2012
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Major states							
Haryana	5.28	4.80	0.72	0.23	0.13	0.14	0.00
Punjab	3.89	3.39	0.28	0.03	0.44	0.00	0.00
Rajasthan	9.80	9.82	0.47	0.16	0.04	0.35	0.33
Uttar Pradesh	7.42	7.90	0.11	0.17	0.45	0.13	0.39
Andhra Pradesh	7.59	5.47	0.90	0.41	0.08	1.86	0.00
Karnataka	10.51	9.20	0.23	0.10	0.06	0.35	2.18
Kerala	9.08	14.05	1.01	0.64	1.75	0.16	2.25
Tamil Nadu	5.69	5.82	0.40	0.50	0.98	0.96	4.82
Gujarat	14.33	9.11	0.08	0.26	0.00	0.28	0.00
Madhya Pradesh	14.51	11.75	0.45	0.60	0.22	2.46	4.16
Maharashtra	16.07	12.39	0.07	0.05	0.09	0.24	0.26
Bihar	14.06	11.76	0.19	0.61	0.11	0.31	0.13
Orissa	14.02	10.08	1.03	1.05	0.65	4.94	2.35
West Bengal	3.64	4.15	0.56	0.08	0.19	0.71	0.82
Assam	8.29	9.79	0.44	0.08	0.23	0.46	0.26
Minor states							
Himachal Pradesh	28.26	19.65	0.39	0.35	0.37	0.18	0.00
Jammu and Kashmir	36.54	21.99	0.15	0.18	1.03	0.28	0.00
Delhi	3.96	3.62	0.00	0.01	0.00		
Pondicherry	14.93	13.78	0.00	0.00	0.00	4.62	0.00
Goa	6.76	9.64	0.00	3.69	0.00	0.00	0.00
Sikkim	13.14	39.97	0.89	0.20	0.49	0.00	13.90
Manipur	16.60	27.39	0.21	0.72	2.09	11.23	0.38
Meghalaya	42.04	62.50	0.42	0.06	0.27	0.00	0.60
Nagaland	22.50	25.20	0.05	0.00	0.38	0.00	4.14
Tripura	12.20	10.03	1.17	0.61	1.28	3.74	4.35
Arunachal Pradesh	68.13	45.11	0.15	0.62	0.55	7.40	0.00
Mizoram	26.78	26.36	0.25	0.05	0.43	0.00	0.00
All states	10.11	8.97	0.40	0.34	0.27	1.02	1.03

Source: Same as in Table 1.

TABLE 8. STATES WISE CAGR OF VALUE OF OUTPUT OF FORESTRY SUB-SECTOR OVER THE PERIOD 1999-2000 TO 2011-12 AND SAGR OF EMPLOYMENT (UPS AND USS) IN FORESTRY SUB-SECTOR OVER THE PERIOD 1993-94 TO 2011-12.

States	CAGR in value of output of forestry sub-sector	SAGR of UPS employment in forestry sub-sector	SAGR of USS employment in forestry sub-sector
(1)	(2)	(3)	(4)
Major states			
Haryana	0.69	-4.29	-5.56
Punjab	0.10	1.36	-
Rajasthan	1.36	-5.06	-1.56
Uttar Pradesh	1.03	15.56	8.73
Andhra Pradesh	0.30	-5.09	-5.56
Karnataka	0.04	-4.20	2.15
Kerala	1.94	1.49	34.44

(*Contd.*)

TABLE 8. (CONCLD.)

States	CAGR in value of output of forestry sub-sector	SAGR of UPS employment in forestry sub-sector	SAGR of USS employment in forestry sub-sector
(1)	(2)	(3)	(4)
Tamil Nadu	0.69	4.00	0.42
Gujarat	0.31	-5.56	-5.56
Madhya Pradesh	0.28	-2.67	0.16
Maharashtra	0.21	1.96	-1.61
Bihar	0.47	-1.99	-3.97
Orissa	-0.04	-2.64	-3.52
West Bengal	1.78	-3.35	-2.10
Assam	1.24	-2.38	-4.06
Minor states			
Himachal Pradesh	-0.48	0.48	-5.56
Jammu & Kashmir	-1.83	71.29	-5.56
Delhi	-2.08		
Pondicherry	-2.66		-5.56
Goa	1.72		
Sikkim	2.50	2.63	
Manipur	2.80	60.09	-5.45
Meghalaya	1.47	-1.96	
Nagaland	1.55	98.53	
Tripura	0.22	0.85	-1.75
Arunachal Pradesh	-2.95	15.35	-5.56
Mizoram	2.03	7.43	

Source: Same as in Table 1.

5.1 *Crop Sub-sector*

Share of government expenditure on crop-sector across the states and share of value of output from crop sub-sector across the states are positively but insignificantly related during the period from 1999-2000 and 2011-12 (Table 9). The states with higher government expenditure on crops are the states with higher share of value of output from crops. However the estimated correlation coefficients are not statistically significant.

But the share of government expenditure on crop sub-sector across the states and the share of UPS employment in crop sub-sector across the states are negatively and insignificantly related in the years 1993-94, 1999-2000 and 2011-12 (Table 9). The states with higher government expenditure on crops are also the states having lower share of employment in crops. Again estimated correlation coefficients are not statistically significant.

Compound Annual Growth Rate (CAGR) of government expenditure on crop sub-sector is positive in 14 major states (Table 10). CAGR of value of output from crop sub-sector across the states is positively and insignificantly related with CAGR of government expenditure on crop sub-sector across the states (Table 11). SAGR of both UPS and USS employment in crop sub-sector across the states is negatively and insignificantly related with CAGR of government expenditure on crop sub-sector across the states. The estimated correlation coefficients are not statistically significant (Table 11).

TABLE 9. CORRELATION COEFFICIENT BETWEEN SHARE OF ECONOMIC ACTIVITIES AND SHARE OF GOVERNMENT EXPENDITURE IN DIFFERENT AGRICULTURAL SUB-SECTORS ACROSS THE STATES IN THE YEAR 1993-94, 1999-2000 AND 2011-12

(1)	Share of value of output and share of government expenditure (2)	Share of UPS employment and government expenditure (3)	Share of USS employment and share of government expenditure (4)
Crop sub-sector			
1993-94	-	-0.016	-0.022
1999-2000	0.171	-0.044	-
2011-12	0.043	-0.003	0.1134
Livestock sub-sector			
1993-94	-	0.1532	-0.128
1999-2000	0.168	-0.144	-
2011-12	-0.185	0.110	0.281
Fishery sub-sector			
1993-94	-	0.600***	0.078
1999-00	0.862***	0.752***	-
2011-12	0.748***	0.824***	0.077
Forestry sub-sector			
1993-94	-	0.018	0.040
1999-2000	0.226	0.064	-
2011-12	0.280	0.010	0.090

Note: *,** and *** Significant at 10, 5 and 1 per cent level, respectively.

TABLE 10. STATE WISE CAGR OF GOVERNMENT EXPENDITURE IN DIFFERENT AGRICULTURAL SUB-SECTORS AND CAGR OF GOVERNMENT EXPENDITURE ON RESEARCH AND EDUCATION IN AGRICULTURAL SECTOR OVER THE PERIOD 1993-94 TO 2011-12.

States (1)	CAGR of government expenditure in crop sub-sector (2)	CAGR of government expenditure in livestock sub-sector (3)	CAGR of government expenditure in fishery sub-sector (4)	CAGR of government expenditure in forestry sub-sector (5)	CAGR of government expenditure on research and education in agricultural sector (6)
Major states					
Haryana	1.84	2.23	2.03	0.81	2.15
Punjab	1.4	1.69	1.89	1.89	1.14
Rajasthan	3.07	1.59	0.09	1.63	1.08
Uttar Pradesh	2.71	1.85	1.59	2.92	2.19
Andhra Pradesh	3.52	2.03	1.12	1.36	2.52
Karnataka	3.3	3.25	1.83	1.64	2.88
Kerala	0.84	2.02	1.13	0.99	0.95
Tamil Nadu	-1.47	0.67	2.95	1.37	1.67
Gujarat	3.02	1.89	3.43	1.56	2.45
Madhya Pradesh	2.82	2.02	2.07	1.84	1.79
Maharashtra	6.32	2.57	7.48	4.35	5.65
Bihar	2.95	1.8	3.11	2.75	2.98
Orissa	2	0.97	-0.04	1.63	1.27
West Bengal	0.86	-0.74	1.51	-0.94	1.08
Assam	1.56	0.37	1.52	0.6	-0.18
Minor States					
Himachal Pradesh	0.31	2.26	0.56	1.13	1.94
Jammu and Kashmir	1.59	1.31	2.88	2.13	4.22
Delhi	5.1	4.9	2.23	4.97	8.2

(Contd.)

TABLE 10. (CONCLD.)

States	CAGR of government expenditure in crop sub-sector	CAGR of government expenditure in livestock sub-sector	CAGR of government expenditure in fishery sub-sector	CAGR of government expenditure in forestry sub-sector	CAGR of government expenditure on research and education in agricultural sector
(1)	(2)	(3)	(4)	(5)	(6)
Pondicherry	4.04	4.79	2.03	-5.03	1.51
Goa	1.16	1.63	2.16	2.16	-0.05
Sikkim	0.78	2.53	2.46	0.61	-2.11
Manipur	2.33	1.49	1.31	1.2	-2.57
Meghalaya	3.1	1.67	3.11	1.14	0
Nagaland	2.44	1.29	1.68	1.16	2.7
Tripura	2.42	2.43	1.72	2.67	5.53
Arunachal Pradesh	2.21	1.48	1.24	1.32	1.73
Mizoram	7.09	4.06	8.89	4.85	7.05

Source: Same as in Table 1.

TABLE 11. CORRELATION COEFFICIENT BETWEEN GROWTH RATE OF ECONOMIC ACTIVITIES AND GROWTH RATE OF GOVERNMENT EXPENDITURE IN DIFFERENT AGRICULTURAL SUB-SECTOR ACROSS THE STATES IN THE YEAR 1993-94, 1999-2000 AND 2011-12

Variables	CAGR of value of output and CAGR of government expenditure	SAGR of UPS employment and CAGR government expenditure	SAGR USS employment and CAGR of government expenditure
(1)	(2)	(3)	(4)
Crop sub-sector	0.364	- 0.07	- 0.059
Livestock sub-sector	- 0.292	- 0.035	- 0.087
Fishery sub-sector	- 0.149	0.104	0.124
Forestry sub-sector	0.122	- 0.002	- 0.074

Note: *,** and *** Significant at 10, 5 and 1 per cent level, respectively.

5.2 *Livestock Sub-sector*

During the period under study, share of government expenditure on livestock sub-sector has increased only in 7 out of 15 major states and in only 3 out of 12 minor states. In India share of expenditure on livestock has come down from 17.84 per cent to 12.87 per cent of the total expenditure in agriculture during the period 1999-2000 to 2011-12 (Table 12).

Share of value of output of livestock sub-sector across the states and share of expenditure on livestock sub-sector across the states are positively and insignificantly related in 1999-2000. But they are negatively and insignificantly related in 2011-12 (Table 9).

Share of UPS employment in livestock sub-sector and share of government expenditure on livestock sub-sector are positively but insignificantly related across the states in the years 1993-94 and 2011-12. But they are negatively and insignificantly related in 1999-2000. Share of USS employment in livestock sub-sector across the states and share of government expenditure on livestock sub-sector across the states are positively related in 2011-12. They are negatively related in 1993-94. But their relationship is not significant in both the years (Table 9).

CAGR of government expenditure on livestock sub-sector is positive in all the states except in one major state (Table 10). Correlation coefficient shows that CAGR of value of output from livestock sub-sector across the states is negatively and insignificantly related with CAGR of government expenditure on livestock sub-sector across the states (Table 11). SAGR of both UPS and USS employment in livestock sub-sector across the states is negatively and insignificantly related with CAGR of government expenditure on livestock sub-sector across the states (Table 11). All the estimated correlation coefficients are not statistically significant.

TABLE 12. STATE WISE SHARE OF GOVERNMENT EXPENDITURE IN DIFFERENT AGRICULTURAL SUB-SECTORS TO TOTAL GOVERNMENT EXPENDITURE IN AGRICULTURAL SECTOR OVER THE PERIOD 1993-94 TO 2011-12

(*per cent*)

	Share of government expenditure in crop sub-sector			Share of government expenditure in livestock sub-sector		
	1993-94	1999-2000	2011-12	1993-94	1999-2000	2011-12
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Major States						
Haryana	24.72	12.67	33.20	17.35	15.85	25.72
Punjab	27.62	10.79	35.82	13.46	13.90	24.99
Rajasthan	25.48	30.09	55.35	14.37	16.83	12.56
Uttar Pradesh	35.36	32.10	48.48	15.05	8.59	11.72
Andhra Pradesh	35.26	24.68	50.60	15.61	19.07	15.37
Karnataka	24.73	19.88	29.02	9.92	10.60	15.72
Kerala	33.59	25.51	25.65	9.98	13.15	14.14
Tamil Nadu	72.77	62.00	38.44	5.79	8.67	9.31
Gujarat	25.83	23.90	38.23	8.93	9.41	9.62
Madhya Pradesh	21.37	19.21	29.07	12.87	12.83	9.95
Maharashtra	11.90	12.26	23.03	45.84	37.19	15.05
Bihar	35.91	24.33	57.43	18.02	21.02	13.99
Orissa	25.95	28.88	29.55	14.48	14.03	7.83
West Bengal	26.13	19.43	32.51	28.28	29.84	19.62
Assam	25.50	32.07	39.48	18.09	17.56	15.16
Minor States						
Himachal Pradesh	26.38	21.84	20.25	11.09	12.69	16.68
Jammu& Kashmir	24.51	25.35	20.29	25.60	23.43	17.86
Delhi	24.35	22.54	38.26	25.81	24.34	11.76
Pondicherry	-	-	26.17			18.28
Goa	31.06	30.78	28.62	17.81	20.86	17.33
Sikkim	27.67	33.02	13.89	14.58	14.52	40.24
Manipur	24.12	27.20	30.40	20.90	21.40	17.40
Meghalaya	22.56	26.54	35.65	16.75	20.37	12.30
Nagaland	22.73	30.21	33.40	17.06	17.15	16.14
Tripura	43.37	38.86	43.11	14.97	15.20	12.89
Arunachal Pradesh	20.22	18.83	30.52	10.46	9.46	12.86
Mizoram	-	-	41.83			13.69
Northern	29.36	24.38	38.85	15.68	13.36	12.61
Southern	50.67	38.69	35.57	8.94	11.71	13.61
Western	17.35	16.06	28.13	29.30	26.25	12.16
Eastern	29.16	23.85	40.52	20.95	22.54	14.01
North-Eastern	25.80	29.73	37.62	16.57	16.71	14.37
All States	32.61	25.68	36.58	17.84	18.21	12.87

(Contd.)

TABLE 12. (CONCLD.)

	Share of government expenditure in fishery sub-sector			Share of government expenditure in forestry sub-sector		
	1993-94	1999-2000	2011-12	1993-94	1999-2000	2011-12
(1)	(8)	(9)	(10)	(11)	(12)	(13)
Major States						
Haryana	1.61	1.34	1.97	21.63	10.5	15.36
Punjab	0.84	0.75	1.71	6.41	10.63	7.35
Rajasthan	1.25	1.01	0.54	21.77	24.86	19.44
Uttar Pradesh	1.81	1.07	1.21	13.67	11.30	17.23
Andhra Pradesh	3.06	2.36	2.09	16.70	29.80	10.70
Karnataka	2.80	2.51	2.52	23.21	26.42	17.14
Kerala	8.92	9.63	9.87	14.46	16.29	10.47
Tamil Nadu	1.65	1.92	4.91	5.68	10.56	7.85
Gujarat	2.92	3.18	2.32	25.97	35.22	20.93
Madhya Pradesh	1.52	1.40	1.38	44.30	44.44	29.67
Maharashtra	0.92	1.35	2.50	12.09	12.21	13.23
Bihar	2.07	3.02	3.04	16.62	24.37	12.61
Orissa	6.02	4.70	2.55	23.76	19.83	13.59
West Bengal	4.36	7.82	6.55	16.10	17.25	15.61
Assam	3.32	3.52	3.90	22.25	24.52	19.85
Minor States						
Himachal Pradesh	1.33	1.29	1.28	35.02	44.64	32.21
Jammu and Kashmir	2.39	3.83	3.15	30.81	34.16	28.20
Delhi	2.25	2.08	2.59	31.09	32.94	16.40
Pondicherry	-	-	24.78			1.93
Goa	10.22	11.77	13.70	16.44	26.09	19.90
Sikkim	1.85	2.21	5.99	31.78	27.48	19.86
Manipur	8.46	8.88	6.82	18.93	18.77	15.71
Meghalaya	2.69	3.19	4.95	30.11	21.05	17.46
Nagaland	4.76	3.87	5.43	22.30	21.66	18.35
Tripura	9.18	6.86	6.29	20.39	17.21	23.51
Arunachal Pradesh	2.43	2.35	3.56	23.04	22.83	27.06
Mizoram			3.32	-	-	13.54
All States	2.59	2.64	2.89	18.52	20.84	16.79

Source: Same as in Table 1.

5.3 *Fisheries Sub-Sector*

Share of government expenditure on fisheries sub-sector has slightly increased in India from 2.59 per cent to 2.89 per cent over the study period. But state-wise consideration shows that the share of government expenditure on fisheries sub-sector has increased only in 6 major states during the period under consideration (Table 12). Share of government expenditure on fisheries sub-sector across the states is positively and significantly related with the share of value of output from fisheries sub-sector across the states in all the years under consideration.

Share of government expenditure on fisheries sub-sector across the states is positively related with the share of UPS employment in fisheries sub-sector across the states in all the years under consideration. Share of government expenditure on fisheries sub-sector across the states is positively related with the share of USS employment in fisheries sub-sector across the states but they are significant in all the years under consideration (Table 9). This implies that the states which incur more

government expenditure on fisheries sub-sector are the states where value of output of fisheries sub-sector as well as UPS employment generated in fishery sub-sector are more. Here the estimated correlation coefficients are statistically significant.

CAGR of expenditure on fisheries sub-sector is positive in all the major states except in Orissa. Correlation coefficients show that CAGR of value of output from fisheries sub-sector cross the states is negatively related with CAGR of government expenditure on fisheries sub-sector across the states. SAGR of UPS employment in fisheries sub-sector across the states is positively related with CAGR of government expenditure on fisheries sub-sector across the states but SAGR of USS employment in fisheries sub-sector across the states is negatively related with CAGR of government expenditure on fisheries sub-sector across the states. Here estimated correlation coefficients are not statistically significant (Table 10 and Table 11).

5.4 *Forestry Sub-sector*

Share of expenditure on forestry has declined in most of the major and minor states. Share of value of output of forestry sub-sector and share of employment (UPS and USS) in forestry sub-sector across the states are positively related with the share of government expenditure on forestry sub-sector across the states in all the years under consideration. Here the estimated correlation coefficients are not statistically significant (Table 12 and Table 9).

CAGR of government expenditure on forestry sub-sector is positive in 14 states out of 15 major states and in 11 minor states out of 12 states. Correlation coefficient shows CAGR of value of output from forestry sub-sector and CAGR of government expenditure are positively related across the states. Correlation coefficients also show that SAGR of UPS and USS employment in forestry sub-sector negatively related across the states. The estimated correlation coefficients are not statistically significant (Table 10 and Table 11).

Data on government expenditure on agriculture (excluding expenditure on agricultural research and education) includes expenditure for extension works and all other promotional activities. These activities are taken mainly by line departments, Krishi Vigyan Kendras (KVKs), Agricultural Universities, institutions under Indian Council of Agricultural Research (ICAR), etc. Survey of literatures in this area reveals that public sector line departments, viz. the Department of Agriculture remained the main agricultural extension agency in the 60's and 70s. But the last two decades have witnessed the increasing involvement of private sector, NGOs, community based organisations and media (Rasheed, 2012). KVKs are the most important carriers of frontline technologies and impart knowledge and critical input support for the famers at the ground level (NILERD, 2015). Due to the interventions of KVK scientists in training, demonstrations activities, on farm trials and other extension activities helped in enhancing the knowledge of farmers which in turn led higher adoption of agricultural production technologies (Singhal and Vatta, 2017) which led to increase in the agricultural productivity. Although KVKs have positive

impact in increasing productivity but it has very little impact on generating gainful employment for the farmers. This clearly reflects that KVKs need to orient its effort for entrepreneurship development among farming community so that farmers/trainees are not only self-employed but also create opportunity for unemployed (Ahmad *et al*. 2012). Not only KVKs but other public agencies like agricultural university/college and veterinary department are also engaged in providing extension services to the farmers.

The most important question is that to what extent the above mentioned agencies have succeeded in providing extension services at the farm level. As in the case of agricultural extensions, agricultural research and education activities are undertaken by a large number of organisations and agencies such as agricultural universities and institutions under Indian Council of Agricultural Research (ICAR), Krishi Vigyan Kendras (KVKs), Non-Government Organisations (NGOs), Central and State Department of Agriculture, Agricultural Technology Information Centres (ATICs). All these organisations have their impacts on agricultural output and employment. Consideration of these impacts at the farm level requires field survey and primary data which are beyond the scope of this present study. However, data from the Situation Assessment Survey of Farmers conducted by NSSO can throw some lights in this regard. 'Situation Assessment Survey of Farmers' conducted by NSSO during the year 2003 showed that only 40.40 per cent cultivating households in India has accessed technical helps from one or other source. Among the sources, the share of public agencies is very low. Radio/TV/newspapers (29.30 per cent) and Progressive farmer (16.70 per cent) were the two main sources for giving technical help to the farmers. Only 5.70, 0.70, and 2.00 per cent farmers have taken technical help respectively from extension agents, KVKs and Government demonstration farms. Gradually numbers of KVKs, Agricultural universities/colleges have increased but still they have failed to reach a large section of cultivating households.

Situation Assessment Survey of Agricultural Households conducted by NSSO in January-July, 2013 showed that only 35 per cent of the cultivating households in India has sought technical help from this or that source. Among the sources the share of public agencies remained at very low level as it was during the earlier survey in 2003. Progressive farmers (18.40 per cent) and radio/TV/newspaper/internet (17.00 per cent) were the two main sources for giving technical help to the farmers. Only 3.80, 2.40, 9.00 and 6.8 per cent farmers have taken technical help respectively from extension agents, KVKs, agricultural universities/colleges and veterinary department. Though the number as well as the works of Agricultural Universities, KVKs, research institutes have increased over the years but these are much less than the required level. All these research and extension organisations work in their immediate surrounding areas. Actually covered areas under these research and extension organisations are very small compared to the total areas under agriculture. More and more attentions as well as flow of funds are required for increasing the coverage of these research, education and extension organisations.

VI

GOVERNMENT EXPENDITURE ON RESEARCH AND EDUCATION IN AGRICULTURAL SUB-SECTORS

Agricultural research and education is an important factor in promoting agricultural development. It promotes innovation and adoption of new efficient production techniques, machinery, generates efficient human resources and improves agricultural marketing. Impacts of expenditure on agricultural research and education on production and employment in agricultural sector need careful examination.

States have been ranked in two ways: (A) according to the share of government expenditure on research and education in agricultural sector to Net State Domestic Product (NSDP) from agricultural sector and (B) according to the share of government expenditure on research and education in agricultural sector to total expenditure on agricultural sector (Table 13).

TABLE 13. STATE WISE SHARE OF GOVERNMENT EXPENDITURE ON RESEARCH AND EDUCATION (R AND E) TO AGRICULTURAL NSDP, SHARE OF GOVERNMENT EXPENDITURE ON RESEARCH AND EDUCATION TO TOTAL EXPENDITURE IN AGRICULTURAL SECTOR AND CAGR ON RESEARCH AND EDUCATION IN AGRICULTURAL SECTOR

(*per cent*)

	Percentage share of expenditure on R and E to agricultural NSDP				Percentage share of expenditure on R and E to total expenditure in agricultural sector				
	1993-94		2011-12		1993-94		2011-12		CAGR on
	Share	Rank	Share	Rank	Share	Rank	Share	Rank	R and E
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Haryana	0.312	6	0.521	6	11.98	2	15.46	1	2.15
Punjab	0.307	8	0.31	10	13.70	1	13.2	2	1.14
Rajasthan	0.21	10	0.165	14	5.54	9	3.67	12	1.08
Uttar Pradesh	0.173	11	0.35	9	6.38	7	8.48	5	2.19
Andhra Pradesh	0.35	4	0.7	4	8.97	3	12.16	3	2.52
Karnataka	0.311	7	0.519	7	6.39	6	5.28	11	2.88
Kerala	0.58	1	0.93	1	7.76	5	6.78	9	0.95
Tamil Nadu	0.45	2	0.84	3	3.42	13	7.75	6	1.67
Gujarat	0.34	5	0.65	5	8.76	4	10.82	4	2.45
Madhya Pradesh	0.17	12	0.171	13	2.94	14	1.67	14	1.79
Maharashtra	0.43	3	0.85	2	4.85	10	7.66	7	5.65
Bihar	0.25	9	0.44	8	5.94	8	7.03	8	2.98
Orissa	0.166	13	0.3	11	3.72	12	2.8	13	1.27
West Bengal	0.13	14	0.18	12	4.39	11	5.46	10	1.08
Assam	0.02	15	0.03	15	0.29	15	0.38	15	-0.18
Himachal Pradesh	1.11	2	1.67	3	7.26	2	8.94	3	1.94
Jammu & Kashmir	0.42	7	1.56	4	3.91	3	9.06	2	4.22
Delhi	0.02	9	0.08	10	3.1	4	1.3	8	8.2
Pondicherry	-		5.32		-		7.44		1.51
Goa	0.17	8	0.23	8	1.61	9	0.96	9	-0.05
Sikkim	0.56	3	2.63	2	1.68	8	7.97	4	-2.11
Manipur	0.51	4	0.15	9	3.07	5	0.65	10	-2.57
Meghalaya	0.46	6	0.56	6	2.04	7	1.59	7	0
Nagaland	0.48	5	0.71	5	2.26	6	4.44	5	2.7
Tripura	0.05	10	0.51	7	0.48	10	3.17	6	5.53
Arunachal Pradesh	8.11	1	10.36	1	20.5	1	32.4	1	1.73
Mizoram	-		0.52		-		0.89		7.05

Source: Same as in Table 1.

Percentage share of government expenditure on research and education in agricultural sector to Net State Domestic Product (NSDP) has increased in all the states (except in Rajasthan and Manipur). During the period under study according to way-A, rank of the states has improved only in 5 out of 15 major states. It declined in 4 major states and remained unchanged in 6 major states. Rank of the states, according to way-A, has improved only in 3 minor states and declined in 3 minor states but it remained unchanged in 4 out of 10 states during the study period

Percentage share of government expenditure on research and education in agricultural sector to total expenditure on agricultural sector has increased in 9 out of 15 major states and in 6 out of 10 minor states. Rank of the states, according to way-B, has improved from 1990-91 to 2011-12 in 5 major states and declined in 5 major states. It remained same in 5 major states. Rank of the states, according to way-B, has improved in 4 minor states and declined in 3 minor states but it remained unchanged in 3 out of 10 states during the study period. If share of expenditure on research and education is assumed as an indicator of the states' importance, then above findings show that majority of the states are giving importance to agricultural research and education.

The impact of changing pattern of government expenditure on research and education in agricultural sector on the changing pattern of activities in the agricultural sub-sectors has been examined in terms of correlation coefficient (i) between growth rates of value of output of agricultural sub-sectors and government expenditure on research and education and (ii) between growth rate of employment in agricultural sub-sectors and government expenditure on research and education.

6.1 *Crop Sub-sector*

Correlation coefficients show that CAGR of value of output from crop sub-sector is positively related with CAGR of government expenditure on agricultural research and education across the states (Table 14). SAGR of UPS employment in crop sub-sector is negatively but insignificantly related with CAGR of government expenditure on agricultural research and education. SAGR of USS employment in crop sub-sector is positively but insignificantly related with CAGR of government expenditure on

TABLE 14. CORRELATION COEFFICIENT BETWEEN GROWTH RATE OF ECONOMIC ACTIVITIES AND GROWTH RATE GOVERNMENT EXPENDITURE ON RESEARCH AND EDUCATION ACROSS THE STATES

Variables	CAGR of value of output and CAGR of expenditure on R and E	SAGR of UPS employment and CAGR expenditure on R and E	SAGR USS employment and CAGR of government expenditure on R and E
(1)	(2)	(3)	(4)
Crop sub-sector	0.433***	- 0.138	0.147
Livestock sub-sector	- 0.023	- 0.344	- 0.050
Fishery sub-sector	- 0.415	- 0.076	0.023
Forestry sub-sector	- 0.433***	- 0.001	- 0.022

Note: *,** and *** Significant at 10, 5 and 1 per cent level, respectively.

agricultural research and education across the states. Value of output of fisheries sub-sector has increased at a higher rate in the states where government expenditure on research and education grew at a higher rate and the estimated correlation coefficient is statistically significant.

6.2 *Livestock Sub-sector*

SAGR of employment (UPS and USS) and value of output from livestock sub-sector is negatively related with CAGR of government expenditure on agricultural research and education across the states. Employment (UPS and USS both) and value of output of livestock sub-sector has increased at a higher rate in the states where government expenditure on research and education grew at a lower rate. But estimated correlation coefficients are not statistically significant (Table 14).

6.3 *Fisheries Sub-sector*

Correlation coefficient shows that CAGR of value of output from fisheries sub-sector is negatively related with CAGR of government expenditure on agricultural research and education across the states. SAGR of UPS employment in fishery sub-sector is negatively related with CAGR of government expenditure on research and education across the states. SAGR of USS employment in fisheries sub-sector is positively related with CAGR of government expenditure on research and education across the states (Table 14). Here all the estimated correlation coefficients are not statistically significant.

6.4 *Forestry Sub-sector*

Correlation coefficient shows CAGR of value of output from forestry sub-sector and CAGR of government expenditure on research and education are negatively related across the states. SAGR of both UPS and USS employment in forestry sub-sector and CAGR of government expenditure on research and education are negatively related. But estimated correlation coefficients are not statistically significant (Table 14).

So far it has been observed that there are mixed impact of expenditure done on agricultural research and extension.

VII

DIVERSIFICATION OF ECONOMIC ACTIVITIES AND ROLE GOVERNMENT EXPENDITUREIN AGRICULTURAL SECTOR

To find out how changes in government expenditure on activities related to crops, livestock, fishery and forestry over this period have affected the economic activities

of these sub-sectors and thereby led to agricultural diversification, a double log panel regression equation has been estimated. Year wise level of economic activities(as measured by the value of output) related to the different sub-sectors of agricultural sector and agricultural diversification are dependent on the cumulative expenditure of past years and not on the expenditure incurred in a particular year. Consideration of alternative of 2, 3, 4 and 5 years' cumulative total expenditure as the explanatory variable for regression analysis showed that R^2 is highest when four years' cumulative total expenditure last is taken as the explanatory variable. Simpson index of agricultural diversification is the dependent variable. Simpson index has been calculated considering four sub-sectors (crop, livestock, fishery and forestry) of agriculture. Again states are of different sizes. For standardisation, expenditure of the states has been considered per unit of 1000 Sq.km of geographical areas.

Following regression equation has been estimated:

$$\log(ADI)=a+b1 \log(CGECLFF) \quad ....(1)$$

where ADI=agricultural diversification index and CGECLFF = Four year's cumulative government expenditure on crop, livestock, fishery and forestry sub-sectors.

Regression result shows that cumulative government expenditure on crops, livestock, fisheries and forestry sectors has a positive and significant impact on agricultural diversification. This implies extension, training and other government active participations help the farmers to shift their economic activities from crop sub-sector to other agricultural sub-sectors (Table 15).

TABLE 15. REGRESSION BETWEEN AGRICULTURAL DIVERSIFICATION INDEX AND GOVERNMENT EXPENDITURE ON CROPS, LIVESTOCK, FORESTRY AND FISHERY SECTORS

Variables (1)	Coefficient (2)
Total government expenditure on crops, livestock, fisheries and forestry	0.013*
Constant	- 0.305***
F value	2.93*

Note: * and *** Significant at 10 and 1 per cent level, respectively.

Similarly, a panel data regression equation has been estimated to examine the effect of government expenditure on research and education on agricultural diversification. Cumulative government expenditure on agricultural research and education per 1000 square kilometres area for the last 2, 3, 4.....10 years has been considered one by one as the explanatory variable. But no statistically significant result has been found. It may be due to the fact that the research and education of a particular state is only a part of the total research expenditure incurred at the state level.

VIII

SUMMARY AND CONCLUSION

The share of government expenditure in crop sub-sector and share of value of output from crop sub-sector, are positively related but the relationship is not significant. But CAGR of value of output of crop sub-sector and CAGR of government expenditure on research and education are positively and significantly related. Value of output of crop sub-sector has increased at a higher rate in the states where government expenditure on research and education grew at a higher rate. State government expenditure on crop sub-sector is negatively and insignificantly related with share of UPS employment in crop sub-sector.

Share of government expenditure on fisheries sub-sector and share value of output from fisheries sub-sector are positively and significantly related. Share of government expenditure on fisheries sub-sector and share UPS employment in fisheries sub-sector are positively and significantly related. The states which incur more government expenditure on fisheries sub-sector are the states where value of output of fisheries sub-sector as well as UPS employment generated in fisheries sub-sector are more.

Share of government expenditure on forestry and share of value of output from forestry sub-sector are positively but insignificantly related. Government expenditure on crops, livestock, fisheries and forestry could encourage the farmers to diversify from crop sub-sector to other agricultural sub-sectors.

From this analysis it can be concluded that as in the industrial sector, jobless growth also exists in the crop sector. On the other hand, the fisheries and forestry sectors have huge capacity to generate rural employment. Government should take special care to promote these sub-sectors to revive the rural economy.

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