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## **Transitioning India's Public Expenditure in Agriculture towards Higher Growth and Equity**

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### ABSTRACT

The study aimed to develop broader series of public expenditures and investments impacting growth of agriculture and allied sectors and explored how sectoral and regional priorities of agricultural investments had responded to the national priorities by tracing their growth linkages. The study indicated that following a period of stagnation in the 1990s, public expenditure on agriculture and allied sectors has stepped up in the mid-2000 decade. Further, the broad observations do not corroborate the idea of neglecting marginal agro-eco-regions as far as public investment in agricultural research is concerned. However, higher infrastructure and agricultural research investment priority should be given to relatively backward states of eastern India, as the region still has poor infrastructure and higher concentration of subsistence producers which make private sector hesitant to invest. Enhanced public investment is justified to strengthen infrastructure and also attract private investment leading to high pay-offs as the region is well endowed with natural resources. The other issue relates to prioritisation of public resources towards those sectors and regions where presence of market failures or core distributional concerns exists. The public resources should increasingly be deployed to produce goods and services that are not produced by market actors. The rising government spending under revenue account on agri-inputs and farm support services can also have a crowding-out effect on private investment. Studies have shown that the biggest payoffs for reducing rural poverty and increasing growth came from investments in R&D and infrastructure and that too from backward regions. These investments must, therefore, be treated as a composite strategy for rural development and a sustained step-up in investments should be maintained in order to benefit agriculture, given that the benefits from these investments tend to materialise after a considerable time lag. The policy shift towards raising capital expenditure in rural infrastructure and irrigation would translate into economic gains only, if it is backed by responsive institutions as they form part of the enabling environment for private investment.

**Keywords: Growth and equity, Public investment, Agricultural research.**

**JEL: E62, Q16, Q13, Q14.**

### I

#### INTRODUCTION

Globally, it is a well-articulated fact that technology, investments, enabling institutions and policies have driven agricultural growth and poverty reduction. India's agricultural gross domestic product (GDP) and total factor productivity growth witnessed phenomenal growth since the Green Revolution period following significant investments in public rural goods especially agricultural research, infrastructure and irrigation. During the decades of the 1970s and 1980s, agricultural GDP growth attained new peaks as the growth stimulus spread into wider areas with the rapid adoption of high-yielding varieties of cereals. However, this impressive

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overall growth performance could not be sustained for long and showed a marked slowdown during the later years of the nineties till early years of the last decade. Several reasons were attributed to this decline, ranging from degradation of the land resources due to intensive cultivation, decline in public investment, rise in energy prices, inefficient markets etc. among others. Though, resurgence of agricultural growth since 2004-05 was seen as a sign of optimism, but much of the recent growth has been spurred by price growth rather than productivity induced (Chand and Shinoj, 2012, Birthal *et al.*, 2014). Further, the optimism about catalytic effect of rising rural non-farm sector on agricultural incomes also seems to be waning, as a number of studies highlighted the fact that the growth of the rural non-farm sector is more of distress induced rather than driven by agricultural growth (Jatav, 2010, Abraham, 2009, Ranjan, 2009, Himanshu, 2011). The declining contribution of productivity and rising share of prices in agricultural growth may not be sustainable for long, and in fact demands a balance between both price and non-price interventions so that all sections of the society are benefitted (Dev and Rao, 2010).

This revisits the fact that productivity increase in agriculture is the only effective driver of sustainable economic growth and poverty reduction both within and outside agricultural sectors.

There is rich literature suggesting that enhanced expenditure on rural public goods contributes strongly to agricultural growth across regions, although with varying degrees; and within agriculture, expenditure on infrastructure and R&D sectors continue to be the most desirable way of increasing farm profitability (Fan *et al.*, 2007). Further, rural public goods are complementary to private on-farm investment; investing in former often enhances investments in the other by creating enabling environment. Evidence also shows that agricultural productivity and poverty reduction are compatible goals, with investments in rural public goods usually having high pay-offs for both (FAO, 2012). Achieving these goals will require a significant increase in agricultural spending, but more importantly, setting right priorities and efficiency in spending.

In the light of the continuing underperformance of country's agricultural growth in relation to the targets set, questions are being raised about the magnitude, priorities and efficacy of public expenditure for agriculture sector. Based on spatial, temporal and sector-wise dataset<sup>1</sup> of public expenditure made for agriculture, a key policy indicator of government's priority towards its development, the study explores the extent to which the level and composition of public expenditures in the agricultural sector is consistent with both national and regional priorities. The paper also studies the impact of public investment in agriculture on farm households' access to farm services, on-farm capital stock and productivity. This paper intends to provide insights into an ever pertinent question whether agricultural public expenditures are strategically prioritised across regions and sectors, and in the light of these, suggestions are made to enhance use of limited public resources.

## II

## RESULTS AND DISCUSSION

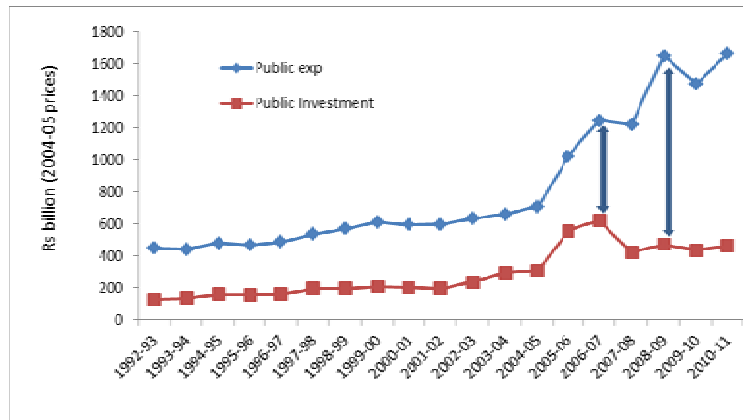
*Level and Composition of Public Expenditure and Investment for Agriculture and Allied Sectors*

The all India real public expenditure, based on the aforesaid definition, was estimated to have risen from Rs. 455 billion in TE<sup>2</sup> 1995 to Rs. 1,595 billion in TE 2011 (Figure 1). However, most of this growth occurred during 2004 to 2011 (14 per cent per annum) mainly through the central government's initiative, as is evident from its growth (32 per cent) during the period (Table 1). At all India level, the expenditure items that constitute major share were primarily agri-inputs and support services (44 per cent) followed by rural infrastructure mainly roads and rural electrification, other infrastructure like rural cooperatives, finance and markets etc. (29 per cent), major, medium and minor surface irrigation systems (22 per cent) and agricultural research, education and extension (5 per cent) during TE 2011. The growth in the expenditure on agri-inputs and support services (related to crop husbandry, animal and dairy husbandry, soil and water conservation, fisheries and plantation etc.) was particularly rapid since 2004-05. This expenditure head continued to grow at 22 per cent per annum during 2004-10 and includes various centrally sponsored, central sector and additional central assistance schemes related to agriculture and allied sector. These schemes intend to serve the multiple purposes like increase in rural incomes, transforming the countryside, narrowing rural-urban disparity through agricultural modernization, and public services expansion in rural areas. Substantial plan expenditures took place in different states through these schemes which have been greatly expanded during the Twelfth Plan. This substantially raised momentum in expenditure growth, raising share of agricultural expenditure to AgGDP to 24 per cent in TE 2010 from just 11 per cent in TE 1995. The majority of the expenditure under this head is of recurring in nature with little emphasis on asset creation. The deliberate policy changes towards short term spending plan were designed primarily to dispense inputs and farm services with involvement of beneficiaries as passive recipients (Hans, 2012).

TABLE 1. GROWTH IN PUBLIC EXPENDITURE AND INVESTMENT FOR AGRICULTURE (CAGR)

(1)	<i>(per cent)</i>		
	1991-92 to 2003-04 (2)	2004-05 to 2010-11 (3)	All period (4)
Public Expenditure			
Centre	7.41	31.70	15.27
All States	3.50	8.27	5.74
Public Investments			
All States	5.32	7.39	8.90

*Source:* Estimated by authors.



Source: Compiled by authors from Combined Finance and Revenue Accounts, Government of India (various years).

Figure 1. Trends in Public Expenditure and Investments in Agriculture and Allied Sectors (All India)

A significant proportion of the government expenditure for agriculture has been in the form of capital expenditure (investment<sup>3</sup>) for asset creation. Its share in total agricultural expenditure increased from 26 per cent in TE 1995 to 39 per cent during 2002-2007, but declined to 24 per cent in TE 2011. In absolute terms, public investment<sup>4</sup> grew three and half times from Rs. 140 billion in TE 1995 to Rs. 456 billion in TE 2011 (Figure 1). As discussed above, major reason for the decline in investment is the rapid increase in the revenue expenditure in the recent years on agri-inputs and support services, and increased administrative cost due to rapid expansion of major and medium irrigation and power projects. As a result, there has been a growing divergence between expenditure and investment indicating increase in size of expenditure, but shrinking capital formation. The stagnancy in public investment for agriculture is also noticeable as its share in AgGDP still remained at 6 per cent as against 11 per cent in non-agricultural sector during TE 2011. Though, across the countries comparison of agricultural investment is difficult owing to limited data availability and differences in the definitions/ methods used, still evidence showed that China and India have substantially lower rates of investment in agriculture than the overall economy in contrast to Brazil (Landes, 2008).

Though, the public investment for agriculture by all states grew from 5.3 per cent in the 1990s to 7.4 per cent in the 2000s (Table 1), still the broader composition of public investments has not changed much since last two decades. Major and medium irrigation still claims about half of the resources (55 per cent) followed by rural roads (19 per cent), electricity (11 per cent), agricultural finance, co-operatives and marketing (2 per cent) and agricultural research including education and extension (8 per cent). There also exist large regional variations, as all states experienced higher investment intensity (investment share in state agricultural gross domestic product) in

TE 2011 as compared to TE 1995, except Bihar, Punjab, Assam, Rajasthan and West Bengal. Maharashtra and Andhra Pradesh attained substantially higher investment intensity as compared to poverty stricken states of West Bengal, Rajasthan and Bihar. However, it is equally worrying to note that majority of the states except Maharashtra, Andhra Pradesh, Karnataka, Kerala, Assam and Himachal Pradesh, could not sustain the investment growth momentum of the 1990s (Table 2).

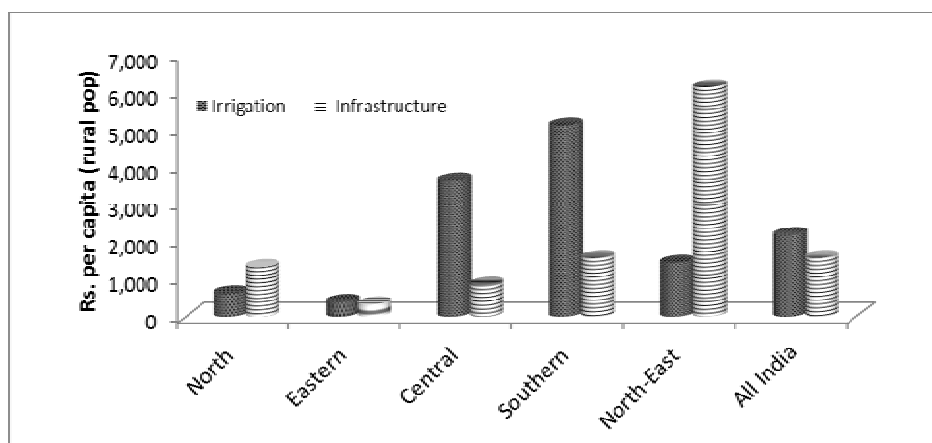
TABLE 2. STATE-WISE PUBLIC INVESTMENT INTENSITY AND GROWTH IN AGRICULTURE

States (1)	Share of investment in state agricultural domestic product (per cent)		Compound annual growth rate (per cent)	
	TE 1995 (2)	TE 2011 (3)	1991-1999 (4)	2000-2010 (5)
West Bengal	0.77	0.68	13.31	7.12
Kerala	2.88	3.25	1.80	7.08
Himachal Pradesh	4.75	6.68	5.20	9.54
Punjab	2.24	1.88	0.89	0.38
Haryana	2.00	3.45	12.68	8.12
Rajasthan	3.45	1.55	2.28	-3.94
Madhya Pradesh	3.22	3.78	0.98	1.74
Maharashtra	6.14	15.36	3.53	12.50
Orissa	4.22	4.71	7.96	3.33
Karnataka	5.07	9.30	4.35	7.67
Gujarat	3.17	3.05	14.54	2.06
Andhra Pradesh	3.57	11.54	7.73	16.63
Assam	2.50	5.23	3.98	13.12
Bihar	2.53	0.90	-3.18	-5.84
Tamil Nadu	1.99	6.17	14.91	11.31
Uttar Pradesh	1.18	4.93	15.29	13.44

Source: Computed by authors.

### *Regional and Sectoral Public Investment Priorities*

Development of rural infrastructure has been key to rural social and economic life. Irrigation attracted most of the public investment for creation and development of major and medium irrigation infrastructure, especially dams, reservoirs, and canal networks. The real investment (at 2004-05 prices) on major and medium irrigation including command area development grew from Rs. 89 billion in TE 1995 to Rs. 191 billion in TE 2011 at an annual growth rate of 7 per cent. Across all the regions, southern states invested highest on irrigation as measured by per capita real cumulative capital expenditure (2000-2009) followed by the central region of India (Figure 2). Although government investment in water-related projects has soared in recent years, it is heavily biased towards the construction of large-scale facilities and major water systems. More than 80 per cent of government spending on water management was assigned to large water development, leaving little role of minor surface water and water conservation schemes, while farmers are responsible for ground water irrigation at farm level.



Source: Computed by authors.

Figure 2. Per Capita Cumulative Real Capital Expenditure on Irrigation and Rural Infrastructure in Different Regions (2000-09).

Next to irrigation, investment in infrastructure especially rural roads and electrification received highest priority over the years. At all India level, real public investment on all kinds of rural infrastructure (rural roads and electricity, credit, cooperatives and markets) has risen from Rs. 16 billion in 1990-91 to Rs. 131 billion in 2010-11. Their share in total public investment increased from 15 per cent in TE 1995 to 29 per cent in TE 2010. Starting from a base of 0.5 per cent of AgGDP in TE 1995, infrastructure investment rose to touch 2 per cent of AgGDP in TE 2011 at the national level. However, the magnitude and compositional changes within investment varied across the states, and it varied from as low as 0.2 per cent of AgGDP in Bihar to an average of 14 per cent in the north-eastern states in TE 2010. Overall, the trend confirms a conscious policy shift towards enhanced focus on infrastructure development in the north-eastern states during the last decade (Figure 2). Other than the north-eastern states, Uttarakhand, Tamil Nadu, Uttar Pradesh, Karnataka and Maharashtra showed infrastructure investment intensity higher than the national average. However, the analysis clearly showed that relatively poor states of eastern India still spend far less than the progressive states of the northern, central and southern regions (Figure 2).

The role of government in provision of public services like agricultural research education and extension is of utmost importance, and therefore, government plays a major role in its funding and execution. At the national level, the real expenditure on agricultural research and education (Ag R&E) has risen little less than four-fold in the last two decades from Rs. 15 billion in 1990-91 to Rs 68 billion in 2010-11. The all India real spending on Ag R&E grew by 5.8 per cent during the nineties and maintained its growth momentum during the 2000 decade (7.2 per cent) too, but substantial increase came only during the second half of the decade (13 per cent per

annum between 2005-06 to 2010-11. The recent spurt in Ag R&E investments have led to an impressive rise in the research intensity (share of Ag R&E investment to AgGDP (0.63 per cent in TE 2011) Further, disaggregating total Ag R&E expenditure into research and other expenditure, the total research expenditure (net of education and frontline extension activities) was estimated to Rs. 50 billion in 2010-11, constituting only 0.36 per cent of agricultural gross domestic product. Hence, the excitement of recent hike in agricultural research spending to reach at least one per cent of AgGDP is still a distant reality (Singh and Pal, 2015). Further, the figure is much less than China (0.50), Brazil (1.80), South Korea (2.30) and substantially lower than the developed countries like Australia (3.56), Japan (4.75) (Pal *et al.*, 2012).

The resource allocation for agricultural research and education across different agro-climatic regions of the country, clearly exhibits an increased R&D attention towards marginal production environments (Figure 3). This is particularly true for the hills and northeastern region (having research intensity close to one per cent) which received higher resource attention by both ICAR and state governments. The region requires higher research resource allocation because of difficult terrains and need of location specific research. The semi-arid region which constitutes the highest share in country's cropped area and agricultural workers, also shared the largest research resources. The demand for agricultural research continues to be strong in these regions as their agro-ecological conditions are more complex and risk-prone. New

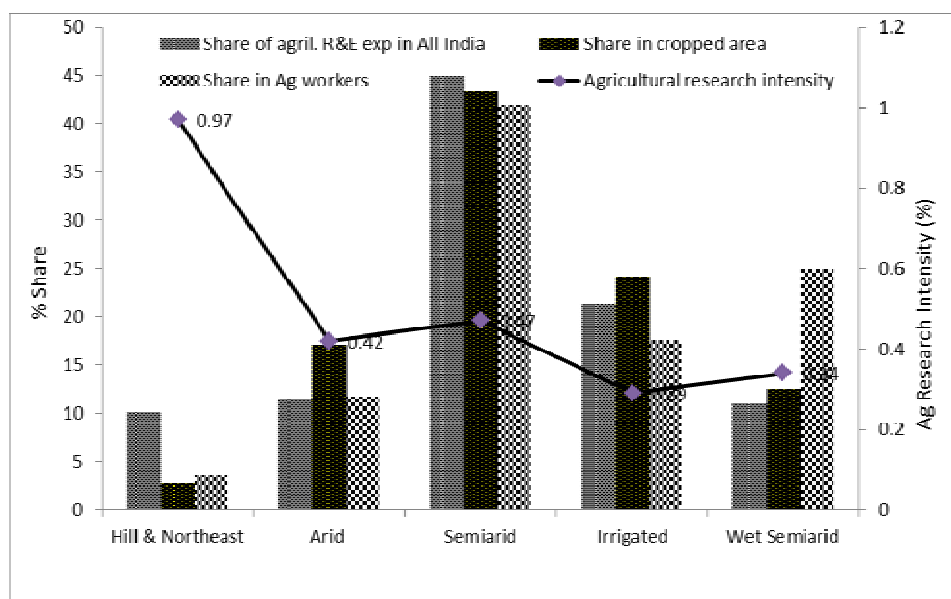


Figure 3. Agricultural Research and Education Investments in Different Agro-Climatic Regions of the Country (2010-11).

breakthroughs are needed in water-saving technologies in cultivation, enhancement of land productivity, natural resource management and climate-resilient agriculture. The irrigated agro-eco region which has received the highest resource priority during the Green Revolution era and shares one-fourth of gross cropped area, now spend 0.29 per cent of AgGDP in 2010-11. This should be viewed amidst the fact that the recent growth revival has been weak in this region, and yields of rice and wheat has almost reached to a plateau. Hence achieving growth by accelerating higher productivity levels without infusing new technology in the region, which demands higher research investments, seems difficult.

The most worrying fact is that wet semi-arid region comprising mainly of agrarian and poverty stricken states like Assam, Bihar, West Bengal and Odisha still deserve higher research resource allocations as revealed by relatively lower research intensities. These states tend to have poor infrastructure and higher concentration of subsistence producers which make the private sector hesitant to invest. Experience across developing countries including India provides evidence that more investments in less-developed regions not only offer the largest poverty reduction per unit of spending, but also lead to the highest economic returns (Fan, 2007).

#### *Impact of Public Investments on Farmers' Access to Public Goods, On-Farm Capital Stock, and Agricultural Productivity*

This section explores an important question as whether recent spurt in agricultural expenditure has enhanced farm households' access to farm services. It is evident that, despite the fact that the major and medium surface irrigation projects have been assigned a consistent investment priority since last several decades, still half of the farmlands have no access to it. Canal irrigated areas as a percentage of total area irrigated is declining and now constitute only one-fifth (Table 3). Many of the irrigation projects suffered huge time and cost overruns and therefore, growth in area irrigated through publicly funded schemes slowed down and large number of unfinished irrigation projects piled up. In spite of huge central assistance released under Accelerated Irrigation Benefits Programme (AIBP), the success has been modest only, and the utilisation of the irrigation potential was also unsatisfactory (Government of India, 2011). One of the notable achievements in the development of rural India has been the rapid increase of electrification and use of electricity for agricultural purposes. In 1970, only 34 per cent of the villages in rural India had access to electricity. But in 2010, this percentage had increased to almost 90 per cent, and access to power has increased in terms of per capita electricity consumption. This rapid increase in electrification not only contributed to agricultural productivity growth through encouraging more irrigation, but also contributed to rural economy through generation of non-agricultural employment opportunities. Similarly, the road transport sector has expanded manifold, both in terms of spread (total road length and road density) and capacity (No. of registered vehicles on road and the volume of



TABLE 3. AGRICULTURAL HOUSEHOLD'S ACCESS TO RURAL INFRASTRUCTURE AND TECHNOLOGY SERVICES- ALL INDIA

Per cent of area irrigated by different sources of irrigation-All India					
(1)	Canal (2)	Minor surface works (3)	Ground water (4)	Combination of these three sources (5)	Others (6)
(Jul-Dec, 2012)	21	5	67	4	3
Percentage distribution of quantity sold by agency for selected crops during January, 2013- June, 2013					
	Local private trader	Mandi	Co-operative and Government agency	Input dealers	Others
Paddy	64	17	6	11	2
Wheat	29	44	19	7	0
Per cent of agricultural households having accessed technical advise by different sources-All India					
	Extension agent	KVKs	Agri Univ/college	Progressive farmer	Radio/TV/ Newspaper
Jan-June 2013	4	2	1	18	17
Per cent of agricultural households not insuring their crops for selected crops July, 2012- June, 2013					
July, 2012- December, 2012	Paddy	Wheat	Sugarcane	Cotton	Potato
	95.2	95.3	98.7	89.6	99.7

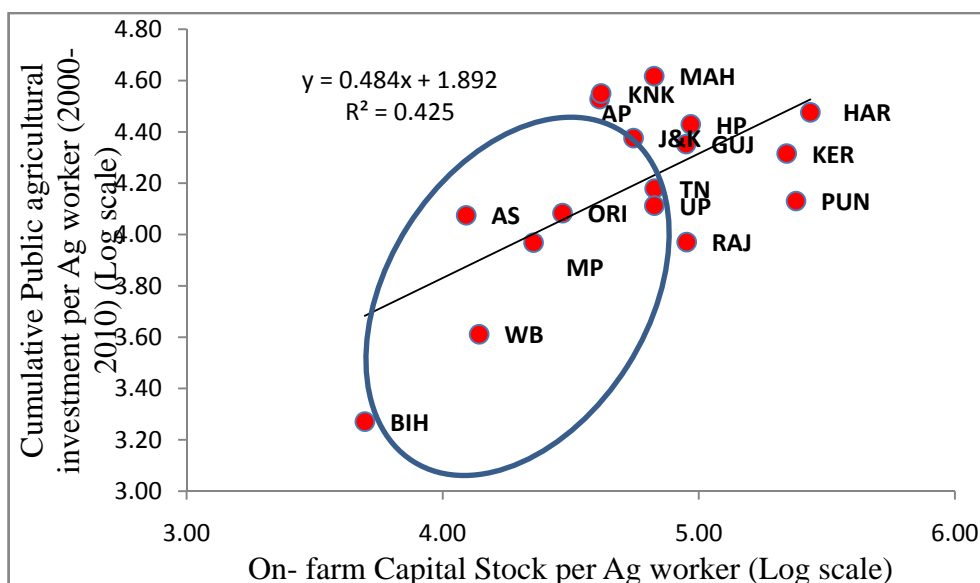
*Source:* Compiled from Key indicators of situation of agricultural households in India, NSSO 70th Round Data.

passenger and freight traffic handled). The surface road length in rural areas grew (4.3 per cent per annum) faster than that in urban areas (1.49 per annum) during 2001-08, which increased rural road density per 1000 population from 4.20 km to 4.86 km during the same period (Government of India, 2011).

Agricultural households' access to modern technology and technical advice in agriculture is another important aspect which positively affects the farm profitability. The National Sample Survey (2012) shows that, inspite of continued proliferation of new SAUs in specialised disciplines, only 41 per cent of the cultivating households availed technical advice from different sources during the period July 2012-December 2012. The major sources of technical advice were progressive farmers and media, while share of SAU's and KVK's was miniscule. Similarly, a very small segment of agricultural households insured their crops against possible crop losses. The trend of under-insurance was seen consistent across all the major crops. Among the reasons for not insuring the crops, lack of awareness and its availability were cited as the most prominent one. The survey also highlighted a low level of awareness about minimum support prices in paddy and wheat among agricultural households, and even lower level of sale of these crops to the procurement agencies. The majority of the production was sold off to either local private trader or mandi, showing sub-optimal utilisation of procurement agencies (NSSO, 2014). These deficiencies give sufficient evidence of limited access to farm services by farm households amidst the recent spurt of expenditure in agriculture.

Further, given the observed diversity in the levels and composition of public investment across states, it is also important to explore whether private investment

has increased faster in those states that had higher public investment levels. Do states having higher public investment in agriculture also have higher on-farm agricultural capital stock? To answer this, we calculated correlation coefficients across twenty states between the cumulative public investments in agriculture per agricultural worker and agricultural capital stock<sup>5</sup> per agricultural worker for the year 2007. The correlation indicates that the relationship between the level of public investment and the agricultural capital stock in 2007 was positive and significant. This clearly suggests a decisive role of public investment in creating an enabling environment for private investment in varied agri-environments. However, the variation of observations around the fitted trend line indicates that other factors also affect the relationship such as composition of public investment on agriculture and their effectiveness (Figure 4). Nevertheless, this relationship provides a strong signal for state governments to change priorities in budget allocations in favour of agriculture especially for states of eastern India.

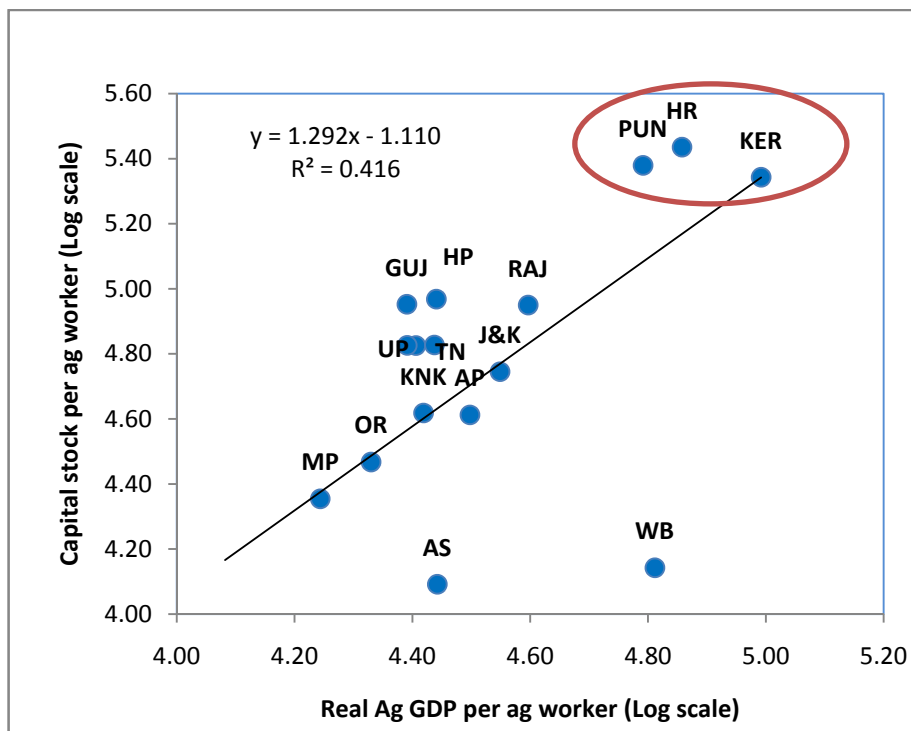


Source: Estimated by authors

Figure 4. Government Expenditure on Agriculture Per Worker and the Agricultural Capital Stock Per Worker for Major States (2007).

The other important issue is whether the increase in on-farm capital stock is sufficient to stimulate agricultural productivity. Figure 5 shows the correlation between agricultural capital stock per worker and labour productivity (measured by state AgGDP per worker). The two are found correlated and rise markedly with overall per capita income levels of states except West Bengal and Assam. Thus, the relationship between aggregate capital-labour ratio and the productivity of labour

engaged in agriculture also reinforce the argument that capital stock tends to have a short run positive impact on productivity of labour in agriculture. An effort was made to estimate the long run and causal relationship between capital-labour ratio and labour productivity using autoregressive distributed lag (ARDL) bounds testing approach. The ARDL test indicated a weak long run movement between agricultural productivity and capital stock at the aggregate level for the period 1990-2007. However, the empirical investigation could not establish the direction of causality between the variables (Pearson *et al.*, 2001). Nevertheless, the close correlation between public investments and on-farm capital stock, and capital-labour ratios and agricultural labour productivity suggest that significant increases in investments will be the major driver of future sources of growth in eastern states of India.



Source: Estimated by authors.

Figure. 5: Relationship between Agricultural Capital Stock and Productivity.

### III

#### FUTURE INVESTMENT PRIORITIES FOR INCLUSIVE GROWTH

The study concluded that, following a period of stagnation in the 1990s, public expenditure for agriculture and allied sectors has stepped up in the mid-2000 decade.

Further, the broad observations do not corroborate the idea of neglecting marginal agro-eco regions as far as public investment in Ag R&E is concerned. However, higher infrastructure and Ag R&E investment priority should be given to relatively backward states of eastern India, as the region still has poor infrastructure and higher concentration of subsistence producers which make private sector hesitant to invest. Enhanced public investment is justified to strengthen infrastructure and also attract private investment leading to high pay-offs as the region is well endowed with natural resources.

The other issue relates to prioritisation of public resources towards those sectors and regions where presence of market failures or core distributional concerns exists. The public resources should increasingly be deployed to produce goods and services that are not produced by market actors. The rising government spending under revenue account on agri-inputs and farm support services may have a crowding-out effect on private investment. Studies have shown that the biggest pay-offs for reducing rural poverty and increasing growth came from investments in R&D and infrastructure and that too from backward regions (Pingali, 2011). These investments must, therefore, be treated as a composite strategy for rural development and a sustained step-up in investments should be maintained in order to benefit agriculture, given that benefits from these investments tend to materialise after a considerable time lag. The policy shift towards raising capital expenditure in rural infrastructure and irrigation would translate into economic gains only, if it is backed by responsive institutions as they form part of the enabling environment for private investment.

In addition to investment in creation of physical infrastructure, the investment should be directed towards designing and up-scaling participatory and innovative institutions, improved rural markets, technology development for disadvantaged regions and groups and facilitating non-farm enterprises in rural areas. Substantial investment is further needed for up-gradation of irrigation infrastructure, but efforts to strengthen the institutions for efficient use of the investment and management of water resources will go a long way in increasing agricultural productivity.

#### NOTES

1. Public agricultural expenditure refers to spending by public authorities (Central as well as all state governments) for the development of the agricultural sector, covering major and medium irrigation, minor irrigation and command area development, rural infrastructure (rural roads, rural electricity, agricultural finance, cooperation and marketing), expenditure on agri-inputs and support services for crop husbandry, soil and water conservation, animal & dairy husbandry and fishery sectors, and also agricultural research and education and extension, both plan and non-plan types under revenue and capital heads. The actual expenditure data was drawn from Combined Finance and Revenue Accounts, Government of India from 1991 to 2011 for central government as well as all the major states. All expenditure measured at current prices were deflated by capital formation deflator and expressed at 2004-05 prices to ensure comparability.

2. Denotes triennium ending average

3. The expenditure is reported under two heads; revenue and capital. In theory, revenue expenditure is mainly used to cover day-to-day operation costs such as salaries, and maintenance of public capitals and offices, among many other items. Capital expenditures are expenses used for long-term capital formation, hence termed as investment.

4. Public investment as defined by the Central Statistical Organization (CSO) of India is an asset-based approach and comprises primarily irrigation Projects. The study views broader definition of capital formation and includes capital expenditure under the above mentioned heads, but also includes all revenue account expenditure made under agricultural research, education and extension.

5. Private investment in agriculture was measured in terms of agricultural capital stock, derived from FAOSTAT database<sup>1</sup> from 1975 to 2007. The state-wise net capital stock in agriculture in 2007 was arrived at apportioning the all India series by states share in farm household investment based on 2002-03 NSSO rounds. The agricultural capital stock is composed of the following four main components: land improvements, livestock, machinery and farm structures.

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