

Accelerating Agricultural Development for Inclusive Growth: Strategic Issues and Policy Options

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Like most other developing countries, India has predominantly been an agrarian economy, with agriculture sector contributing the largest share to gross domestic product (GDP) and employment. Under the colonial regime, Indian agriculture was geared towards the production of commercial crops (tea, coffee, rubber, cotton, etc.), while the food crops suffered from neglect. After independence, India depended heavily on imports of foodgrains as it inherited a stagnant, low-productivity, food-crop sector.

At the time of independence, the share of agriculture in total GDP was more than 55 per cent and about 70 per cent of the population was dependent on the agriculture sector for their livelihood. In the post-independence era, stagnant production, low productivity, traditional technology, and poor rural infrastructure were the major challenges for the Government. Not surprisingly, food self-sufficiency became a key national policy goal. To achieve this goal, agricultural development received the highest priority and in the First Five Year Plan, about 17.5 per cent of the plan outlay was allocated to agriculture and about 22 per cent to irrigation, multi-purpose irrigation, and power projects. However, in the Second Five Year Plan, the emphasis shifted from labour-intensive agriculture and small scale production to large-scale capital-intensive heavy industry (Dantwala, 1986). Consequently, foodgrains production during the first three Five Year Plans remained stagnant, and India faced crisis in food production.

The introduction of high yielding varieties (HYV) technology (commonly known as Green Revolution) in mid-1960s yielded spectacular results and the production of foodgrains increased from about 83.4 million tonnes in the triennium ending (TE) 1964-65 to 104.4 million tonnes in TE 1971-72 (GoI, 2012). Subsequently, the country, which was threatened by hunger and high dependence on imports as late as in mid-1960s, became one of the largest producers of many agricultural commodities such as rice, wheat, pulses, fruits and vegetables, etc., thus being self sufficient in staple foods. In aggregate, the food situation is quite favourable in the country and the problem of hunger is one of access and income distribution rather than shortages. Today, about 407 million people in India live below poverty line (GoI, 2009) and about 42 per cent of all children under 5 years suffer from malnutrition (HUNGaMA Survey Report, 2011). Increase in demand for food due to increasing population, rising income levels, and other demographic changes will require continuous in-

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crease in agricultural production. However, growth in productivity is slowing down in many states while the scope for expanding the area under cultivation as well as irrigation is limited. The growing environmental and natural resources concerns and food safety and human health issues associated with agriculture could threaten sustainability of agricultural growth. Therefore, the real challenges for agricultural sector in future would be to feed the ever growing population and to protect long-term sustainable productive capacity of natural resources like land and water.

In this paper, we analyse the dynamics of structural transformation of the Indian economy and major drivers of transformation, giving an overview of the past achievements and future challenges of Indian agriculture, finally identifying the key policy issues and strategies to accelerate sustainable broad-based growth in the agriculture sector in the country.

STRUCTURAL TRANSFORMATION OF INDIAN ECONOMY AND DRIVERS OF CHANGE

The Indian economy has undergone structural transformation from an agriculture-based to knowledge-based services and industrial economy but the agriculture sector is still the mainstay as about half of India's population is wholly or significantly dependent on agriculture and allied activities for their livelihood (GoI, 2011). The dependence of workforce on agriculture is high in rural areas as nearly 63 per cent of the male workers are engaged in agricultural sector and dependence of female workers is much higher as nearly 79 per cent of them are engaged in agricultural sector (GoI, 2011a). The contribution of agricultural sector to GDP has continued to decline over the years, while that of other sectors, particularly services, has increased. In 1970-71, agriculture contributed about 44 per cent of the GDP, which declined to 31.4 per cent and 13.9 per cent in 1990-91 and 2010-11 (at 2004-05 prices), respectively (CSO, 2012). The pace of structural transformation has accelerated in the post-reforms period. The decline in the share of agricultural workers in total workers has been slower as compared to the decline in the share of agriculture in GDP. During the last four decades, there was more than 30 percentage point decline in the share of agriculture in GDP, while the decline in the share of agriculture in employment was less than 20 percentage points. As a result, the labour productivity in agriculture has increased mar-

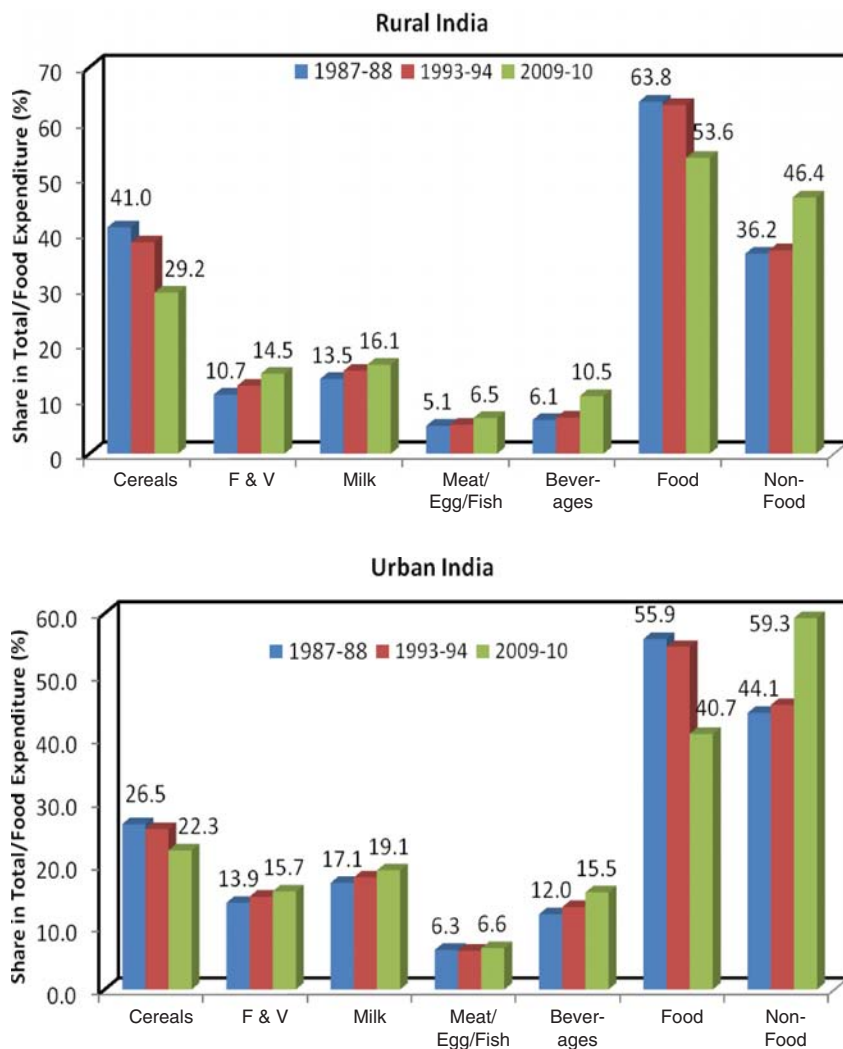
ginally, while for non-agricultural workers, it has increased rapidly. Moreover, the gap between agriculture and non-agriculture GDP has increased significantly in the post-reforms period leading to an increasing disparity between rural and urban areas.

Although the share of agricultural GDP has declined in almost all states, agriculture is still an important contributor to Gross State Domestic Product (GSDP) in some States like Punjab (24%), Madhya Pradesh (22.3%), Uttar Pradesh (21.7%), Assam (19.8%), and Bihar (19%) during TE 2010-11 (CSO, 2011). On the other hand, in States like Maharashtra (6.5%), Tamil Nadu (7.4%), Uttarakhand (8.9%), and Kerala (9.9%), the share of agriculture in GSDP is relatively low. But, that does not reduce the importance of agriculture as a large share of rural population in almost all the states is dependent on agriculture for employment and livelihood. However, the problem of disguised unemployment and underemployment in agriculture is an issue and has important implications for a variety of organizations working in agriculture and rural non-farm sector.

Other important structural changes are under way in agriculture and in the economy in general. First, higher disposable income levels, increasing urbanization, changing demographics and lifestyles, and increase in availability of food have been accompanied by changes in the composition of diet. According to Bennett's Law, as per capita incomes rise, consumers diversify their diets and demand high-value products such as fruits and vegetables, livestock products, processed food, beverages, and relatively less staple foods. They also demand better quality and safer products, and more processed and ready to eat/ready to cook foods. On the other hand, Engel's Law states that as incomes increase, the proportion of additional income spent on food decreases (even if actual income spent on food rises) and that on non-food items increases. Indian dietary consumption has shown an expected fall in the traditional dominance of cereals and an increased intake of high-value products such as fruits and vegetables, processed food, milk and dairy products, and meat, eggs, fish, etc (Sharma, *et al*, 2012).

The changing consumption patterns in India are presented in Figure 1. We observe that the share of food in the total consumer expenditure has fallen from 63.8 per cent in 1987-88 to 53.6 per cent in 2009-10 in rural areas

Figure 1: Changing Dietary Consumption Patterns in India during 1987-88 and 2009-10



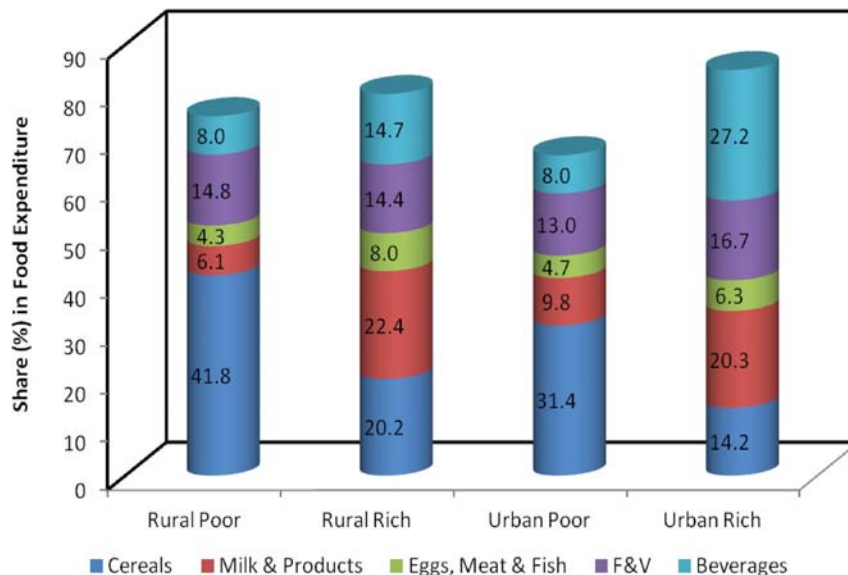
Source: NSSO (2011).

whereas in urban areas, the decline is steep and it has declined from about 56 per cent to 40.7 per cent during the same period. In contrast, the share of non-food expenditure has increased significantly both in rural and urban areas but the decline has been much faster in urban areas (Figure 1). Recent data from the 66th Round of Consumption Expenditure Survey of NSSO for the year 2009-10 show that cereals continue to remain by far the most important food source in the country, contributing 29.2 per cent of the food expenditure in rural areas and 22.3 per cent in urban areas. However, the share of cereals in food expenditure has declined by about 12 percentage points between 1987-88 and 2009-10 in rural areas, while in urban areas, the share has declined by 4 percentage points from 26.5 per cent to 22.3 per cent during the same period. It is expected that the share of cereals in food expenditure will continue to

decline both in rural and urban areas. In contrast, the share of high-value products has increased significantly both in rural and urban areas. However, their share in total food expenditure varies markedly between rural and urban areas. Among livestock products, expenditure on milk and dairy products is the highest in both rural and urban areas due to the existence of large vegetarian population but the trends are now changing fast in the country.

There is an inverse relationship between income and food expenditure and the percentage of total calories derived from cereals and other staple foods (Figure 2). For example, the bottom 10 per cent of the poor consumers (bottom decile) in India still spend a large share of consumption expenditure on food items in both rural (66.5%) and urban (62.5%) areas, while the top 10 per

Figure 2: Composition of Consumer Expenditure between Poor and Rich Households in India: 2009-10



Source: NSSO (2011).

cent of the consumers (top decile) in rural India spend about 38 per cent and urban consumers 25.4 per cent on food (NSSO, 2011). As regards commodity composition, in rural areas, the poorest among the poor (bottom decile) spend 41.8 per cent of the food expenditure on cereals, while the urban poor spend 31.4 per cent on cereals (Figure 2). On the other hand, the rural rich (top decile) spend only 20.2 per cent on cereals; their expenditure on milk and dairy products (22.4%), eggs, meat and fish (8%), fruits and vegetables (14.4%), and beverages (14.7%) was much higher compared with the rural poor. A similar trend was observed in the urban areas, where average expenditure on milk and dairy products (20.3%), fruits and vegetables (16.7%), and beverages (27.2%) was even higher than the expenditure on cereals. Since poor people still spend a large share of consumption expenditure on food items, there is a need to keep food prices low and affordable to help the poor consumers in the country.

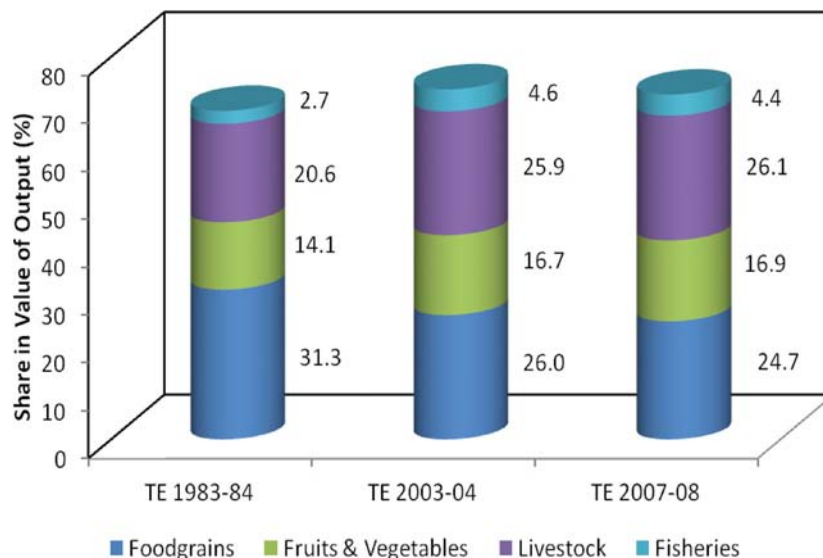
Second, value of output from the agriculture sector has diversified to comprise not only the traditional crops like rice and wheat but also high-value commercial crops and livestock products. At the all-India level, the share of foodgrains in the total value of output from agriculture and allied sectors (excluding forestry and logging) has fallen from 31.3 per cent (at 1999-00 prices) in TE 1983-84 to 24.7 per cent in TE 2007-08 (Figure 3). The decline in share was more pronounced in case of cereals among foodgrains, where it declined from 26.3 per cent

in TE 1983-84 to 21.7 per cent in TE 2007-08, whereas due to shift in the demand pattern towards high value crops, the farmers are also responding to market signals and gradually shifting production-mix to meet the growing demand for high-value commodities (Sharma and Jain, 2011).

There is a clear shift from staple foodgrains towards fruits and vegetables, livestock products, and fisheries. The share of high-value commodities/products (fruits and vegetables, livestock products, fisheries) increased from 37.3 per cent in TE 1983-84 to 47.4 per cent in TE 2007-08. The share of livestock in the total value of agricultural output has increased from 20.6 per cent in TE 1983-84 to 26.1 per cent in TE 2007-08. Among livestock products, the contribution of milk has increased at a faster rate, from 12.7 per cent in TE 1983-84 to 17.4 per cent in TE 2007-08 than meat (from 3.4% to 4.5%). The share of fisheries has also increased from 2.7 per cent in TE 1983-84 to 4.6 per cent in TE 2003-04 but marginally declined to 4.4 per cent in TE 2007-08 (Sharma and Jain, 2011). The above trends clearly indicate that farmers have responded to market signals and diversified into high-value agriculture under given technological, institutional, and infrastructural constraints.

Third, although the share of agricultural exports in the total national exports has declined in the post-reforms period, the share of high-value agriculture in the total agricultural exports has increased. The share of agricul-

Figure 3: Changing Composition of Value of Output from Agriculture in India: TE 1983-84 and TE 2007-08



Source: CSO (2011a)

ture in total export value declined from about 18.5 per cent in 1990-91 to about 10.5 per cent in 2009-11, while the share of agricultural imports to total national imports increased from 2.8 per cent in 1990-91, reaching a high of 8.2 per cent in 1998-99 and then declining to about 3.5 per cent in 2010-11 (GoI, 2011b). Overall, India experienced a trade surplus in agriculture and food products during the last decade. The trade surplus in TE 2009-10 was about Rs. 42.7 thousand crore, a 279 per cent increase over TE 2003-04. The share of high-value products in total agricultural exports in the country has also witnessed an increase during the last decade. For example, the share of horticulture crops has increased from about 5.7 per cent in 2001-02 to 7.9 per cent in 2009-10.

Marketing chains are changing in all developing countries including India due to trade liberalization and globalization. For example, supermarkets are expanding rapidly and may become dominant players in controlling access to retail markets in developing countries including India (Reardon, *et al*, 2003 and Gulati, 2009). Some of these changes will pose challenges as well as provide opportunities to smallholder producers, who constitute about 83 per cent of the total farms in the country. Many small producers are under serious threat from such developments as they have poor access to input and output markets, institutional credit, and hence find it difficult to meet the requirements of changing markets in terms of quality, volume and cost, both domestic

and overseas. If left to market forces alone, the major beneficiaries of new high-value and globalized agriculture will be largely big and commercial farms who have access to technology, capital, infrastructure, and markets (Sharma, 2008). These changes can also provide opportunities to smallholders, who are more efficient, have higher productivity, better management, and can take advantage of family labour in labour-intensive high-value crops being promoted by emerging chains. Adequate levels of rural infrastructure are essential for agriculture growth and poor infrastructure is one of the major constraints in linking small producers with markets – better road access to markets increases opportunities for high-value agriculture including perishable products besides providing more opportunities for off-farm employment (Hazel and Wood, 2008).

In the recent times, there is only one crop (cotton) that has witnessed a phenomenal growth due to technological breakthrough. Cotton production in India has more than doubled, from 15.8 million bales in 2001-02 to 33.9 million bales in 2010-11, and is expected to reach 34.5 million bales in 2011-12 (Cotton Advisory Board, 2012). This unprecedented growth in cotton production has been primarily the result of introduction of Bt (*Bacillus thuringiensis*) technology in 2002. The use of Bt seeds of cotton resulted in a dramatic turnaround in the yields, almost doubling over the period 2000-01 (308 kg/ha) to 2007-08 (554 kg/ha). Not only it improved crop yields, but there was a substantial reduction in the use of pesti-

cides, which resulted in higher incomes (Gandhi and Namboodiri, 2010 and Gulati, 2009). This increased profitability led to large scale adoption of Bt technology and, in less than a decade, more than 90 per cent of the cotton area in the country has come under Bt cotton (Cotton Advisory Board, 2012). However, Bt cotton yield has started stagnating, in fact even declining during the last 5-6 years and is forecasted to reach 481 kg per ha in 2010-11, which is a matter of concern. India's consumption of cotton is around 22-26 million bales while the production exceeded 30 million bales and this could have led to depressed prices if the surplus cotton could not have been exported. Raw cotton exports have increased from less than a million bales in 2002-03 to about 8.9 million bales in 2007-08, which declined to 3.5 million bales in 2008-09 and is expected to be about 8.4 million bales in 2011-12. Imports have declined from about 2.5 million bales in 2001-02 to about half a million bales in 2010-11. This success story of cotton in India has been primarily written by the corporate sector. The Indian agriculture needs such technological breakthroughs in other crops and sub-sectors

PAST ACHIEVEMENTS AND FUTURE CHALLENGES

Agricultural production in the country has increased faster than the population growth in recent decades, thereby leading to a steady increase in per capita agricultural output but a steady decline in per capita availability of foodgrains due to changing food demand patterns (CSO, 2012 and GoI, 2011b). The increase in per capita agricultural output has been achieved mainly with technological change that has led to an increase in yield through increased use of modern inputs such as improved seeds, irrigation-water, fertilizers, pesticides, etc. In a dramatic shift from historical trends, expansion of cropped area has played a small role in increasing agri-

cultural production in the recent past and technological change has been a major production growth strategy in the post-green revolution period. However, there is increasing evidence that yield growth is slowing in many foodgrain-basket regions of India in recent decades, while there is no scope for bringing more area under agriculture. In this section, we review past achievements and identify major challenges facing Indian agriculture.

Trends in area, production, and yield of foodgrains, non-foodgrains, and all crops between 1950-51 and 2010-11 are presented in Table 1. The foodgrains production grew at about 2.64 per cent per annum in the pre-green revolution period (1951-52 to 1965-66) and area growth contributed to the output growth (Table 1). The net sown area in the country increased from 119.4 million ha in 1951-52 to 138.1 million ha in 1964-65. The foodgrains production increased from 52 million tonnes in 1951-52 to 89.4 million tonnes in 1964-65 and declined to 72.4 million tonnes in 1965-66 and 74.2 million tonnes in 1966-67 due to two consecutive unprecedented severe droughts necessitating massive emergency food aid imports (10.4 million tonnes in 1966-67). This triggered a complete restructuring of agricultural policy in the country and emphasized technological innovation and introduction of new technologies from abroad. Achieving food security became the overriding goal of agricultural policy. The High Yielding Varieties (HYVs) of wheat developed at CIMMYT in Mexico suitable for conditions in the north-western states like Punjab, Haryana, and Western Uttar Pradesh were introduced in 1966-67. This was followed by the introduction of HYVs of rice from IRRI, Manila, and the Philippines, which ushered the green revolution in India. Since HYVs required assured irrigation and more chemical fertilizers, the government facilitated diffusion of private tube-wells and chemical fertilizer consumption through various incentives.

Table 1: Compound Growth Rates of Area, Production and Yield of Foodgrains, Non-Foodgrains and All Principal Crops during 1951-52 to 2010-11 (Base: TE 1981-82 = 100)

Period	Foodgrains			Non-Foodgrains			All Crops		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
1951-52 to 1965-66	1.12	2.64	1.51	2.07	3.70	1.00	1.29	2.72	0.93
1966-67 to 1980-81	0.51	2.82	2.30	0.87	2.49	1.42	0.58	2.62	1.62
1981-82 to 1990-91	-0.23	2.85	2.74	1.12	3.77	2.31	0.10	3.19	2.56
1991-92 to 2000-01	-0.07	2.02	1.52	1.18	2.69	1.09	0.27	2.29	1.33
2001-02 to 2010-11	0.37	2.12	2.89	2.16	3.67	2.49	0.91	2.50	3.25

Source: GoI (2011b).

The new HYV seed-fertiliser technologies led to a significant increase in foodgrains production from 74.2 million tonnes in 1966-67 to 129.6 million tonnes in 1980-81 at an annual growth rate of 2.82 per cent. Improvement in yield (2.3%) contributed to increased production while the contribution of area was very small (0.51%). Despite the introduction of Green Revolution, large quantities of food as well as chemical fertilizers had to be imported for several years. Moreover, the first phase of Green Revolution in India was limited to wheat and rice and to the north-west and small deltaic regions of peninsular India, and so, it could not raise rural incomes and alleviate rural poverty over a wider area.

The decade of the 1980s witnessed favourable and broad-based agricultural growth in India, including other regions and important crops and sub-sectors. The foodgrains production recorded an annual compound growth rate of 2.85 per cent, mainly driven by productivity improvement (2.74%) while the area under foodgrains witnessed a negative growth rate (-0.23%). The growth in non-foodgrains production also increased at a much higher rate of growth (3.7%) compared with the period 1966-67 to 1980-81 and both area expansion and yield improvement contributed to output growth. In many states, agricultural growth during the 1980s was accompanied by a substantial increase in labour productivity (Bhalla and Singh, 2009).

However, in the early 1990s, India embarked upon a liberal policy framework, which got reinforced with the signing of the Uruguay Round Agreement on Agriculture (URAA) in 1994. The economic reforms aimed at reducing government controls and increasing the role of the private sector in all sectors of the economy and the agricultural sector was no exception to this. Agricultural price policy became a major policy instrument for bringing in technological change and more private investment, thereby, attaining high growth in agriculture. On the other hand, non-price factors such as technology, infrastructure, farm credit, etc., were neglected. The substantial increase in procurement price of wheat (24.4%) and rice (17.3%) in 1991-92 and de-protection and deregulation of trade and industry led to improvement in terms of trade in favour of agriculture but did not trigger agricultural growth. However, the impact of barter terms of trade on private investment, technological change, and agricultural growth is ambiguous due to income, wealth, and substitution effect, which work

in the opposite direction (Desai and D'Souza, 1999 and Desai, 2002). The empirical estimates have shown a negative impact of terms of trade on output and marketed surplus of foodgrains (Desai and Namboodiri, 2001). As is evident from Table 1, growth in agricultural sector decelerated (2.29%) during the 1990s. The growth rate in foodgrains production declined from 2.85 per cent in 1980s to 2.02 per cent in 1990s and growth rate in yield fell from 2.74 per cent to 1.52 per cent during the same period. A similar trend was observed in the case of non-foodgrains. During the 1990s, "fatigue" in the agricultural and rural economy became a serious problem, in contrast to rapid growth in non-agricultural sector, particularly services sector and urban areas.

The slowdown in growth rate and plateauing of the productivity in major crops is a matter of concern and efforts are needed to step up crop productivity as there is no scope for area expansion. Ahluwalia (2011) suggests that productivity can be increased by 80-100 per cent for many crops in large areas by using modern agronomic practices based on available technologies but it would require state government action.

Concerned with slow growth in the agricultural sector during the 1990s, the government focused concentrated attention on agriculture in the last decade and more particularly since 2005-06. Public investment in agriculture increased significantly, e.g., Gross Capital Formation in agriculture and allied sectors has increased from 13.1 per cent of GDP in agriculture in 2004-05 to 20.1 per cent in 2010-11 (CSO, 2012). Minimum support prices for many agricultural commodities have been significantly increased. For example, minimum support price of paddy increased from Rs. 570 per quintal in 2005-06 to Rs. 1,080 in 2010-11 and wheat price from Rs. 700 to Rs. 1,285 per quintal during the same period (GoI, 2011). The flow of institutional credit to agriculture and allied sectors has increased from Rs. 86,981 crore in 2003-04 to Rs. 4,46,779 crore in 2010-11, at an annual compound growth rate of about 25 per cent (Sharma, 2011). The actual achievement in flow of credit has exceeded the targets during the period. The government launched two centrally-sponsored scheme — the 'National Food Security Mission' (NFSM) to increase the production of rice, wheat, and pulses by 10, 8, and 2 million tonnes, respectively, by the end of the Eleventh Plan and the Rashtriya Krishi Vikas Yojana (RKVY) in 2007 to incentivize states to increase investment in agriculture

and allied sectors, which has led to an increase in allocation for agriculture and allied sectors from 4.88 per cent of the State Plan expenditure in 2006-07 to 6.04 per cent in 2010-11. In order to develop the horticulture sector, the “National Horticulture Mission (NHM)” was implemented in 2005-06.

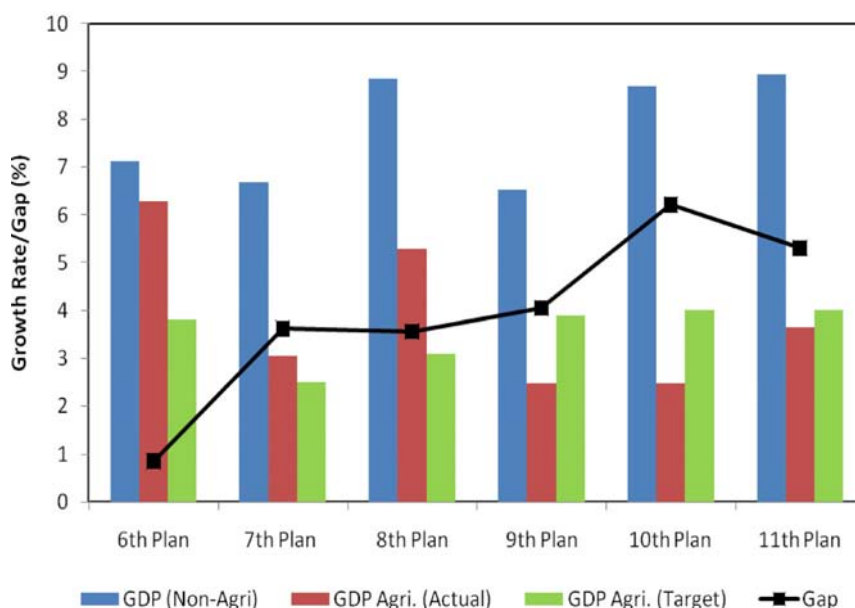
Due to the concerted efforts, there is a definite growth recovery in the agricultural sector during the last decade, the performance increasing particularly in the last 5-6 years. Foodgrains production growth rate increased to 2.12 per cent and the yield growth rate increased to 2.89 per cent during the 2000s. The foodgrains production reached a record level of 244.78 million tonnes in 2010-11 and is expected to be over 250 million tonnes in 2011-12, exceeding the target for the year by 5 million tonnes (GoI, 2012). The pulses production also touched a record of 18 million tonnes in 2010-11. A similar trend was observed in the case of non-foodgrains and all crops. Cotton production in the country increased more than three times from about 100 lakh bales in 2001-02 to 330 lakh bales in 2010-11. In order to exploit the potential of Eastern Plains for enhancing agricultural production, a new programme, “Bringing Green Revolution in Eastern India (BGREI)” has been implemented with an allocation of Rs. 400 crore. However, there is a need to increase allocation under the programme as a large investment is required for strengthening the production

and market infrastructure in the region. Despite these accomplishments, serious concerns related to slow and uneven growth, high food inflation, declining public investment, rising subsidies, environmental issues, participation of small farmers in emerging agri-food chains, etc., still remain. Some of these challenges are discussed here.

Slow and Uneven Agricultural Growth

Figure 4 presents the average growth rate of agriculture and non-agriculture GDP during the last three decades. The results clearly show that in post-reforms era, the growth rate of real agricultural GDP decelerated from 6.3 per cent in the Sixth Five Year Plan to about 2.5 per cent in the Tenth Five Year Plan while that of non-agriculture GDP increased significantly from 7.1 per cent to 8.7 per cent during the same period. Moreover, the gap between agriculture and non-agriculture GDP increased significantly in the post-reforms period. The ratio of growth rate of real agricultural GDP to that of total real non-agriculture GDP was the lowest (0.29) in the Tenth Five Year Plan period compared to that in the Sixth Five Year Plan period (0.88), indicating a deceleration in agricultural growth compared with non-agriculture GDP. There is a definite growth recovery in the agricultural sector during the Eleventh Plan. The year-on-year annual growth rate during the first four years of the Elev-

Figure 4: Growth Rate (%/year) in GDP Agriculture and Non-agriculture Sector in Different Plan Periods (1999-00 prices for 6th to 10th Plan and 2004-05 prices for 11th Plan)



Source: CSO (2011a).

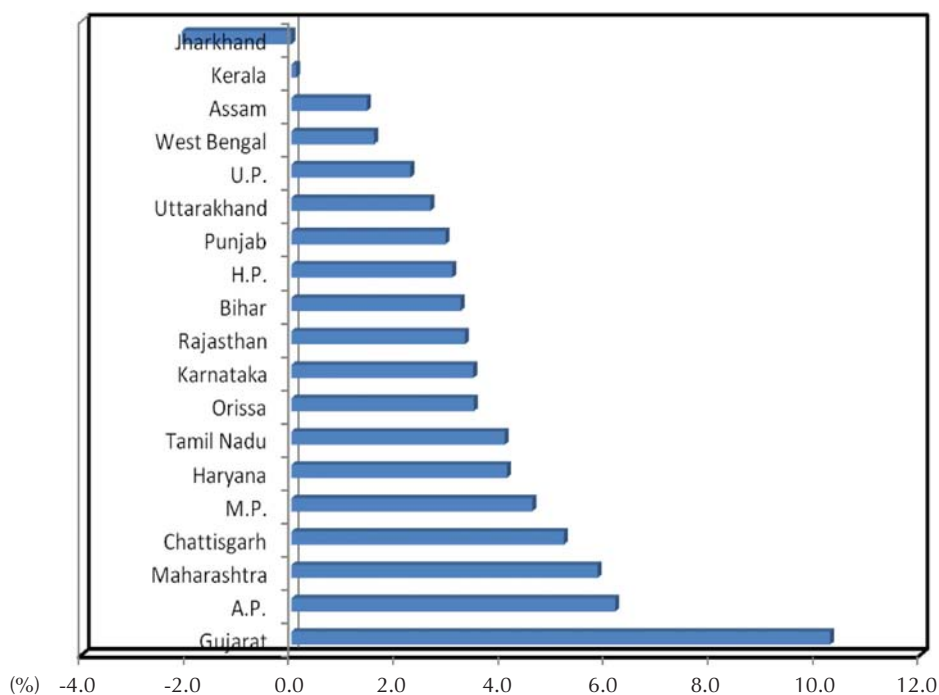
enth Five Year Plan (2007-08 to 2010-11) averaged about 3.6 per cent which is still less than the targeted growth rate of 4 per cent.

The agricultural performance has been subjected to wide fluctuations spatially as well as temporally (-0.5% in 2008-09 to 6.5% in 2010-11) during the period 2004-05 to 2010-11 (CSO, 2012). Gujarat tops the list with its agricultural sector growing at 10.3 per cent during 2001-02 to 2007-08, followed by Andhra Pradesh (6.2%) and Maharashtra (5.8%). However, in major agricultural states like Punjab, Uttar Pradesh, and West Bengal, agriculture has been growing at less than 3 per cent (Figure 5). Technology (mainly Bt cotton) along with investment in infrastructure, effective watershed development programmes, coordination of various line departments, and effective extension services through *Krishi Mahotasava*, assured power supply, market sector reforms, etc., have been instrumental in the accelerated growth in the agriculture sector in Gujarat but the real challenge is to sustain this growth momentum as cotton productivity, the major contributor to the growth story, has started stagnating and/or declining.

Persistence and Higher Incidence of Food Inflation

Inflation, especially in food prices, has been persistently high in the country in the recent years and this has been a cause of concern for the policy-makers. However, by the fiscal year-end, on a point-to-point basis, the rate of inflation, based on monthly wholesale price index (WPI), showed a marked deceleration. The inflation rate declined to 6.55 per cent in January 2012 as compared to 7.47 per cent for December 2012 and 9.47 per cent during January 2011 (GoI, 2012a). The food inflation remained in double digit between January 2009 and February 2011, ranging from about 10 per cent in November 2010 to as high as about 22 per cent in February 2010. Moreover, food inflation in general and for Agricultural Labourers (AL), Rural Labourers (RL), and Industrial Workers (IW) in particular has been significantly higher than the overall inflation. However, increase in food prices has now started to ease and has entered the negative zone on December 24, 2011. Food inflation is a serious issue as the weights of food articles in consumer price index (CPI) indices for AL, IW, and RL are much higher at 69.2 per cent, 46.2 per cent, and 66.8 per cent,

Figure 5: Compound Annual Growth Rates (at 1999-00 prices) in GSDP from of Agriculture in Major States (2001-02 to 2009-10)



Note: Average annual growth rate for all states are from 2001-02 to 2009-10 except for Gujarat, Madhya Pradesh, Maharashtra, and J&K for which latest data is up to 2007-08 and Tamil Nadu, Karnataka, HP, Uttarakhand, UP, West Bengal, Kerala, and Jharkhand is up to 2008-09.

Source: CSO (2011).

respectively as compared to 14.3 per cent in overall WPI index for India. Therefore, it is important to contain food inflation as poor households (both rural and urban) spend a large share of their consumption expenditure on food items.

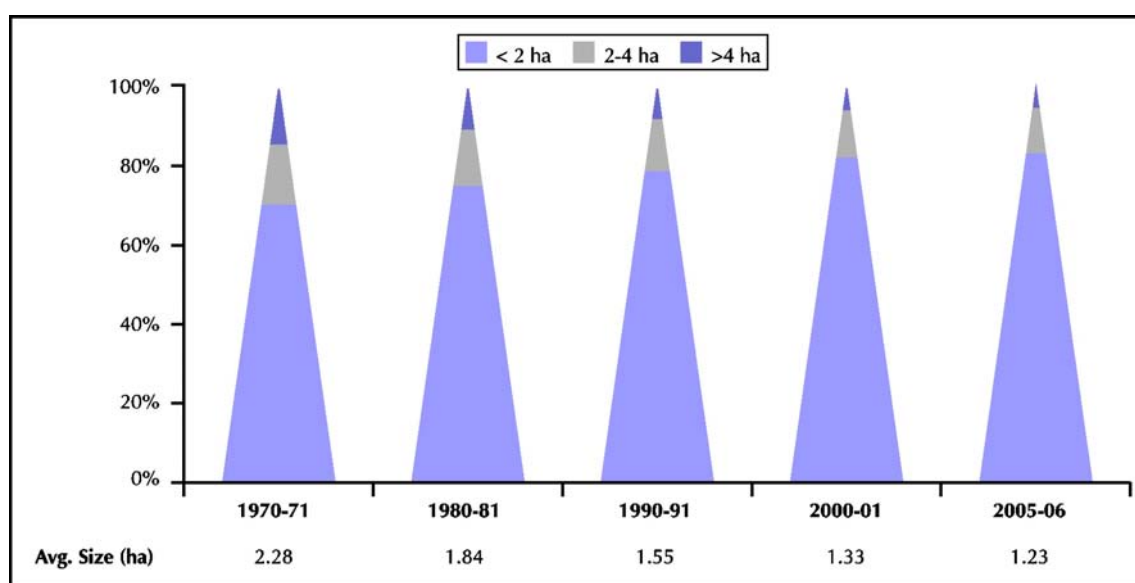
As discussed earlier, rising per capita income, urbanization, and other demographic changes have led to a shift in the food demand commodity composition. The demand for high-value agriculture has increased significantly while production has not kept pace with the rising demand and led to demand-supply imbalance and thereby high prices. The food inflation has been primarily driven by high value agriculture. For example, during the last six months, inflation was 3.3 per cent for rice and (-)3.1 per cent for wheat while it averaged 12.2 per cent for fruits, 10.8 per cent for milk, and 12.8 per cent for eggs, meat, and fish (GoI, 2012). Sharma and Jain (2011) reported that output of high-value agriculture increased significantly during the nineties, e.g., fruits and vegetables output increased at an annual growth rate of about 6.3 per cent in 1990s; livestock sector grew at an annual compound growth rate of 3.7 per cent (milk 4.3% and meat 2.6%) compared with 4.6 per cent in the eighties. However, during the 2000s, there has been a slowdown in growth of high-value segment. The rate of growth in fisheries declined from 4.7 per cent in 1990s to 2.9 per cent in 2000s, milk output declined to 3.6 per

cent and fruits and vegetables to about 3.5 per cent. All these suggest that high growth of high-value agriculture achieved during the 1990s could not be maintained in the 2000s, while demand for these commodities significantly increased, thus leading to a high food inflation. Therefore, efforts are needed to increase production and productivity of high-value crops/sub-sectors to contain food inflation.

Rising Number of Small Farms and Fragmentation of Farms

Indian agriculture is characterized by small and fragmented land holdings. There are about 129 million operational holdings possessing about 158 million ha land with an average farm size of only 1.23 hectares (GoI, 2012b). Around 83 per cent of the farmers have land holdings of less than 2 ha and they cultivate nearly 41 per cent of the arable land. The share of small and marginal farmers has increased from 69.7 per cent in 1970-71 to about 83 per cent in 2005-06 and the average farm size in the country has declined from 2.3 ha in 1970-71 to 1.23 ha in 2005-06 (Figure 6). There has been an increase in the number of farming households with fragmenting and shrinking farm size and this trend will continue in future. Even though there are no economies of scale in agricultural production sub-system and small farms are more efficient and productive, their partici-

Figure 6: Changes in Composition of Different Categories of Farmers and Average Farm Size in India (1970-71 to 2005-06)



Source: GOI (2012).

pation in markets remains low due to a range of constraints such as low volumes, high transaction costs, problems in meeting quality standards, lack of access to markets, capital, and information. On the other hand, there is scaling-up and consolidation at front- and back-end of agribusiness supply chains with the entry of large corporate players. Therefore, there is a need to link small-holder producers with markets through institutional innovations to reap the benefit of scale economies in processing and marketing. Such institutional innovations can reduce transaction costs, provide technology, quality inputs, and extension and even buy-back arrangements. There are some examples of successful models such as contract farming, cooperatives, farmers' organizations, etc., in case of dairy, poultry, fruits and vegetables, basmati rice, sugarcane, etc., but the challenge lies in multiplying/up-scaling these models across different states and commodities. The policy and institutional reforms are needed to create such linkages. For example, in some states, the land leasing is prohibited; farmers are not allowed to sell directly to consumers or processors or traders; processors/traders are not allowed to procure directly from farmers; mandi taxes and commissions on agricultural commodities are high and variable, etc. Therefore, there is a need to have more flexible laws related to leasing of land but with sufficient safeguards to protect the interest of small and marginal farmers and market sector reforms to ensure more participation of the private sector, particularly in the post-harvest management, infrastructure, and value addition.

Public Expenditure in Agriculture vs Agricultural Subsidies

Investment (both public and private) is required to bring about technological change in agriculture and attain higher agricultural growth. However, Indian agriculture witnessed stagnation and even decline in public investment in some years in the post-reforms period. As a result, the share of public sector gross capital formation (GCF) in total GCF in agriculture and allied sectors declined from more than 36 per cent to 15.7 per cent during 1992-93 and 2002-03. Private sector investment also showed stagnation/decline during the 1990s; it, however, reversed in 2003-04 when public investment in real terms (1999-00 prices) increased by about 24 per cent (CSO, 2012). The total gross capital formation in agriculture and allied sectors recorded a significant increase

from Rs. 76,096 crore in 2004-05 to a level of Rs. 142,254 crore in 2010-11 as per provisional estimates (about 87% increase). The gross capital formation in agriculture and allied sectors has increased from 13.5 per cent of GDP in agriculture in 2004-05 to 20.1 per cent in 2010-11 (2004-05 prices). Public investment as per cent of GDP in agriculture increased from 2.9 per cent to 3.6 per cent during 2004-05 to 2009-10, while the share of private investment increased from 10.6 to 16.6 per cent during the same period.

Agricultural subsidies have been one of the most contentious issues of economic policy. While the original goals of subsidizing agriculture were to support small-scale producers for adopting modern technologies and inputs, improve economic viability of farming, create employment, and to ensure national food security, the rising outlays for agricultural subsidies are of growing concern for policymakers. As a part of economic reforms initiated in early 1990s, the government attempted to contain subsidy but volume of subsidies has increased substantially in the post-reforms period. For example, fertilizer subsidy has increased from Rs. 4,389 crore in 1990-91 to Rs. 76,602 crore in 2008-09 representing an increase of over 17 times but some decline during 2009-10 and 2010-11 (GoI, 2011c). The total food subsidy has jumped to about Rs. 59,620 crore in 2009-10 from 2,492 crore in 1990-91, about 25-fold increase in less than two decades in absolute terms. The fertilizer subsidy as percentage of GDP from agriculture varied from 2 per cent in 1993-94 to 8.2 per cent in 2008-09, while food subsidy as percentage of GDP has varied from 1.6 per cent in 1990-91 to 5.4 per cent in 2009-10, and on an average remained at about 3 per cent over the last two decades. The fertilizer subsidy has grown mainly due to high international prices of fertilizers, raw materials, feedstocks, and intermediates during the past few years and constant farm gate prices between 1991 and 2001 and 2002 and 2009. The main reasons for the ever increasing food subsidies are significant increase in procurement prices of foodgrains, and increased government procurement and storage costs, without any increase in the issue price of foodgrains provided through public distribution system during the last decade. Rising agricultural subsidies and increased and larger public expenditure on rural development schemes like the Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA), and other rural development and poverty alleviation

programmes, which increased from about 6.4 per cent of the total plan expenditure during the Sixth Plan to about 9 per cent during the Eleventh Plan, had an adverse effect on public investment in agriculture, which fell from about 6.1 per cent to 4.4 per cent between the Sixth and the Eleventh Five Year Plan period (Desai, *et al*, 2011).

The issue of burgeoning subsidies has emerged as an important issue in recent policy debates. The studies have shown that initial subsidies on fertilizer, credit, and irrigation have a positive impact on agricultural growth through adoption of new technologies and modern inputs particularly in the case of smallholders (Fan, *et al*, 1999), but it is important to ensure that they are better targeted and should not become a permanent feature. Moreover, input subsidies in agriculture, particularly fertilizers, do have an adverse effect on environment and lead to degradation of land and water resources. It is a well established fact that investment in agricultural research and development, education, and rural infrastructure is more effective than input subsidies in increasing agricultural growth and poverty reduction (Fan, Gulati and Thorat, 2007). Therefore, a 'big push' for public expenditure in agriculture is required to bring about technological change in agriculture and higher agricultural growth. Since there is a strong complementarity between public and private investment in agriculture, public investment in public goods like research and development, rural infrastructure such as roads, power, irrigation, etc., would facilitate private investment in post-harvest management, market infrastructure and processing sectors. Efforts in this direction would go a long way in improving agricultural growth.

Environmental Issues

Increasing food demand along with policies encouraging production (input subsidies and output price support), and technological and economic changes have led to intensification of agriculture and cultivation on fragile and forest land, which has caused adverse impact on natural resources and environment in some regions. These detrimental effects include soil degradation, water depletion, deforestation, biodiversity losses, etc. Environmental issues, if not addressed, could threaten future levels of productivity and food security of the country.

Under-pricing of irrigation water and inappropriate irrigation practices have led to problems of overexploitation of groundwater and salinization and waterlogging in irrigated areas. For example, in Central Punjab, mainly rice producing areas, the water table has declined from 4-5 meters in mid-1970s to more than 14 meters in 2005, while in the Southern and Western regions, water table has risen, leading to the problem of water-logging (Singh, 2011). As a large number of states supply electricity to farmers at a very low price or even free of charge, the problem of over-extraction of groundwater has become more serious. Similarly, surface irrigation water rates are very low and have not been revised in most of the states since long and that has led to inefficient use of irrigation water resulting in the problem of water-logging and salinity. Farming in fragile soils and unsustainable exploitation of soil nutrients have led to land degradation in the country. Rapid expansion of modern technologies has caused serious loss of traditional crops, species, and other germplasm. There is ample evidence that agriculture has both contributed to and been impacted by climate change. Assessing impacts of climate change on agriculture is a complex issue and there is debate about the nature of underlying driving forces, but there is evidence of the impact of the changing temporal and spatial patterns of climatic factors on agriculture. More research is needed to understand climate change in order to enhance the resilience of agriculture.

Strategies for Sustainable Agriculture

Considering that agriculture is the mainstay of the Indian economy as more than half of our population is still dependent on agriculture and allied activities, rapid and more inclusive growth of the economy and poverty reduction would not be possible without agricultural growth. For broad-based and inclusive development of the agriculture sector, there are three strategy options: (i) extensive farming – bringing more area under farming; (ii) intensive agriculture – increasing use of inputs such as land, labour, fertilizers, irrigation, etc., and (iii) technological change (Dantawala, 1986 and Desai, 2002a). However, the first two approaches are agro-economically and ecologically unsustainable in the long run. The only sustainable strategy for growth in agriculture is continuous technological change, which shifts the production function upwards and to the right so that it avoids getting trapped into Ricardo's law of Diminishing Returns to Scale (Desai, *et al*, 2011). In order to im-

plement this strategy, three types of policy instruments, namely, technological, economic, and institutional are needed (Figure 7).

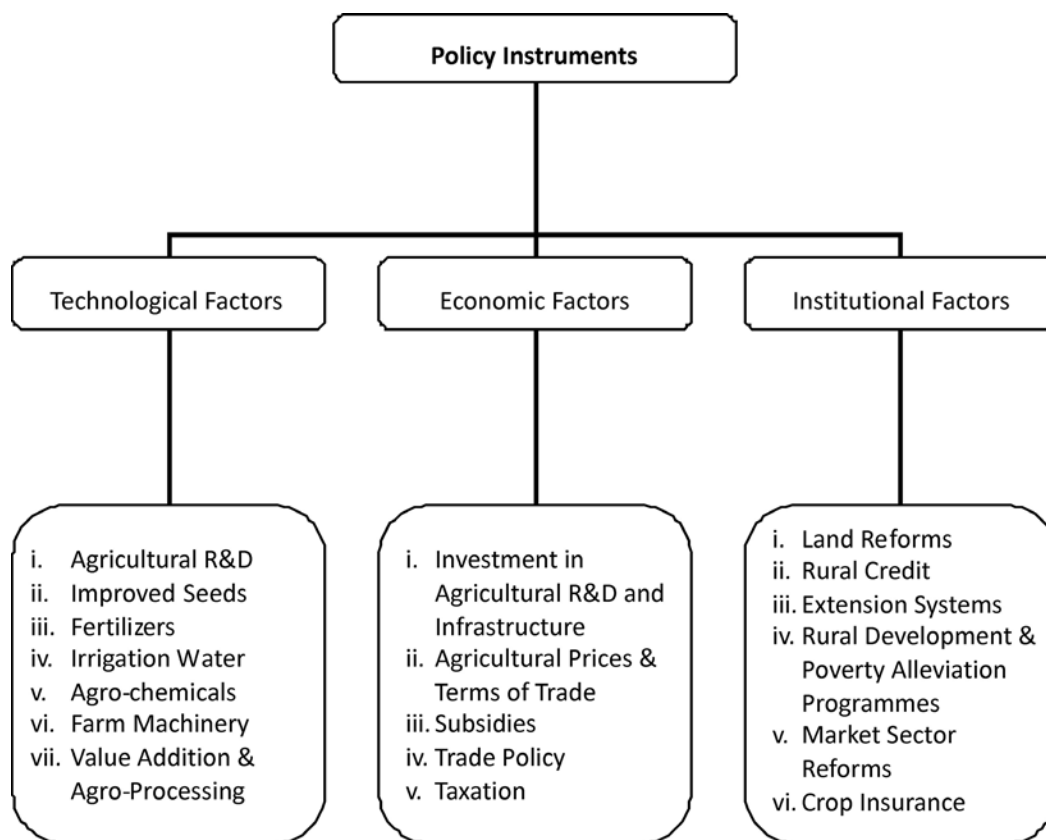
Agricultural research has played an important role in the transformation of the Indian agriculture but of late there has not been any major technological breakthrough except for Bt cotton. As agricultural research is subjected to various market failures, the public sector has a key role to play, but the private sector should also contribute. It is generally agreed that payoffs to agricultural research could be much higher with a stronger research-extension interface. Therefore, efforts are needed to create strong research-extension-farm linkages.

The trends in public investment in agriculture point to a disturbing development of a pervasive slowdown in the rate of growth during the reform period. Public investment in agriculture including irrigation is not consistent with the contribution of the sector and the targeted growth for the sector. Public expenditure in agricultural research and development including its transfer, irrigation, soil and water conservation, and rural infrastructure, must be prioritized. Private sector research and

investment has tended to emphasize mechanical and chemical technologies, which are well protected under the IPR and has generally neglected varietal technologies except where the returns are appropriable, as for hybrid seed. Thus a complementary public-private strategy will be the key to improve agricultural production and productivity.

Agricultural price policy as a dominant policy instrument for agricultural development, as pursued during the reform period, has its own limitations due to substitution income, and wealth effects on investment, technological change and agricultural supply as discussed in the earlier sections. A steep increase in output prices without a technological change would lead to high inflation, particularly food inflation; hence, non-price factors of technology, infrastructure, efficient institutional structures, and management should get high priority. The distinction between minimum support price and procurement price must be restored and minimum support price should be announced before the sowing season to help in the area allocation decisions. Another issue, which must get attention, is decentralized procurement

Figure 7: Policy Instruments for Agricultural Development



of commodities and gradual increase in issue prices of foodgrains distributed through public distribution system (PDS). Decentralized procurement would lead to wider coverage of crops and farmers and improve the efficiency in storage and transportation. Better targeting of PDS is also needed to contain food subsidy as well as ensure food security to the poor.

There is a need to rationalize prices of various inputs like fertilizers, irrigation water, and electricity. The present pricing has an adverse effect on efficiency of these inputs. The fertilizer pricing policy has been *ad hoc* and mainly driven by political considerations, e.g., prices of phosphatic and potassic fertilizers have been decontrolled while nitrogenous fertilizer prices are still under government control. This would adversely affect the fertilizer use pattern and lead to an imbalance in the use of NPK nutrients, with consequent adverse effect on soil quality. Imbalance in use of fertilizer nutrients also signals to lack of effective extension system, which has not been able to educate farmers about the role of N, P, and K and avoid substitution among nutrients. Indian soils have become deficient in micro- and secondary nutrients, but there is no consistent policy. Recently, the government has proposed to transfer the fertilizer subsidy directly to farmers rather than routing it through manufacturers as has been the practice. However, it may not be able to contain subsidy as well as create problems for small and marginal farmers who have no/poor access to credit and may not be able to buy fertilizers at market prices and claim subsidy later. In addition, there are a large number of concealed and informal tenants, who face a range of problems, dominantly stemming from the lack of official recognition of tenancy — as their status as actual cultivators is nowhere recorded, they will not be eligible for subsidy and that could adversely affect fertilizer consumption and consequently production and productivity. A long-term sound pricing policy and mechanism to encourage fertiliser consumption growth in the low-use areas, and a balanced and efficient fertiliser use, need to be developed. The under-pricing of irrigation water adversely affects the availability of resources for the management of irrigation systems as well as water use efficiency. A revision in water rates and price of electricity is thus necessary to increase efficiency and reduce wastages. Moreover, pricing must be based on volumetric use rather than a flat rate. While subsidies in agriculture are

justified considering the socio-economic benefits, they need to target the poorer farmers.

Availability and cost of labour has become a major constraint in the agriculture sector. Therefore, rural development and poverty alleviation programmes like Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA), and National Rural Livelihood Mission (NRLM) should be integrated with agricultural and allied sectors, irrigation and watershed development, soil and water conservation programmes, rural infrastructure, and non-farm activities.

There has been a fragmentation and decline in the average farm size and a marked rise in the share and absolute number of households operating small and marginal holdings in India, while agri-input and food industry are fast scaling up and consolidating. Therefore, linking smallholder producers with emerging agri-food chains is inevitable. In order to strengthen these linkages and improve the bargaining power of farmers with large agri-food chains, it is necessary to organize farmers in groups like cooperatives, producer companies, farmers' groups, commodity-based associations, etc. It will help in reducing the transaction cost of agribusiness companies and balance of power between large retailers/processors/traders and millions of small farmers in negotiating prices and other terms and conditions. Two important reforms are needed to strengthen these linkages. Since the declining size of operational holdings and fragmentation are serious problems in Indian agriculture, there is a need to review the land reforms related to land consolidation and land tenancy. Land consolidation should be made mandatory as it can be an effective and active land management instrument for solving problems not only with land fragmentation, but as an instrument for the sustainable rural development and poverty alleviation in a wider context. Uncertain tenancy arrangements and/or ban on tenancy in some states create disincentive for the landowner as well as the tenants and lead to lower productivity and low returns to tenants. Since concealed tenancy is very common and creates disincentives for both tenants and owners, leasing-in and leasing-out of agricultural land should be legalized and permitted within ceiling limits as it would improve the rural poor and landless labourers' access to land through leasing and better access to institutional credit at low interest rates and discourage landowners to keep their land fallow.

It has been argued that regulatory barriers have constrained investments in the development of storage and processing facilities, efficient competitive market institutions, and adversely affected competitiveness of Indian agriculture. So, functioning of traditional markets (APMCs) needs to be improved to enhance their efficiency and create more competition by allowing active participation of the private sector. It is true that restrictions under APMC Act have acted as major constraints for participation of private sector in agricultural markets, but many states like Bihar, Tamil Nadu, Maharashtra, Rajasthan, Orissa, Karnataka, etc., have either amended or repealed the State APMC Act and removed the restrictions for private sector participation. Yet, the private sector has not made sincere efforts to invest in post-harvest management and market infrastructure in those states.

Although the flow of institutional credit to agriculture sector has increased manifold during the last decade, there are some issues related to its composition, access to small and marginal farmers, and certain regions particularly the east and north-eastern states. Cooperatives, which have a strong presence and reach in rural areas, have lost their share from 58.3 per cent in TE 1993-94 to 15.8 per cent in TE 2010-11. The share of direct institutional credit has declined from over 80 per cent in early 1990s (pre-reforms period) to about 33 per cent in early 2000s; the number of rural branches has declined in the post-reforms period; and the definition of priority sector lending has been diluted — all these changes have led to low availability of credit to farmers (Sharma, 2011). The share of investment credit in the total credit has also declined which may adversely affect sustainable agricultural growth. Therefore, policy interventions are needed to correct these distortions/imbances. The government has reduced cost of credit to farmers (5-7%), which is a welcome step but it is more important to ensure timely and adequate access to institutional credit for the small and marginal farmers and other weaker sections to enable them to adopt new technology and improved agricultural practices as less than half of the farmers have access to institutional credit.


CONCLUDING OBSERVATIONS

Despite a strong growth linkage between agriculture and other economic sectors, and poverty reduction, agriculture has not received the required attention during the

reforms period. The neglect of agriculture and rapid growth of non-agriculture sector has led to serious agrarian crisis and increased disparity between urban and rural incomes. There has been some revival in the recent period as agricultural GDP growth accelerated to about 3.6 per cent during 2007-08 to 2010-11 but is still below the 4.0 per cent target for the Eleventh Plan. High food inflation due to increase and volatility in world prices as well as drought in 2009 has adversely affected the inclusive growth objective.

Many factors have contributed to the slowdown in agricultural growth: inadequacies of the provision of the critical public goods such as research, extension, rural infrastructure (on which agricultural growth depends), increased competition for resources from other sectors/programmes such as rural development and poverty alleviation, and subsidies; lack of long-term government commitment required for agricultural development. To get agriculture back on broader development agenda, substantial increase in investment in agriculture research and development, rural infrastructure, post-harvest and market infrastructure including storage and processing, reforms in laws related to land markets and marketing of agricultural products, promotion of farmers' organization/groups, Self Help Groups, etc., and appropriate agricultural price and food procurement and distribution policy are needed. In addition, pricing of inputs such as electricity, irrigation water, and fertiliser needs rationalization are required. Farm subsidies should be rationalized and better targeted to benefit the poor. These subsidies are justified as they benefit not only producers but the society at large. Agricultural price policy has played an important role in Indian agriculture but is facing some challenges. The price support policy should follow the strategy of technological change which requires more emphasis on non-price factors. Issues related to distributional aspects of agricultural credit including better access to small and marginal farmers, decline in rural branches, declining share of direct credit and significant regional and inter-class inequalities need to be addressed. Moreover, there is a need to follow multi-dimensional model of organization and management, which requires integration of agri-input, agri-production, and agro-processing and marketing segments of the value chain. Restructuring of the existing research and development institutions to make them demand-driven and more responsive to the needs of users like

farmers and industry, and participation of the private sector, particularly in post-harvest activities including

storage, food processing, and marketing should be promoted. 

REFERENCES

- Ahluwalia, Montek S (2011). "Prospects and Policy Challenges in the Twelfth Plan," *Economic and Political Weekly*, 46(21), 88-104.
- Bhalla, G S and Singh, Gurmail (2009). "Economic Liberalisation and Indian Agriculture: A Statewise Analysis," *Economic and Political Weekly*, 44(52), 34-44.
- Cotton Advisory Board (2012). Data Available at <http://www.cotcorp.gov.in/statistics.aspx> accessed on March 7, 2012.
- CSO (2011). *Gross State Domestic Products and Net State Domestic Product (2004-05 Series)*, Central Statistics Office (CSO), Ministry of Statistics and Programme Implementation, Govt. of India, New Delhi, August.
- CSO (2011a). *National Accounts Statistics 2011 and Earlier Issues*, Central Statistics Office (CSO), Ministry of Statistics and Programme Implementation, Govt. of India, New Delhi, August.
- CSO (2012). *Quick Estimates of National Income. Consumption Expenditure, Saving and Capital Formation 2010-1*, Central Statistics Office (CSO), Ministry of Statistics and Programme Implementation, Govt. of India, New Delhi, 31st January.
- Dantwala, M L (1986). "Strategy of Agricultural Development since Independence," in Dantwala, M L et al (Eds.) *Indian Agricultural Development Since Independence*, New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd., 1-15.
- Desai, Bhupat M (2002). "Policy Framework for Reorienting Agricultural Development," *Indian Journal of Agricultural Economics*, 57(1), 1-22.
- Desai, Bhupat M (2002a). "Public Policies to Turn Around Agriculture in the New Millennium," Professor M L Dantwala Monograph Series, Monograph No. 3, Department of Economics, University of Mumbai.
- Desai, Bhupat M and D'Souza, Errol (1999). "Economic Reforms, Terms of Trade, Aggregate Supply and Private Investment in Agriculture: The Indian Experience," *Economic and Political Weekly*, 34 (20), 1220-1225.
- Desai, Bhupat M and Namboodiri, N V (2001). *Farmers' Response, Prices and Government Expenditure Analysis under WTO Framework for Developing Agriculture*, Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad, India, New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.
- Desai, Bhupat; D'Souza, Errol; Mellor, John; Sharma, Vijay Paul and Tamboli, Prabhakar (2011). "Agricultural Policy Strategy, Instruments and Implementation: A Review and the Road Ahead," *Economic and Political Weekly*, 46 (53), 42-50.
- Fan, Shenggen, Hazell, Peter and Thorat, Sukhadeo (1999). *Government Spending, Agricultural Growth and Poverty: An Analysis of Interlinkages in Rural India*, IFPRI Research report 110, International Food Policy Research Institute, Washington, D C.
- Fan, Shenggen, Gulati, Ashok and Thorat, Sukhadeo (2007). "Investment, Subsidies and Pro-Poor Growth in Rural India," IFPRI Discussion Paper 00716, International Food Policy Research Institute, Washington, D C September 2007.
- Gandhi Vasant P and Namboodiri, N V (2010). *Economics of Bt Cotton vis-à-vis Non-Bt Cotton in the State of Maharashtra, India*, New Delhi: Allied Publishers Pvt. Ltd.
- Government of India (2009). *Report of the Expert Group to Review the Methodology for Estimation of Poverty*, Planning Commission, Government of India, November, 2009.
- Government of India (2011). *Faster, Sustainable and More Inclusive Growth: An Approach to the 12th Five Year Plan (2012-2017)*, Planning Commission, New Delhi: Government of India.
- Government of India (2011a). *Key Indicators of Employment and Unemployment in India 2009-10, NSS 66th Round (July 2009 to June 2010)*, National Statistical Office, National Sample Survey Office, Ministry of Statistics and Programme Implementation, Govt. of India, New Delhi, June 2011.
- Government of India (2011b). *Agricultural Statistics at a Glance 2011*, Directorate of Economics & Statistics, Department of Agriculture & Cooperation, Ministry of Agriculture, Govt. of India, New Delhi, October 2011.
- Government of India (2011c). *India Public Finance Statistics 2010-11*, Economic Division, Department of Economic Affairs, Ministry of Finance, Govt. of India, New Delhi, October 2011.
- Government of India (2012). *Second Advanced Estimates of Production of Foodgrains for 2011-12*, Agricultural Statistics Division, Directorate of Economics & Statistics, Department of Agriculture & Cooperation, Ministry of Agriculture, Govt. of India, New Delhi, February 2012.
- Government of India (2012a). *Index Numbers of Wholesale Prices in India (Base: 2004-05 = 100), Review for the Month of January 2012*, Office of Economic Adviser, Ministry of Commerce and Industry, Govt. of India, New Delhi.
- Government of India (2012b). *All India Report on Agricultural Census 2005-06*, Agriculture Census Division, Directorate of Economics & Statistics, Department of Agriculture & Cooperation, Ministry of Agriculture, Govt. of India, New Delhi, 2012.
- Gulati, Ashok (2009). *Emerging Trends in Indian Agriculture: What Can We Learn from These?* 2nd Prof. Dayanatha Jha Memorial Lecture, National Centre for Agricultural Economics and Policy Research, New Delhi.
- Hazel, Peter and Wood, Stanley (2008). "Drivers of Change in Global Agriculture," *Philosophical Transactions of the Royal Society B*, 363, 495-515.

HUNGaMA Survey Report (2011). "HUNGaMA Fighting Hunger and Malnutrition" Available at <http://hungamaforchange.org/HungamaBKDec11LR.pdf> Accessed on March 6, 2012

NSSO (2011). *Level and Pattern of Consumer Expenditure, NSS 66th Round (July 2009 – June 2010)*, National Sample Survey Office, National Statistical Organization, Ministry of Statistics and Programme Implementation, Govt. of India, New Delhi, Dec. 2011.

Reardon, T; Timmer, C P; Barrett, C and Berdegue, J (2003). "The Rise of Supermarkets in Africa, Asia and Latin America," *American Journal of Agricultural Economics*, 85 (5), 1140-46.

Sharma, Vijay Paul (2008). "India's Agrarian Crisis and Corporate-Led Contract Farming: Socio-economic Implications for Smallholder Producers," *International Food and Agribusiness Management Review*, 11(4), 25-48.

Sharma, Vijay Paul (2011). "India's Agricultural Development

under the New Economic Regime: Policy Perspective and Strategy for the 12th Five Year Plan," Keynote address at the 71st Annual Conference of the Indian Society of Agricultural Economics held at University of Agricultural Sciences, Dharwad during November 3-5, 2011.

Sharma, Vijay Paul and Jain, Dinesh (2011). "High Value Agriculture in India: Past Trends and Future Prospects," W.P. No. 2011-07-02, Indian Institute of Management, Ahmedabad, July 2011.

Sharma, Vijay Paul, De, Sourovi and Jain, Dinesh (2012). "Commercialization of Agriculture in South Asia: Drivers and Constraints," Interim Workshop of the Global Development Network (GDN) Project, *Supporting Policy Research to Inform Agricultural Policy in Sub-Saharan Africa and South Asia*, Paris, February 27-28, 2012.

Singh, Karam (2011). "Groundwater Depletion in Punjab: Measurement and Countering Strategies," *Indian Journal of Agricultural Economics*, 66(4), 573-589.

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