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AGRICULTURAL GROWTH IN INDIA SINCE 1991



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EXECUTIVE SUMMARY

The study addresses the observed slow growth of the agricultural sector since 1991. The method is to document the movement during this period of the factors that have been recognised as determining agricultural growth with a view to identifying the proximate causes of the slowdown. It is meant to provide a 'macro', as in sector-wide, perspective on this development. Though Indian agriculture constitutes an area of activity with major differences between crops and across regions, we have in this study maintained the approach as there are many instances when a sectoral perspective is precisely what is needed, such as when identifying a growth strategy for the economy. Moreover, the method adopted here can serve effectively as a framework for the study of Indian agriculture even at a disaggregated level.

Investigation reveals that among the factors likely to be responsible for slow growth is a stagnation of public investment for almost a quarter of a century, a slowing of irrigation expansion since 1991 and a downscaling of production due to farm fragmentation. Combined with evidence of gathering environmental stress, these amount to a hardening of production conditions in Indian agriculture. Also, production is increasingly being carried out in a more open economy, even though import penetration is very low currently for most crops. These developments require publicly-provided Research and Extension to expand to support farming under a changed environment. However, as the study documents, the reverse is true. Public expenditure on this item, historically low as a share of agricultural output in India by international standards, has registered a slower growth in real terms since 1990. We, however, caution against the reading that greater spending alone is the solution to the current impasse in Indian agriculture. We provide evidence, intended as an illustrative case, that steady growth of real expenditure since 1991 has actually coincided with a slowing rate of expansion of the percentage area irrigated. This indicates a declining efficiency of public investment and suggests that governance is as much an issue as greater allocation of funds. Improvement in the functioning of the irrigation and research & extension

networks would require a serious effort on the part of state governments, not only as Agriculture is a 'State subject' but also as there is a limit to how much can be co-ordinated from the Centre once the fund allocation has been made. At least in the case of irrigation, our findings suggest that implementation is the key.

As a slowing of agricultural expansion is being encountered at a time when the economic policy regime has undergone reform it has been suggested by some that this slowing is linked intrinsically to the emerging regime. We find this view limited, and have pointed to structural factors on the supply side of Indian agriculture as worthy of greater attention in the explanation of slow agricultural growth over the past one and a half decades. Improved prospects for Indian agriculture cannot therefore, be sought in mere changes to the policy regime referred to as 'reforms'. Faster agricultural growth will require interventions that are capable of altering the production conditions in Indian agriculture so that farming is a more profitable and less risky economic activity than it can be today. At the same time, while the reforms since 1991 may be seen as having corrected a historical policy-bias against agriculture, economic policy must now address frontally some of the specific factors that have been identified as constraining in this study.

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Pulapre Balakrishnan, Ramesh Golait, Pankaj Kumar*

The pattern of growth that the Indian economy is currently experiencing has received particular attention. This growth process has witnessed the slowing of agriculture at a time when the rest of the economy is growing at unprecedented rates. Manufacturing output, seen as bellwether for the policy stance since 1991, has even registered double-digit growth in some recent years. Growth of the services economy has been less spectacular but more steady over a longer period. The slow growth of agriculture has been explicitly noted as a matter of concern in the 'Approach Paper to the Eleventh Plan'¹, and accelerating the rate of growth of agricultural production is seen as central to a more inclusive growth, if not growth *per se*².

This study addresses the observed slow growth of the agricultural sector since 1991. Our method is to document the movement during this period of the factors that have been recognised as determining agricultural growth, with a view to identifying the proximate causes of the slowdown. It is meant to provide a 'macro', as in sector-wide, perspective on the development. We are aware that Indian agriculture constitutes an area of activity with major differences between crops and across regions. However, we have maintained the approach as there are many instances when a sectoral perspective is what is needed, such as when identifying a growth strategy for the economy. Moreover, the method we have adopted here can serve quite effectively as a framework for the study of Indian agriculture even at a disaggregated level.

I. Agriculture and the economic reforms

As the slowing of agricultural expansion is being encountered at a time when the economic policy regime has been undergoing reform it has been suggested by some that this slowing is linked intrinsically to this very reform. Even before proceeding to the empirical investigation that constitutes the main part of our study we engage with this view.

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¹ New Delhi: Planning Commission, 2007.

² See Mohan (2008), p. 22.

Strictly, there is nothing intrinsic to the policy of liberalisation of an economy in the form of trade and industrial policy reforms that must be damaging of agriculture. While we develop this argument, it must be pointed out that we are here speaking of a slowing of growth. No major segment within agriculture has shown evidence of a steady contraction, the tell-tale sign of damage caused, *ceteris paribus*, by changing policy. On the contrary, some segments such as cotton and horticulture have expanded rapidly despite having been directly in the path of the reform process.

A strand of development economics with a long and influential tradition has actually held the view³ that the external liberalisation of the prototype developing economy would actually be beneficial to agriculture. According to this view, developing economies that have historically pursued import-substituting industrialisation, as India had done, inherently discriminated against their agricultural sectors. First, across-the-board protection of industry, without commensurate protection of agriculture, is believed to shift the terms-of-trade against agriculture, thus lowering incentives for producers in this sector. Secondly, protection of an uncompetitive industrial sector results in an overvalued exchange rate as the balance of payments deficit in manufactures is kept artificially low by protection. This renders an allegedly intrinsically competitive agricultural sector uncompetitive, leaving it stunted. From such a perspective, the liberalisation of industrial imports is believed to advance the cause of both agricultural production and exports. The first is to be brought about by correction of the historical bias against agriculture by a restoration of the terms-of-trade. The second takes place as the exchange rate depreciates once the balance of payments for industry moves 'naturally' into deficit following the removal of protection to industry. The latter mechanism is

³ See Little, Scitovsky and Scott (1970) for the original statement, Singh (1995) for an exposition, Nayyar and Sen (1994) for a critique of the view, and Balakrishnan (2000) for an early examination of the Indian case.

re-inforced if, as is often the case, the trade and industrial policy reforms are combined with macroeconomic stabilisation. Now, any tendency of the exchange rate to depreciate automatically as a result of import liberalisation for manufactures is re-inforced by the devaluation that occurs as part of the standard package of macroeconomic stabilisation in the presence of a balance of payments deficit. This is believed to act as an incentive for agricultural exports.

It will be recognised that the reforms initiated by the Government of India in 1991 fall entirely within the prototype described above. Structural adjustment had driven liberalisation of the trade and industrial policy regime while macro-economic stabilisation involved a real depreciation of the rupee. Going by the arguments of the strand of development economics we have just reviewed, the economic reforms could only have benefited agriculture via enhanced incentives for production and export. Apart from the internally driven reforms in India in the early nineties, the decade was to witness a further change in the economic environment. This was the accession of India to the WTO norms in 1995. The main implication of this was further trade liberalisation, only of a kind that may be thought of as more aggressive in that it envisaged the ultimate elimination of quantitative controls. However, from a theoretical standpoint, accession to the WTO norms was no more than a move further along the course of trade reform set unilaterally in 1991. Therefore, going by the argument expounded above, the WTO accession may be considered as potentially doubly beneficial to agriculture, i.e., if industry was historically the more protected among the sectors, agriculture's terms of trade may be expected to improve further upon across the board import liberalisation and, harbouring the assumption of the inherent competitiveness of developing country agricultures, agricultural exports from India would now be expected to rise as developed country markets, hitherto inaccessible due to protection, would be opened-up to it.

We have here examined the relationship of agricultural growth to the type of reforms India had experienced in 1991 in principle only to suggest that to focus *a priori* and exclusively on the reforms as the likely root cause of agricultural slowing may be misleading. However, we are aware of the possibility that theoretical arguments for their enabling role aside, the reforms as implemented since 1991 - or some associated policy changes - may not have been altogether benign towards agriculture. We shall return to this issue at a subsequent stage in the discussion.

II. Growth of agriculture since 1991

In this study we focus exclusively on crop agriculture. It is of course conceivable that animal husbandry, fisheries and forestry, being the other components of the sector, may assume an increasingly important role in the future but this does not concern us here. As the facts related to the growth of crop agriculture since 1991 are by now fairly well-known, having also reached the attention of the government in the form of the Approach Paper to the Eleventh Plan, we present only such data as necessary to highlight the problem we address here and advance the argument that we intend to make.

In Table 1 are presented data on half a century of growth in area, production and yield in Indian agriculture. We have adopted the standard classification 'food' and 'non food'. The fifty-year span enables a longer

Table 1: Agricultural growth since 1991 in long-term perspective

Crop	1949-50 to 1964-65			1967-68 to 2002-03			1991-92 to 2006-07		
	A	P	Y	A	P	Y	A	P	Y
Foodgrains	1.4	2.8	1.4	-0.1	2.4	2.1	-0.1	1.0	1.1
Others	2.4	3.7	0.9	1.3	3.1	1.6	0.4	1.7	1.1
All Crops	1.6	3.2	1.2	0.3	2.7	1.9	0.1	1.3	1.2

A : Area P : Production Y : Yield

Notes and Sources: Figures for period 1990-91 to 2006-07 are trend growth rates estimated by the authors, rest are compound annual growth rates from *Agricultural Statistics at a Glance 2003*, Government of India.

view and thus helps place the growth since 1991 in comparative perspective. Data have been presented for three phases. The first, in order of appearance in the Table, covers the first fifteen years since 1950, the second period covers close to three and a half decades since the Green Revolution and the third accounts for the nineties upto the present. Ignoring changes in area which, as may be expected, shows almost universal slackening if not shrinkage, we focus on production and yield.

Taking output growth first, we find that even close to four decades since the Green Revolution there is no permanent rise in the rate of growth. Together with the data for period since 1991, we are able to see that it is the slowing of output growth in this decade that depresses the rate of growth for 1967-2003. Coming to yield, we may surmise that output growth during this latter period would have been lower still if yield growth had not accelerated, being the true significance of the Green Revolution. Indeed the rise in the rate of growth of yield is as high as 50 per cent in some instances. However, yield growth since 1967 would have been higher yet had it not slackened in the nineties. To sum-up then, there is an across-the-board slowing of output and yield growth since 1991 for the two main groups in Indian crop agriculture. For 'All Crops' there is slowing of growth in area, production and yield. The period since 1991 now emerges⁴ as a kind of watershed in time when growth in Indian agriculture, resurgent from the middle sixties, was arrested.

Concerns of livelihood and food consumption arise naturally from the recent record of agricultural growth. It also poses a challenge to professional economists to explain an outcome that is contrary to the prediction of an

⁴ Precise dating of the slowing does not concern us in this study. However, we would like to report that when the procedure of generating breakpoints endogenously was applied to the time series for GDP in agriculture a break, indicating deceleration, was found for 2000-01. However, the estimate was not statistically significant at the ten per cent level. We do not highlight this result as the methodology is of relatively recent vintage and yet to command wide acceptance. For an exposition of the method see Bai and Perron (1998). For an application to Indian data, including the agricultural sector, for the period 1950-2003 see Balakrishnan and Parameswaran (2007).

influential economic theory as outlined above. We now proceed directly to an investigation of the factors that are likely to have determined agricultural growth since 1991, classifying these into 'price' and 'non-price'.

III. Prices and the recent agricultural growth

III.1 Relative price movement since 1991

In seeking an explanation of slow growth we start out by looking at price movements. We do so not because we believe that relative prices have an overarching importance, but to address the claim encountered that price shifts account for the slowing of agricultural growth since 1991. Given yields, relative prices form one element in the structure of incentives faced by the producer. In Table 2 are presented indices of prices received and paid out by farmers and the corresponding set of relative prices. The first is the conventional barter terms of trade. The other is the ratio of 'prices paid out' to 'prices received' or an index of input-output prices. This is only a version of the terms of trade itself, with the difference being that the latter index is more finely weighted.

Somewhat unexpectedly for us, the terms of trade and the input-output price ratio show dissimilar movement over the fifteen years since 1990-91, the year immediately prior to the initiation of reforms. On average the terms of trade are higher for the period after, having displayed a move clearly favourable to agriculture till around the mid-nineties and a reversal after that. On the other hand, the input-output price ratio has moved to agriculture's disadvantage. It is, however, important to recognise this exercise for what it is. We are here comparing the average for a fifteen-year period with a single data point, namely, the figure for 1990-91. Also, both indices have shown a cyclical behaviour that is obscured by taking averages.

Table 2: The Evolution of Farm Relative Prices				
year	Index of prices paid	Index of prices received	Input-Output price ratio	Agriculture's terms of trade
1981-82	88.5	54.9	1.61	88.7
1982-83	91.1	60.3	1.51	91.4
1983-84	91.0	64.2	1.42	91.6
1984-85	92.3	68.0	1.36	93.9
1985-86	94.3	70.4	1.34	93.6
1986-87	98.7	76.7	1.29	95.7
1987-88	102.3	86.0	1.19	97.4
1988-89	96.9	90.3	1.07	98.3
1989-90	99.2	97.5	1.02	99.4
1990-91	104.0	112.3	0.93	101.9
1991-92	119.4	130.6	0.91	105.6
1992-93	139.5	138.7	1.01	103.9
1993-94	152.9	151.4	1.01	103.6
1994-95	166.1	171.1	0.97	106.6
1995-96	174.2	182.9	0.95	105.3
1996-97	181.5	190.6	0.95	103.1
1997-98	192.0	205.9	0.93	105.6
1998-99	197.1	220.8	0.89	105.2
1999-00	203.9	219.8	0.93	102.7
2000-01	230.4	225.0	1.02	100.9
2001-02	236.4	235.3	1.00	102.6
2002-03	253.2	247.9	1.02	103.6
2003-04	259.1	251.2	1.03	101.0
2004-05	272.1	260.1	1.05	100.7

Notes: 'Prices paid' are for intermediate purchases which may be treated as variable inputs other than labour; index numbers are based on the triennium ending 1990-91= 100.

Source: Report of the Commission for Agricultural Costs and Prices, April 2007.

We could as well view the data in yet another way. First, our statistical analysis revealed that there is no trend to the terms of trade since 1991 while in the case of the ratio there is a very mild one indicating a worsening for agricultural producers. Eyeballing the data suggests that this is due to a shift occurring from 2000. Secondly, if we are to take a longer view of the movement in agriculture's relative prices, we find that the nineties do not alter the trend improvement in farm relative prices commencing in

1980. In the case of the input-output ratio the improvement by the end of the nineties is of the order of over 40 per cent. Even after the worsening since 2000 the input-output price ratio has improved by over 35 per cent in the last quarter century. The terms of trade show only a modest improvement but are decidedly more favourable to agriculture after the reforms than before. The prediction of the theory that agriculture's terms of trade will improve after trade liberalisation is borne out, but the predicted impact of this on agricultural growth has not materialised.

We conclude this section with two observations. First, the recent history of Indian agriculture reveals no uni-directional link between growth and relative prices. Indeed, there have been phases, such as in the fifties, when production grew rapidly in the presence of declining terms of trade⁵. This is not surprising, for we know while accounting for profit that it is the concurrent change in yield that is crucial. Secondly, we also know that shifts in the terms of trade have reversed themselves in the past, so excessive focus on the relative price may not be appropriate when taking a longer-term view.

III.2 The role of import liberalisation

There exists a strong body of opinion in India that the trajectory of agricultural growth since 1991 is largely determined by increased integration with the world economy, also termed 'globalisation'. In particular it is held that import penetration following India's accession to WTO norms is the main route by which trade has affected domestic production adversely. Though when considering the impact of global integration on domestic agriculture we must consider 'net' trade or both exports and imports, we shall here focus exclusively on imports in order to address the view that import liberalisation is responsible for agricultural slowing in the nineties.

⁵ See Mishra (2004).

Imports enhance supplies, and for agricultural commodities - the prices of which are determined by supply and demand - may be expected to lower the price relative to the counterfactual equilibrium. In the case of manufactures, the prices of which may be expected to be set by firms with market power no actual increase in imports is necessary for a lower price following the integration. Mark-ups are inversely related to potential competition and the very integration of segmented markets is sufficient to lead to declining mark-ups and thus prices in the hitherto protected market. Not so for agricultural commodities, for which expanding imports are the main route to lower prices. However, as with the price of manufactures, we would expect a one-shot decline in the price following the integration, unless the integration is staggered.

Before proceeding to study import penetration in Indian agriculture since 1991 we take yet another look at the behaviour of prices of individual crops as *prima facie* evidence for the putative role of import penetration. Of course, we have a certain idea of the evolution of prices already, but this is from data at a highly aggregated level and some further disaggregation may be warranted in the context.

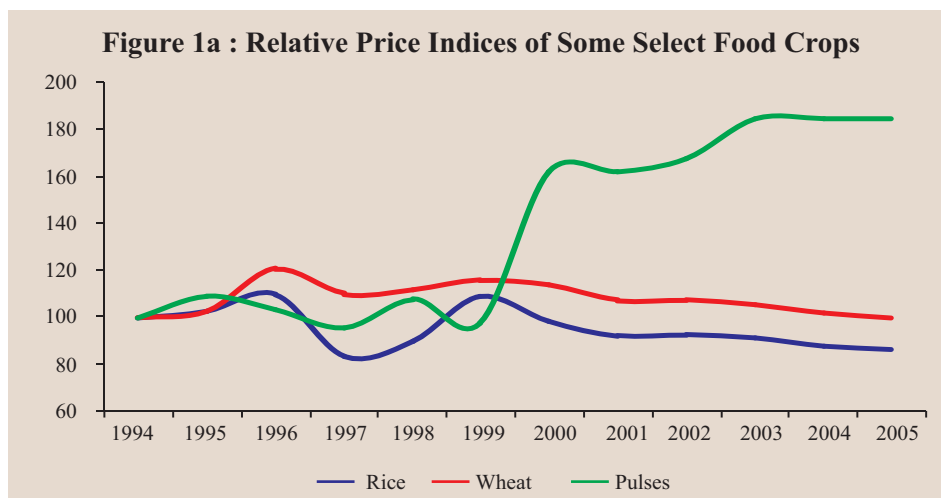
III. 2. a. Relative-price movement: a closer look

We now proceed further in our investigation of price movement since 1991 by studying movement in the prices of individual crops, rather than of the sector as a whole as we have done. In Figures 1a and 1b are plotted the annual prices for three crops in each of the categories 'food' and 'non-food' for the period 1994 to 2005. These are 'real' prices, being producer prices as reported for India by the FAO⁶ deflated by the index of wholesale price for all commodities, meant to capture changes in the profitability given yield of cultivation. Note that for the group 'food' only the price of the rice crop displays a declining trend over the period considered. The

⁶ <http://www.faostat.fao.org/>. This is the closest we can get to prices received by farmers from data in the public domain.

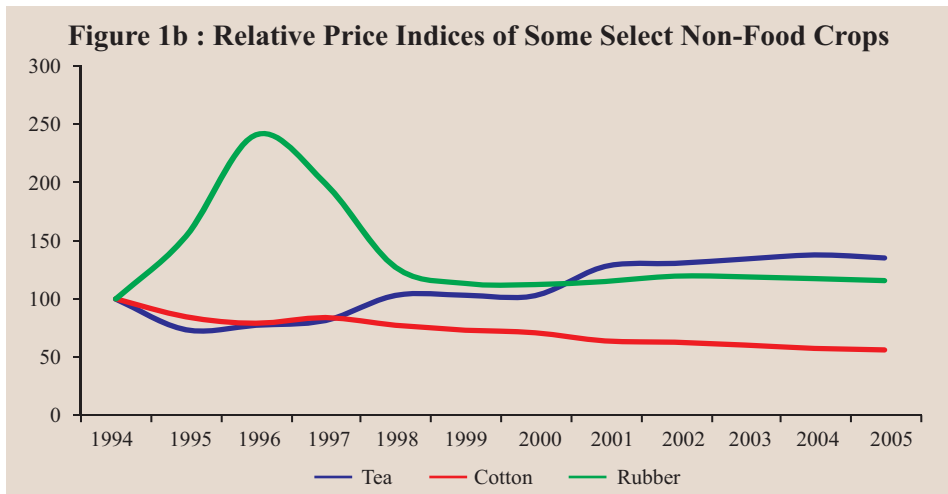
real price of wheat has declined in recent years but is yet higher in 2005 compared to 1994, the initial point in our comparison. Pulses show a sharp increase since the late 90s. Among the 'non-food crops' considered here cotton shows a declining trend in its real price. For the other two the real price is higher at the end of the period than at its beginning, though the price of rubber has fluctuated in between.

Thus visual inspection of the movement of prices of some important crops show no major evidence of the possibility of a price-induced decline in the profitability of production for most of them at least. We are, of course, aware of the possible worsening⁷ of the price situation for some crops grown in south-western India and the distress that this has caused. However, it is important to bear in mind the share of agricultural GDP constituted by these crops. 'Fibres and plantation crops' account for less than 7.5 percent⁸ of the index of crop agriculture for India, even though they constitute a much more substantial part of some regional economies.



⁷ See Jeromi (2007).

⁸ See 'Economic Survey 2006-07', Table 1.9.



Eyeballing graphs can be illuminating but needs to be supplemented by more formal statistical analysis. Thus motivated, we have estimated the trend in real agricultural producer prices for the same set of crops. The results are presented in the box below. Against each crop, both the direction of movement and the statistical significance at the 5 per cent level of the estimated trend are indicated.

The exercise yields results not too different from those reported by us after a visual inspection of the time series plot. There is a negative trend in price for the cotton crop alone. Pulses and tea show a positive trend.

Box: The trend in real farm prices for selected crops 1994- 2005	
Rice	Negative/Not Significant
Wheat	Negative/Not Significant
Pulses	Positive/Significant
Cotton	Negative/Significant
Tea	Positive/Significant
Rubber	Negative/Not Significant

A summary account of price movement since 1991 - perhaps more pertinently, since the advent of the WTO - is that for the majority of Indian crops there is no statistically significant worsening of their real price.

III.2.b. Import penetration

Though the route by which imports have an impact on domestic production is via prices, and having studied the evolution of some important agricultural prices we observe no significant worsening across-the-board, we now investigate the extent of import penetration over the same period. We exclude rubber from this exercise, however, as its relative price has risen steadily since 2000.

The data on the ratio of imports to production are presented in Table 3. Note that for most crops this ratio has been low historically and is low now too. Pulses show a consistently high level of this ratio in recent years

Table 3: Import-Production Ratio for Selected Commodities							
(in per cent)							
Year	Pulses	Wheat	Rice	Other Cereals	Sugar	Cotton	Tea
1990-91	5.6	0.1	0.1	0.0	0.1	-	-
1991-92	2.6	-	0.0	0.0	0.0	-	-
1992-93	3.0	2.4	0.1	0.0	0.0	7.1	-
1993-94	4.7	0.4	0.1	0.0	0.0	0.2	5.0
1994-95	3.9	0.0	0.0	0.0	-	4.0	-
1995-96	4.0	0.0	0.0	0.0	1.0	3.2	-
1996-97	4.6	0.9	-	0.0	0.0	0.1	-
1997-98	7.8	2.2	0.0	0.0	2.7	0.5	-
1998-99	3.8	2.5	0.0	0.0	5.8	2.7	0.0
1999-2000	1.9	1.8	0.0	0.7	6.5	12.1	0.6
2000-01	3.2	0.0	0.0	0.1	0.2	13.1	1.3
2001-02	16.6	0.0	0.0	0.0	0.1	22.8	1.2
2002-03	17.6	-	0.0	0.0	0.2	16.0	2.8
2003-04	11.6	0.0	0.0	0.0	0.5	10.8	1.2
2004-05	10.2	-	-	0.0	7.2	6.9	3.6
2005-06	12.0	-	-	0.1	2.9	3.1	2.0

Notes: denotes not reported/not imported/negligible
Source: Authors' calculation from 'Agriculture Statistics at a Glance', GoI.

but the relative price of this crop has remained steady throughout and is rising in phases⁹ since the late nineties. Indeed the case of pulses demonstrates the fallacy of the position that high imports are always to be interpreted as a worsening of the position for domestic producers.

Indeed imports may be expected to flood-in precisely as domestic prices rise due to a supply-demand imbalance. Of course, we would expect the equilibrium market price to be lower now than it would have been in the absence of imports. But this is a far cry from asserting that imports always cause distress for domestic producers. For two crops, namely tea and cotton, the import ratio has for about five years starting 2000 been higher than the average since 1990. In the case of cotton, there was a surge about that time, but one that has equally dramatically subsided. The latest figures available show that for both crops the ratio is by now far lower than the highest figures recorded before accession to WTO. Except for pulses the ratio of imports to production is by now very low for Indian agriculture in general.

Given the attention it has received, we would like to dwell a little longer on the case of cotton. This is a crop for which the relative price has been declining in the past five years. So has the import ratio, though much more rapidly, having stood at a historical high of 22.8 in 2001-02. This pattern can be reconciled once we take into account the over 100 per cent expansion¹⁰ of cotton production domestically since 2000. A likely scenario is that the expansion in production lowered the relative price and crowded out imports. Such a steady expansion in output in the face of a declining relative price suggests that cotton production is a profitable venture¹¹ and the story of distress related to cotton production is not uniform across the country. It suggests, more generally, that it would be

⁹ See Chart 1a.

¹⁰ See 'Economic Survey 2006-07', Table 1.12.

¹¹ See Sud (2008) for a report of field studies reviewing the results of adopting Bt-cotton.

wrong to always draw a direct line from prices to the profitability of production. No doubt, incentives are central but prices play, apparently from this experience, only a part of the determination of profitability.

From this study of price behaviour and imports we do not see much ground for granting imports a significant role in determining the trajectory of agricultural growth since 1991. However, integration with the world economy has a potential consequence that can be damaging independently of import penetration. One aspect of the new environment, it had been predicted would be an increased¹² volatility of prices. Increased volatility can adversely affect producers, especially if they are small-holders. To address this issue we present in Table 4 the coefficient of variation in prices for some major crops in the Indian and global markets. The data used are, once again, real prices.

Two conclusions may be drawn from an inspection of the coefficients. First, for the overwhelming majority of crops, price volatility in India is substantially lower than in the global market, implying that the integration is less than full. The latter in any case, is also what is implied by the

Table 4: Coefficient of Variation of the Relative Prices of Select Commodities

Crops/Commodities	(Per cent)			
	India		World	
	1998-2002	2003-2007	1998-2002	2003-2007
Overall Food	2.9	2.3	16.5	17.8
Rice	6.6	4.3	34.5	11.1
Wheat	6.0	4.6	16.9	17.4
Edible Oil	15.2	7.6	39.9	24.8
Sugar	8.5	9.3	17.0	21.4
Tea	23.5	9.0	21.0	23.3
Cotton	13.2	14.7	24.2	33.2
Rubber	8.1	20.4	17.9	10.9

Source: Computed using data from IMF and the Office of the Economic Adviser, Ministry of Commerce and Industry.

¹² See Nayyar and Sen (1994).

figures for import-production ratios presented by us earlier. Secondly, comparing data across periods for India and the world separately, we find volatility reduced for most crops in the Indian market, but not so in the global, implying that as the world market has got more volatile the Indian one has become less so. However, there is a clear divergence within the Indian market between food and non-food crops. While the price of food crops, including edible oils and sugar, has become less volatile, the majority of the non-food crops show increased price-volatility, though the degree is worthy of comment only in the case of rubber. Altogether, an increased volatility of prices is not a feature of the environment faced by India's farmers since 1994 at least.

We conclude this section with the following observations. The profile of relative prices over the past fifteen years indicates too mild a shift, if at all, to consider relative price movements as central to understanding the slowing of agricultural growth since 1991. The role of import liberalisation in determining this price movement appears to be marginal too, except perhaps for some crops in some periods. Prices are only one element in the producer's calculation. Yield can play the role of mitigating negative price movements. And yield continues to grow in the nineties, though slower of course. Price movements have received a great deal of attention of late, but we believe that an excessive focus could be misleading when it comes to a serious study both of the factors that have determined growth in the past and of the prospects for growth in the future, as price movements are also reversible, as we have found here. We now turn to a study of non-price factors in the determination of agricultural growth, largely via yield, since 1991.

IV. Non-price factors and the recent agricultural growth

We treat the non-price factors governing agricultural growth under two separate headings, those that are part of the long-run evolution of

production conditions in Indian agriculture and those that are more closely related to the policy regime.

IV.1. Shrinking farm size

A persistent trend in Indian agriculture is the shrinking farm size. This is a long-term trend and unless addressed can have permanent adverse consequences for the sector, impinging upon its prospects. To illustrate, in Table 5a we have presented data on the size distribution of operational holdings.

Note the significant increase in the share of holdings in the smallest category, and a definite decline in the share of holdings of larger size. Thus, by now the majority of farms are in the category referred to as 'semi-medium' or even smaller. At the same time as the smaller farms have come to predominate, due to the fixity of land, they have come to account for the greater part of the area operated. As an indication, note from Table 5b that while in 1960-61 over 60 per cent of the cultivated area was operated by farms exceeding 4 hectares by 2002-03 the figure is less than 35 percent.

Together these tendencies amount to a downscaling of production in the sense of cultivation taking place on progressively smaller farm units.

Table 5a: The Size-distribution of Operational Land Holdings

(percentage of operational holdings)					
Holding Category	1960-61	1970-71	1981-82	1991-92	2002-03
Marginal (Less than 1 hectare)	39.1	45.8	56.0	62.8	69.8
Small (1-2 hectares)	22.6	22.4	19.3	17.8	16.1
semi-medium (2-4 hectares)	19.8	17.7	14.2	12.0	9.0
Medium (4-10 hectares)	14.0	11.1	8.6	6.1	4.3
Large (10 hectares and above)	4.5	3.1	1.9	1.3	0.8
All categories	100.0	100.0	100.0	100.0	100.0

Source: 'Some aspects of operational land holdings in India 2002-03', NSS Report No. 492. Entry for 2002-03 is the average of figures for the kharif and rabi crops.

Table 5b: The Distribution of Operated Area by Holding Size

Holding Category	(percentage of operated area)				
	1960-61	1970-71	1981-82	1991-92	2002-03
Marginal (Less than 1 hectare)	6.9	9.2	11.5	15.6	22.2
Small (1-2 hectares)	12.3	14.8	16.6	18.7	20.6
semi-medium (2-4 hectares)	20.7	22.6	23.6	24.1	22.4
Medium (4-10 hectares)	31.2	30.5	30.1	26.4	22.7
Large (10 hectares and above)	29.0	23.0	18.2	15.2	12.1
All categories	100.0	100.0	100.0	100.0	100.0

Source: 'Some aspects of operational land holdings in India 2002-03', NSS Report No. 492. Entry for 2002-03 is the average of figures for the kharif and rabi crops.

This is likely to have had consequences unforeseen in textbook micro-economic theory implicitly addressed to the western experience. Thus, while standard econometric exercises turn in evidence of constant returns to scale for Indian agriculture, implying that the downscaling that we observe is of no consequence for productivity, some scepticism is advisable as it does not allow for varying form of labour organisation across farm size in India. Allowing for this possibility, we note from Sen and Bhatia (2004) that as farm size is reduced members of the family are driven to look outside the farm to supplement their income, in turn being forced to neglect production management, thus slowing growth. The authors have demonstrated the plausibility of such a scenario by computing for each state the minimum requisite holding-size to maintain a family of five above the poverty line. They find that at least half the Indian states have average holdings below the minimum thus defined. Equally, the states that their estimates reveal as the more dynamic as defined by a rate of growth of agriculture higher than the average - namely, Assam, Haryana, Madhya Pradesh, Punjab, Tamil Nadu, Uttar Pradesh and West Bengal - have holdings on average greater than the minimum required, though average holding-size in Tamil Nadu, Uttar Pradesh and West Bengal is very close to the minimum defined.

The shrinking farm size with its consequence for agricultural growth has generally gone unrecognised in recent discussions of the latter. However it may well be one of the factors that underlie the much reported finding from the National Sample Survey¹³ that close to forty per cent of Indian farmers report that farming are not profitable. In this context, the prospect of an acceleration in the growth rate as expected in the Eleventh Plan is dim, unless a sufficient policy intervention takes place.

We draw two conclusions from the evidence on shrinking farm size provided by us. First, there is reason to believe that smaller holding-size makes it more difficult for the majority of Indian farms to access new technology and adopt more efficient forms of farm production organisation as their capacity to leverage credit is reduced. While these are relatively less capital intensive actions, their pay-off could be large in relation to the investment. More capital intensive investment in what is called the 'land-improvement factor' is very likely inconceivable for the largest number of Indian farmers today due to their meagre asset base. The slower growth of yield since 1991 may, at least to an extent, be related to this aspect. Secondly, an improvement of farm relative-prices can do little to stem agricultural decline when structural factors governing production, such as farm size, turn adverse irreversibly.

Alongside the shrinking farm size should be acknowledged the developing environmental stress reported for the agricultural sector. Ecological stress is difficult to record at the all-India level using official statistics, but its existence is obvious from field studies and media reportage. Two aspects of this are loss of soil nutrients and declining water availability. This contributes directly to potential yield loss that can be compensated, if at all, only via greater expenditure which increases cost of production. It is clear that smaller farms strapped for credit cannot handle this ecological decline by themselves. This is one identifiable consequence of shrinking farm size. The impact on production cost of an

¹³ 'Some Aspects of Farming', NSSO, 2005.

identical fixed input is distributed unequally across farm size, with the implication that smaller farms cannot be expected to initiate much change. A diminishing economic base and gathering ecological stress constitute a pincer movement that impinges upon the future of agriculture in India. This needs to be addressed directly.

We conclude this section with a brief comment on the role of policy vis-à-vis the specific constraints on growth identified here. Actually, economic policy may have contributed indirectly to some aspects of environmental degradation in the agricultural sector. First, the pattern of subsidisation of fertiliser production has skewed fertilizer use in the direction of urea thus impacting the nutrient balance in the soil. Free or even unlimited subsidisation of electricity has meant the depletion of ground water. The depletion of ground water is a negative externality which has no market solution. Concerted action is required as with most environmental issues, and the government is the obvious first choice as the co-ordinator. Next, while the developing environmental stress has received some attention, possible responses to the consequence of shrinking farm size has received much less if at all. In the context of survey response indicating low incentive for farming and evidence we have quoted here of average holding-size falling below the minimum required in the majority of Indian states, economic policy must turn to encouraging an active lease market. Current legislation, dating back to the original land reform, may actually be a hindrance to this. In some states tenancy is not officially recognised. This could hold back output expansion.

IV.2. Capital formation

Capital formation in Indian agriculture is undertaken by both government and the private sector. However, there is an economic distinction between these. Almost all of the public investment is in the nature of a public good, i.e., it is non-excludable, and for that reason unlikely to be undertaken by the private sector. Including roads,

embankments and irrigation networks, public investment is a vital input into agricultural production. Recognition of its importance had made it central to planning for agricultural growth in the past¹⁴. That private capital formation is important can be surmised from the very fact that it is undertaken by profit-oriented agents. In this section we review the record of investment since 1991 with a view to understanding its likely impact on the growth of agricultural production. Data on capital formation by sector is presented in Table 6a.

Table 6a: Gross Capital Formation in Agriculture

(Rupees crore, 1999-2000 prices)

Year	Total	Public Sector	Private Sector
1980-81	27,450	12,521	14,929
1981-82	23,231	12,078	11,153
1982-83	24,924	11,928	12,996
1983-84	26,159	11,944	14,215
1984-85	23,929	11,562	12,367
1985-86	22,855	10,509	12,346
1986-87	22,187	9,848	12,339
1987-88	26,893	10,193	16,700
1988-89	24,023	9,488	14,535
1989-90	23,897	7,968	15,929
1990-91	35,573	7,882	27,691
1991-92	22,338	6,998	15,340
1992-93	28,469	7,333	21,136
1993-94	25,556	8,096	17,460
1994-95	24,377	8,949	15,428
1995-96	24,585	8,731	15,854
1996-97	26,697	8,373	18,324
1997-98	28,650	6,872	21,778
1998-99	28,366	6,926	21,440
1999-2000	43,473	7,716	35,757
2000-01	38,735	7,155	31,580
2001-02	47,043	8,746	38,297
2002-03	46,823	7,962	38,861
2003-04	45,132	9,374	35,758
2004-05	48,576	10,267	38,309

Source: National Accounts Statistics 2007, Govt. of India.

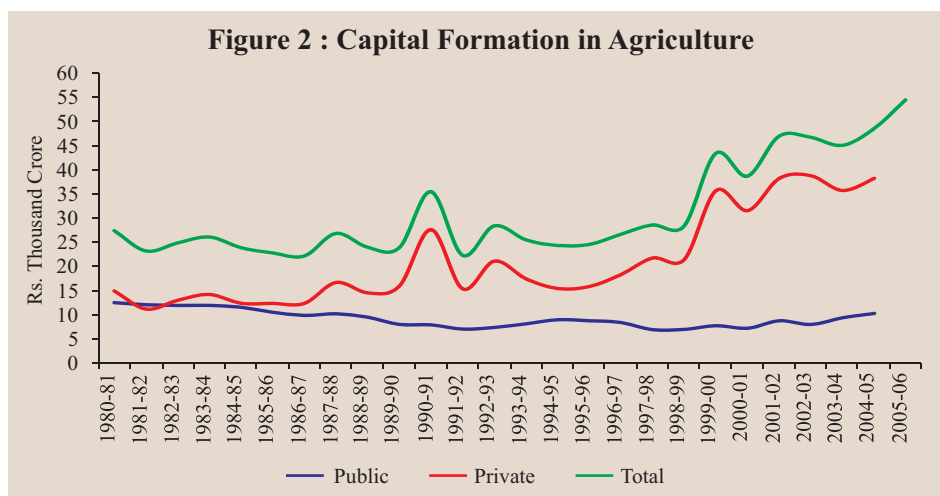
¹⁴ See Alagh (1994).

Aggregate capital formation appears to collapse with the initiation of reforms remaining depressed throughout the nineties. Of course, too much ought not to be read into the decline in 1991-92 as it is magnified by an increase in 1990-91 that far exceeds the trend value for that year. Nevertheless, capital formation rises over the level of 1990-91 only in 1999-2000, leaving the nineties as a period of low investment in agriculture. We would expect it to have affected the rate of growth of output. Aggregate capital formation has revived more recently.

The figure for aggregate capital formation, however, masks a difference between the private and public sectors. The history of public capital formation in the nineties is a continuation of a discernible trend going back at least to 1980-81. The level in 2004-05, the last year for which data was available at the time of writing this, is yet close to 20 per cent less than the level in 1980-81. The behaviour of private capital formation is more volatile, unlike public capital formation, collapsing with the onset of the reforms and remaining depressed during the first half of the nineties. However, unlike public capital formation it begins to rise from the mid-nineties, only to stagnate from around the year 2000. Nevertheless, there is a doubling of capital formation in the private sector over the decade from the mid-nineties, and it is difficult to square this with widespread distress in the agricultural sector. Of course, we may expect a diversity between crops, regions and even farm households, a diversity that is obscured in the aggregation. That is, the observed surge in private investment may be confined to some areas. However, the slowing of the rate of growth of output at a time of accelerating private investment requires explanation. We put forth two tentative ones. First, the impact of capital formation is likely spread into the future, as infrastructure projects in agriculture are of longer gestation than elsewhere in the economy. Secondly, the impact of the depressed state of public capital formation may not have been fully offset by the rising capital formation in the private

sector from the mid-nineties on as private and public capital very likely contribute differently to the production process. Public capital is more in the nature of public goods that are unlikely to be provided by the private sector and the economic role of which cannot be replaced by private capital formation. When we recognise that large irrigation projects and road networks are of the main type of capital formation in the public sector this argument takes on greater force. The data in Table 6a has been graphed in Figure 2.

We have thus far been looking at expenditure on the capital account. This is not the same as evidence on factor accumulation of which we may attempt a direct enumeration. For this we choose to look at the expansion of area irrigated during the nineties. For agricultural production, irrigation is arguably the most important¹⁵ input after seed, and the most important element of public capital formation. Before reviewing the data we might mention that 'area under irrigation' very



¹⁵ It has been estimated (see Vaidyanathan 2004) that almost all of the increase in agricultural production in the last three decades of the twentieth century has come from expansion of irrigated area and the increase in yields that this enables.

likely measures only the potential reach of an irrigation facility. How close to the potential actual delivery is we will never know from this measure. However, it is the only one that we have for water made available via irrigation.

Note from the data in Table 6b that growth in coverage of irrigated area in all the main crop categories has slowed in the nineties. For oilseeds and cotton the area has actually declined. This information must be seen in light of the already very low levels of irrigated area in India by international standards. In the mid-90s, the percentage area in India was less than in Bangladesh and Nepal, lower than in China and less than half that in Japan and Korea¹⁶. Lower yield in Indian agriculture relative to East Asia is not so surprising any more, and the fact of agricultural-yield stagnation in India despite a holding size that is larger on average than in China¹⁷ falls into place. Rice yields in India are exactly half that in Japan, an economy of small-holder agriculture.

While the slow expansion of irrigation is a serious cause for concern given the low coverage, we have reason to believe that public expenditure may not be the only factor governing this lack of movement. In Table 6c are presented data on expenditure on irrigation (and flood control, an intervention of almost equal importance to Indian agriculture). Here we

Table 6b: The Expansion of Irrigation

(Per cent irrigated area)				
Crop/Year	1970-71	1980-81	1990-91	2000-01
Cereals	27.6	34.1	41.0	49.6
Pulses	8.8	9.0	10.5	12.3
Foodgrains	24.1	29.7	35.1	43.1
Oilseeds	7.4	14.5	22.9	22.5
Cotton	17.3	27.3	32.9	32.6
Sugarcane	72.4	81.3	86.9	91.3

Source: Economic Survey 2006-07.

¹⁶ See World Development Indicators 1998.

¹⁷ A feature highlighted in the year 2007 Report of the Economic Advisory Council to the Prime Minister.

Table 6c: Public Expenditure on Irrigation and Flood Control

Period	Nominal Expenditure in Rs. crore	WPI (Base: 1993-94=100)	Real Expenditure in Rs. crore (1993-94 prices)
Third Plan (1961-66)	664.7	9.0	7,402.0
Annual Plans (1966-69)	471.0	12.7	3,699.0
Fourth Plan (1969-74)	1,354.1	16.0	8,484.3
Fifth Plan (1974-79)	3,876.5	25.7	15,095.4
Annual Plan (1979-80)	1,287.9	31.2	4,127.9
Sixth Plan (1980-85)	10,929.9	42.5	25,717.4
Seventh Plan 1985-90)	16,589.9	58.5	28,349.1
Annual Plans (1990-92)	8,206.0	78.8	10,413.7
Eighth Plan (1992-97)	31,398.9	110.7	28,353.7
Ninth Plan (1997-2002)	63,009.5	147.2	42,817.0
Tenth Plan (2002-2007)	1,03,315.0	186.3	55,450.3

Notes: Figure for Tenth Plan is the plan outlay.

Source: Authors' estimates from Economic Survey 2006-07.

find that expenditure on irrigation has not¹⁸ declined in the nineties. Clearly now the reasons for the slowing of an already low rate of expansion of irrigated area must be sought elsewhere. Researchers¹⁹ on irrigation and water usage speak of three deficiencies in the area of public provision of irrigation, namely deficiency at each of the levels of planning, implementation and management. We see this as a question of governance.

Effective governance requires institutional reform and needs to be addressed explicitly if efficiency in the use of the resource most valuable to agriculture after land is to be increased. Inefficient use of water under the current arrangements in irrigation management are said to lead to environmental degradation via water logging and induced salinity. The objective of this study and the nature of our own expertise precludes our elaborating upon the argument. Our intention is to draw attention to the fact that governance may be as important a factor as resources in the

¹⁸ See in particular the figure for the Eighth Plan in the Table.

¹⁹ See Vaidyanathan (2007).

context of extending the frontier of irrigation in Indian agriculture. However, given the low correlation between expansion in area irrigated and expenditure on the same, implied when the information in Tables 6b and 6c is taken as a whole, we argue for an urgent review of usage of funds allotted to this sector. Public funds have alternative uses, and as we demonstrate below some areas of agriculture are severely underfunded.

This review of capital formation in agriculture and of the expenditure on irrigation offers us one clue while trying to identify the factors responsible for the slowdown of agricultural growth since 1991. The fact of the maintenance of spending on irrigation and a history of decline of public investment over a full quarter century suggests that it would be wrong to attribute, as some do, slow growth to the withdrawal of the state as a policy, allegedly initiated in 1991, or due to the contingency of fiscal correction, acknowledged as an objective of the government. Note from Table 6a that public investment had begun to decline in the eighties, a time of fiscal profligacy represented by a ballooning deficit. Altogether, we find here evidence of long-term tendencies predating the launching of reforms that are likely at work in depressing agricultural growth.

IV.3. The knowledge base

We now address an issue that has only recently come into the mainstream discussion of agricultural growth in India despite its heightened relevance, namely, 'research and extension'. Agricultural economists have long pointed²⁰ to the importance of research and extension to the acceleration of agricultural growth in the past. Our contribution here is mainly to provide an indication of how research and extension may have progressed since 1991 as data on these have tended to be more scarce in the public domain than even the recognition of their importance.

²⁰ Pal and Singh (1997) cite several studies that establish this.

Rudimentary growth accounting suggests that future growth must come through productivity increase. Acreage expansion is more or less infeasible. Though double-cropping can be made possible via irrigation, we have seen that the expansion of irrigation has been very slow of late. Acreage actually appears to be at a standstill²¹ since 1990. Yield growth has slowed too, compounding the challenge of bringing about faster output expansion. While yield growth in any context requires technological progress, effected via innovation, in India today this imperative is unlikely to be confined to better plant variety, as in the 1960s when the growth acceleration was engineered mostly via the use of high-yielding varieties of seed. It is clear that the production conditions situation today are vastly different. Three features characterise the present: first, we have had two decades of stagnant public capital formation implying that the necessary public infrastructure is very likely lacking; secondly, compared to the sixties producers confront a more or less open trade regime and, as a result, face far greater international competition; thirdly, and directly prioritising accelerated production of knowledge, the natural resource base is shrinking due to declining farm-size and environmental degradation.

Technological change in the future must encompass the imperatives arising out of these three developments outlined above. Now the need for knowledge-based inputs is very likely set to increase substantially, as producers are increasingly driven to get more out of a limited resource base. With smaller farms accounting for the greater part of operated area the need for a publicly funded, and managed, knowledge production and dissemination system is indispensable as small farmers lack the capital to generate or often to even purchase the relevant knowledge inputs when they may be made available. Of course, India possesses a not insubstantial

²¹ See Table 1.

public research and extension network, the former being largely centred on the ICAR. Researchers²² who have studied the functioning of this network are critical of what it can achieve under its present form of organisation. They also point out that such attempts to improve the effectiveness of public-sector research and extension "have focused too closely on components of research or extension, and have lost sight of what needs to be done to put in place the preconditions for innovation". As an example of how agricultural production today is held back by chronic constraints attributable to a fragile and diminishing resource base and the role of a public support system in addressing this challenge consider this: "Efforts to improve the resource base are channeled especially through the rehabilitation of micro watersheds. Such rehabilitation reduces soil and water runoff, improves percolation, increases the availability of fodder and water for irrigation, and so results in the introduction of new crops and varieties. Farmers are unlikely to be familiar with technologies that will enable them to take full advantage of the possibilities. Research and extension services can play a major role in providing these from outside. The uptake of farm-level technology could also be better enhanced through improved provision of the genetic resources used by farmers."²³ While the case of irrigation expansion is exemplary in communicating to us that today governance is at least as important as funding in the transformation of Indian agriculture, our investigation suggests that the funding of publicly-provided 'research and extension' expenditure has not kept pace with the increasing need for such support. We now turn to the findings that undergird our judgment.

²² Farrington et al (1998). As an indication of the weakness of the research and extension effort in Indian agriculture consider, from data in Farrington et al, that wheat cultivars in India are on average three times older than those in the UK, the economy with the highest wheat yields globally. A 'cultivar' is a plant variety produced from a naturally occurring species that has been developed and maintained by cultivation. Continuously recorded yield increases usually requires planting younger cultivars, in turn requiring greater research and extension effort.

²³ See Farrington et al (1998), Section 1.4.

In Table 7a are presented data on the growth of public expenditure on research and extension, at constant prices, decade-wise for four decades upto 2006. For both the main components of knowledge production and dissemination namely 'research and education' and 'extension and training', respectively, growth has slowed since 1990. In the case of extension services the slowdown is particularly sharp. It is interesting to note that for this category the growth of expenditure was highest by far in the sixties the period of the last acceleration in the agricultural growth rate, suggesting that extension is a crucial component of an enabling policy. The rate of growth of expenditure on extension services has declined three-fold since the nineties.

An indication of the sufficiency of expenditure on the production and dissemination of knowledge is given by the ratio of this expenditure to agricultural output. This data is presented in Table 7b. Note that currently public expenditure on research and extension together stands at well below one per cent of GDP in agriculture. Though it has risen somewhat steadily over the past four decades, the post-2000 figure is above trend largely due to the slowing of output growth²⁴. While only a technical appraisal can provide a norm for such expenditure, at less than less one per cent it is well below international standards. As cited by Pal and Singh

Table 7a: Growth in Real Public Expenditure on Research and Extension

(Per cent)		
Year	Research and Education	Extension and Training
1960s	6.5	10.7
1970s	9.5	-0.1
1980s	6.3	7.0
1990-2005	4.8	2.0

Note: Figure for Extension and Training in the '1980s' is for 1980-94.
Source: For '1990-2005' authors' estimates from 'Finance Accounts'; rest from Pal and Singh (1997).

²⁴ As may be gathered by studying the data in Tables 1 and 7c together.

(1997), the figure for research expenditure as share of GDP for the agricultural sector was 2.39 for the developed countries in the year 1991. By comparison spending in India is woefully²⁵ inadequate. A benchmark is also provided by the targeted spending on education of 6 per cent of GDP in the Eleventh Plan. Finally, from Table 7b note that unlike spending on education the spending on extension has declined steadily since 1991. The figures on spending on both 'research' and 'extension', especially the latter, are propped-up by the unusually high increase²⁶ in 2005-06.

It is clear that public support for expanding the knowledge base for agriculture is shrinking since 1991 precisely when, for reasons stated by us, the need for it is rising. As it would be useful to ascertain whether this is due to a generally tightening financial position of a government committed to expenditure curtailment *per se*, we look at the evolution of the share of 'research and extension' in the total revenue expenditure on agriculture of the Centre and the States. This data is presented in

Table 7b: Public Expenditure on Research and Extension as Share of Agricultural GDP

(Per cent)		
Year	Research and Education	Extension and Training
1960-62	0.21	0.09
1970-72	0.23	0.14
1980-82	0.39	0.11
1989-91	0.41	0.16
1992-94	0.40	0.15
1995-97	0.38	0.14
1998-00	0.44	0.15
2001-03	0.52	0.13
2004-06	0.52	0.13

Source: Figures from 1992 on are authors' estimates from Finance Accounts; rest from Pal and Singh (1997).

²⁵ Of course, the data in Table 7b pertain only to public expenditure. However, according to Pal and Singh (1997), this accounted for 85 per cent of total spending on research in India in the early nineties.

²⁶ See Table 7c.

Table 7c. Note that for almost two decades now this figure has hovered around 0.5 per cent or less. This speaks of choice rather than contingency having determined the magnitude. Once again, compare this with the target spending on education of around 20 per cent of total spending in the Eleventh Plan. Though the already miniscule rate of spending on research and extension has contracted by over 15 per cent since 1990 to a level less than the figure for the early seventies, our judgment is that the low outlay on 'research and extension' has less to do with the reforms than reflecting a structural feature of the policy vis-a-vis agriculture in India. Clearly we have not invested sufficiently in knowledge for agriculture.

Table 7c: Public Expenditure on Research & Extension

(Rs. Crore)				
Year	Total Revenue Expenditure	Extension and Training	Research and Education	Public Expenditure on Research & Extension as share of Revenue spending (in per cent)
1	2	3	4	5
1987-88	1,11,341	156	411	0.51
1988-89	1,28,736	191	477	0.52
1989-90	1,50,225	225	566	0.53
1990-91	1,75,071	254	697	0.54
1991-92	2,01,861	275	772	0.52
1992-93	2,28,900	307	836	0.50
1993-94	2,60,783	352	957	0.50
1994-95	3,04,605	410	1,091	0.49
1995-96	3,41,468	451	1,204	0.48
1996-97	3,94,280	476	1,327	0.46
1997-98	4,64,306	559	1,505	0.44
1998-99	5,18,614	714	1,887	0.50
1999-2000	5,98,870	691	2,356	0.51
2000-01	6,30,614	603	2,564	0.50
2001-02	6,83,632	648	2,520	0.46
2002-03	7,37,211	613	2,680	0.45
2003-04	8,10,019	660	2,838	0.43
2004-05	8,56,507	685	3,057	0.44
2005-06	9,77,601	905	3,509	0.45

Source: 'Finance Accounts', Government of India.

The set of three exercises undertaken here with respect to public expenditure on research and education and its evolution points to the shrinkage of an already meagre outlay. While expenditure on a service cannot reflect the quality of the output, especially of knowledge-based inputs, it remains the only indicator of the availability of the service itself. The shrinkage is occurring at a time of turbulence in the policy environment and a developing fragility of the bio-physical, when the need for publicly-provided support services to production is greater. This is a matter of concern and compounds the issue of governing the national innovation system for India's agriculture. In the study of the factors underlying the growth of agriculture since the initiation of the economic reforms and its prospects this has received less attention than it deserves.

IV.4. Credit

A study of agricultural growth would be incomplete without reference to credit. However, despite its importance this brief section is not an investigation of the role of credit in the slower growth of output since 1991 as a study of this issue is currently being undertaken at the RBI. Instead we here raise some issues and concerns with reference to institutional credit to the agricultural sector.

Recognising the importance of agriculture sector in India's development, the Government and the Reserve Bank of India (RBI) have played a vital role in creating a broad-based institutional framework for catering to the increasing credit requirements of the sector. Sufficient and timely supply of institutional credit to agriculture has assumed critical importance. In India a multi-agency approach comprising co-operative banks, SCBs and RRBs has been followed for purveying credit to agricultural sector. The policy of agricultural credit is guided mainly by the considerations of ensuring adequate and timely availability of credit at reasonable rates

through the expansion of institutional framework, its outreach and scale as also by way of directed lending. Overtime, spectacular progress has been achieved in terms of the scale and outreach of institutional framework for agricultural credit.

IV.4.i. Discernible trends

Some of the major discernible trends are as follows:

- Overtime the public sector banks have made commendable progress in terms of putting in place a wide banking network, particularly in the aftermath of nationalisation of banks. The number of offices of scheduled commercial banks increased rapidly from 8,262 in June 1969 to 73,836 by March 2007.
- One of the major achievements in the post-independent India has been widening the spread of institutional machinery for credit and decline in the role of non-institutional sources-particularly relieving the vast majority of population from the clutches of money lenders. The share of institutional credit, which was little over 7 per cent in 1951, galloped manifold to over 66 per cent in 1991, reflecting concomitantly a remarkable decline in the share of non-institutional credit from around 93 per cent to about 31 per cent during the same period. However, the latest NSSO Survey reveals that the share of non-institutional credit has taken a reverse swing which is a cause of concern (Table 8).

Notwithstanding their wide network, co-operative banks, particularly since the nineties have lost their dominant position to commercial banks. The share of co-operative banks (22 per cent) during 2006-07 was less than half of what it was in 1992-93 (62 per cent), while the share of commercial banks (33 to 68 per cent) including RRBs (5 to 10 per cent) was almost doubled during the above period (see Figure 3).

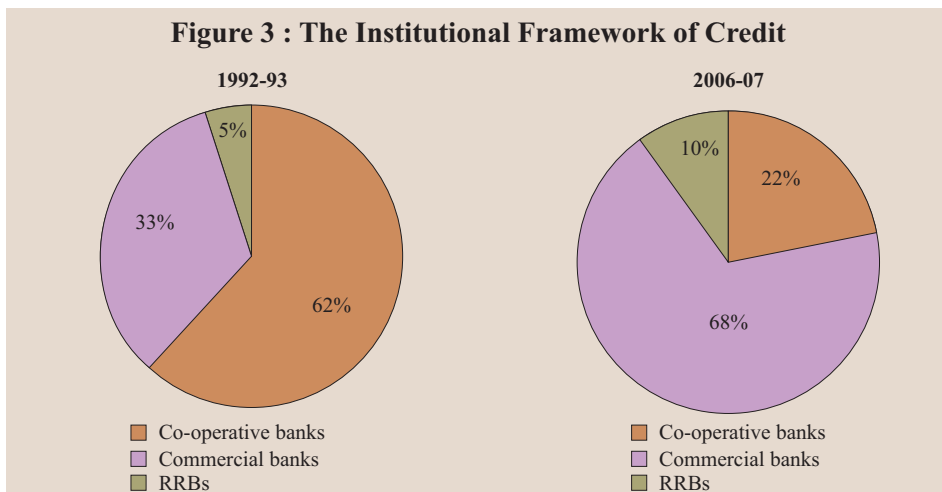
Table 8: Relative Share of Borrowing of Cultivator Households from Different Sources

(Per cent)						
Sources of Credit	1951	1961	1971	1981	1991	2002
1	2	3	4	5	6	7
Non-Institutional	92.7	81.3	68.3	36.8	30.6	38.9
<i>of which</i>						
Money Lenders	69.7	49.2	36.1	16.1	17.5	26.8
Institutional	7.3	18.7	31.7	63.2	66.3	61.1
<i>of which</i>						
Cooperatives						
Societies/Banks	3.3	2.6	22.0	29.8	30.0	30.2
Commercial Banks	0.9	0.6	2.4	28.8	35.2	26.3
Unspecified	-	-	-	-	3.1	-
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: All India Debt and Investment Surveys, and NSS.

The efforts to increase the flow of credit to agriculture seems to have yielded better results in the recent period as the total institutional credit to agriculture recorded a growth of around 21 per cent during 1995-96 to 2006-07 from little under 12 per cent during 1986-87 to 1994-95.

Figure 3 : The Institutional Framework of Credit



IV.4.ii. Issues and concerns

Despite the significant strides achieved in terms of spread, network and outreach of rural financial institutions, the quantum of flow of financial resources to agriculture continues to be inadequate. One of the major impediments constraining the adoption of new technological practices, land improvements and building up of irrigation and marketing infrastructure has been the inadequacy of farm investment capital. Farmers seem to borrow more short-term credit in order to meet input needs to maintain continuity in agricultural operations without much worrying about long-term capital formation. It might be the case from supply side that short-term credit bears low credit risk, lower supervision and monitoring costs, and a better asset liability management. The flow of investment credit to agriculture is constrained by host of factors such as high transaction costs, structural deficiencies in the rural credit delivery system, issues relating to credit worthiness, lack of collaterals in view of low asset base of farmers, low volume of loans with associated higher risks, high man power requirements, etc. The large proportion of population in the lower strata, which is having major share in the land holdings receives much less credit than its requirements. The growing disparities between marginal, small and large farmers continues to be a cause for concern. This observed phenomenon may be attributed, inter alia, to the "risk aversion" tendency of the bankers towards small and marginal farmers as against the large farmers, who are better placed in offering collaterals. Notwithstanding the rapid spread of micro-finance programme, the distribution of SHGs is skewed across the States. Around 50 per cent of the total SHG credit linkages in the country are concentrated in the Southern States. In the States, which have a larger share of the poor, the coverage is comparatively low. The tragic incidents of farmers' suicides in some of the States have been a matter of serious concern. A number of studies have been conducted to go into the causes of such tragedies and

to suggest short and long term measures to prevent such unfortunate incidents. These studies have identified crop losses, consecutive failure of monsoon, recurrent droughts, mounting debts, mono-cropping, land tenancy, as some of the main causes which led many distressed farmers to commit suicide. Of the total number of suicide cases reported, 76 per cent of the victims were dependent on rain-fed agriculture and 78 per cent were small and marginal farmers. Furthermore, 76 to 82 per cent of the victim households have reported borrowed from non-institutional sources and the interest rates charged on such debts ranged from 24 to 36 per cent. These studies have recommended various measures, *inter alia*, improvement in irrigation coverage; crop diversification; promotion of animal husbandry as an alternate source of income; better accessibility to institutional credit and overall improvement of the marketing infrastructure to ameliorate the distress faced by the small and marginal farmers.

Agricultural policies in India have been reviewed from time to time to maintain pace with the changing requirements of the agriculture sector, which forms an important segment of the priority sector lending of scheduled commercial banks (SCBs) and target of 18 per cent of net bank credit has been stipulated for the sector. The Approach Paper to the Eleventh Five Year Plan has set a target of 4 per cent for the agriculture sector within the overall GDP growth target of 9 per cent. An assessment of agriculture credit situation brings out the fact that the credit delivery to the agriculture sector needs to be enhanced. It appears that the banking system is still hesitant on various grounds to purvey credit to small and marginal farmers. The situation calls for concerted efforts to augment the flow of credit to small and marginal farmers, alongside exploring new innovations in product design and methods of delivery, through better use of technology and related processes.

V. Conclusion, with implications for policy

We have in this study addressed the slowing of agricultural growth in India since 1991. Our method has been to study the movement in this period of factors that have been identified by past researchers as determining agricultural growth in India. Considering separately price and non-price factors we had concluded first that the evidence of price shifts is too mild to account for the observed slowing. On the other hand, there is ample evidence that non-price or 'structural' factors on the supply side may have altered disadvantageously for producers, in some cases from even before 1991, and by now constitute a bottleneck to faster growth in the future. This conclusion is broadly in line with assessments²⁷ based on empirical research over a period of the constraints on growth of Indian agriculture.

The implications for policy follow directly from our findings. Mainly, we observe stagnant public investment for almost a quarter of a century, a slowing of irrigation expansion since 1991 and a downscaling of production due to farm fragmentation. Combined with evidence of gathering environmental stress, these amount to a hardening of production conditions in Indian agriculture. Also, production is increasingly being carried out in a more open economy, even though import penetration is very low currently for most crops. These developments require research and extension to expand to support farming. However, as we have found here, this is not the case. Public expenditure on this item, historically low as a share of agricultural output in India by international standards, has registered a much slower growth in real terms since 1990. We would,

²⁷ For instance: "... studies show that more than 50 per cent of the increments in agricultural output in India in recent years are attributable to shift variables, such as technology and infrastructure, which are unlikely to be responsive to incentives or investment in the private sector." Nayyar and Sen (1994), pp. 85-86.

however caution against the reading that greater spending alone is the solution to the current impasse in Indian agriculture. We have here provided evidence in the case of irrigation that rapidly rising growth of real expenditure since 1991 has actually coincided with a slowing rate of expansion of the percentage area irrigated. This suggests that governance is as much an issue as greater allocation of funds. Improvement in the functioning of the irrigation and research & extension networks would require a serious effort on the part of state governments not only as Agriculture is a 'State subject' but also as there is a limit to how much can be co-ordinated from the Centre once the fund allocation has been made. At least one of our findings suggest that implementation is the key.

As a slowing of agricultural expansion is being encountered at a time when the economic policy regime has undergone reform it has been suggested by some that this slowing is linked intrinsically to this very reform. We find this view limited, and have pointed to structural factors on the supply side of Indian agriculture as worthy of greater attention in the explanation of agricultural growth over the past one and a half decades. Improved prospects for Indian agriculture cannot therefore be sought in mere changes to the policy regime referred to as 'reforms'. Faster agricultural growth will require interventions that are capable of altering the production conditions. At the same time, while the reforms since 1991 may be seen as having corrected a historical bias against agriculture, economic policy must now address frontally some of the specific factors that have been identified in this study as constraining its expansion.

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