Diversification towards High Value Agriculture

Role of Urbanisation and Infrastructure

During the last several years diversification of agriculture in India towards high value commodities, i e, fruits, vegetables and livestock products, has been proceeding at a fast pace and is reflected in the high share of HVCs in agricultural production in a number of districts. This paper builds on the hypothesis that access to markets, defined in terms of demand for HVCs and the factors facilitating their transport from production sites to consumption centres, is critical to their growth. The analysis thus brings out regional variations in HVCs across the country that have implications for regional agricultural planning and consequently for public and private sector investment strategies.

P Parthasarathy Rao, P S Birthal, P K Joshi

I Introduction

Sustained economic and income growth, urbanisation and globalisation are fuelling rapid growth in demand for high value food commodities in India. By 2025 demand for milk, meat, fish, fruits and vegetables is expected to double over the current levels [Kumar et al 2003, Pingali and Khwaja 2004]. This offers both an opportunity as well a challenge to the millions of producers especially smallholders, who dominate the Indian agriculture (80 per cent of holdings are of less than 2.0 ha in size). High value agriculture has a comparative advantage in production and labour absorption over staples, and thus is reckoned as an important strategy for smallholders to augment income and employment [Pingali and Rosegrant 1995, Barghouti et al 2004, Joshi et al 2004, Mellor 2004]. Besides, globalisation offers opportunities to augment exports of high value food commodities. Diaz-Bonilla and Recca (2000) have observed an accelerated flow of exports of fruits and vegetables from developing to developed countries during the 1990s.

Nevertheless, there are apprehensions whether smallholders can take advantage of the emerging opportunities. Most of the high value food commodities are perishable, and require immediate transportation to consumption centres/markets or storage or processing into less perishable forms, which are woefully inadequate in India. Markets for high value commodities are concentrated mainly in urban and semi-urban areas, and transport facilities are inadequate especially for smallholders in remote rural locations. In other words, lack of access to markets, transport facilities and post-harvest infrastructure inflate the transaction costs of marketing, discouraging producers to diversify towards high value agriculture.

This paper builds on the hypothesis that access to markets is critical to the growth of high value agriculture. Access to markets is defined in terms of demand for high value commodities and the factors facilitating transport of high value commodities from production sites to consumption centres. In India most of the production of high value commodities takes place in rural areas, which is then transported to markets in urban areas, the major consumption centres. Thus, access to markets is approximated by urbanisation and road density. Using district level data we undertake a detailed empirical exploration of the role of these factors in the growth of high value agriculture. After a brief description of the methodology and data sources in the next section, the paper proceeds to provide an overview of the changes in rural and urban food consumption patterns in India. Thereafter, the paper maps spatial distribution of high value agriculture, and changes during the last two decades. A detailed analysis of the role of urbanisation and infrastructure in diversification towards high value agriculture is presented in the subsequent sections, followed by the impact of high value agriculture on the farm economy. Conclusions and policy issues are discussed in the last section.

Data and Adjustments

District level information on the area, production and prices of agricultural commodities including livestock products, and variables related to land use, agroclimatology, agrarian structure, infrastructure, technology and demography were compiled from different sources to understand the processes and dynamics of diversification towards high value agriculture. The data pertains to the period 1980-1998 for 492 districts covering 16 major states for which information was available for the required variables.[1]

Often, agricultural diversification is defined in terms of area shares of different crops. This restricts the scope of diversification to the crop subsector only, ignoring other agricultural activities like livestock and fisheries. In India, livestock accounts for about a quarter of the agricultural value of output. In this paper we have included crop and livestock activities, and diversification is defined in terms of value shares of major crop and livestock products in the gross value of agricultural output. Production figures of different commodities were converted into monetary values by multiplying them with their respective farm harvest prices. Values of livestock outputs were available only at the state level. These were apportioned among the districts in proportion to the population of the species in the districts in a given state.

A major problem using district level time-series data is the frequent reorganisation of districts, which renders time comparison of different parameters difficult. One hundred and eighty two new districts were formed between 1970 and 1998 from the existing districts in 1970. To overcome the problem arising due to reorganisation, data for the new districts was apportioned back to their parent districts by adjusting the boundaries of the new districts to 1970 base. The final data set thus pertains to 309 districts.

II
Consumption of High Value Food Commodities

Urbanisation is an important determinant of demand for high value commodities. In India about 28 per cent of India's population lives in urban areas and is increasing rapidly. Between 1991 and 2001 urban population increased at a rate of 2.7 per cent a year compared to 1.7 per cent for rural population. The faster growth in urban population is largely on account of migration from rural areas. By 2020 urban population is expected to be nearly 35 per cent of the total population. This is expected to fuel rapid growth in the demand for high value food commodities. Except cereals, the consumption level of all food commodities is higher in urban areas (Table 1). The difference however is substantial in the case of high value commodities such as fruits and vegetables and animal products (65-75 per cent).

With rapid growth in income, the food basket of both rural and urban consumers however, is changing gradually in favour of high value commodities. In 1999, an urban consumer spent over 58 per cent of the food budget on high value commodities, up from 49 per cent in 1983. In rural areas too, the share of high value commodities went up from 36 to 46 per cent during this period. At a more disaggregated level, the share of fruits and vegetables increased from about 6 per cent in 1983 to 13.3 per cent in 1999 in rural areas and from 9.3 to 15.7 per cent in urban areas. The share of milk, which is the most important high value food in rural as well as urban areas also increased, but not as fast as that of fruits and vegetables.

These results suggest that although consumption is increasing in both rural and urban areas, urbanisation would remain an important driver of the overall growth in demand for high value foods because of faster increase in the urban population and higher levels of consumption. Evidence shows that by 2025 demand for fruits, vegetables, milk and meat, eggs and fish would almost be double that in 2000 [Kumar et al 2003].

III
Spatial Distribution, and Growth in High Value Agriculture

At the all India level, high value food commodities (fruits, vegetables, animal products, spices, tea and coffee) contribute nearly 40 per cent to the gross value of agricultural output. There is, however, considerable regional variation in the incidence of high value agriculture. To map this variation, districts were classified into intensive, moderate and extensive regions based on the share of high value commodities in gross value of agricultural output. Fruits, vegetables and livestock products (milk, meat and eggs) were considered as high value commodities (HVCs) in this study. Districts with a share of 50 per cent or more under HVCs were grouped under intensive, between 25-50 per cent into moderate, and less than 25 per cent into extensive HVC regions. Accordingly, 18 per cent districts in the country fall in the intensive 54 per cent in the medium and 28 per cent in the extensive HVC regions. Their share in net cropped area is 11, 53 and 36 per cent respectively with a corresponding contribution of 24.6, 59.3 and 16.1 per cent to the total value of output of high value commodities (Table 2).

To a large extent there is contiguity in the districts so classified (Figure 1). Most of the districts with intensive high value agriculture are in the coastal and hill regions of the country, and a majority of the extensive high value agriculture districts are in the central and north-western parts of the country. Districts with moderate degree of high value agriculture are largely in the irrigated tracts of northern and eastern parts of the country. Some districts in southern and western parts of the country close to the coast all fall in this category.

On average, high value commodities account for 61 per cent of the total value of agricultural output in the intensive HVC region, 35 per cent in the moderate region, and 20 per cent in the extensive region (Table 3).

Table 3 also presents the mean values of some important characteristics that explain regional variation in the incidence of high value agriculture. In general, intensive high value agriculture is practised in the regions with high rainfall and low irrigation. Here, the agrarian structure is dominated by smallholders (<2.0ha) and the average size of landholding is much smaller compared to the moderate and extensive HVC regions. Adoption of high yielding varieties of cereals is low in the intensive HVC region. So is the level of mechanisation. Fertiliser use however is higher in the intensive high value agriculture perhaps due to intensive cultivation of fruits and vegetables. Intensive high value agricultural regions have better infrastructure of roads and markets compared to the other two regions. Demographically, intensive high value agricultural regions have greater population pressure and a larger urban population. This characterisation suggests that urbanisation is an important factor in the growth of high value agriculture from the demand side and sufficient availability of labour and better infrastructure would facilitate it from the supply side.

Table 1: Food Consumption Pattern of Rural versus Urban Population in India

(Rs/capita/month at 1999-2000 prices)

Commodity	Rural		Urban	
	1983	1999	1983	1999
Cereals	137.3	108.7	119.6	106.9
Pulses	19.4	18.5	25.8	24.3
Edible oils	12.4	18.2	21.7	26.8
Sugar	12.3	11.6	14.0	14.1
Fruits and vegetables	17.6	38.3	33.1	64.6
Milk and milk products	30.8	42.6	55.0	74.2
Meat, egg and fish	17.5	16.1	29.1	26.8
Others	30.8	34.8	59.0	73.3
Total food	277.9	288.7	357.3	410.8

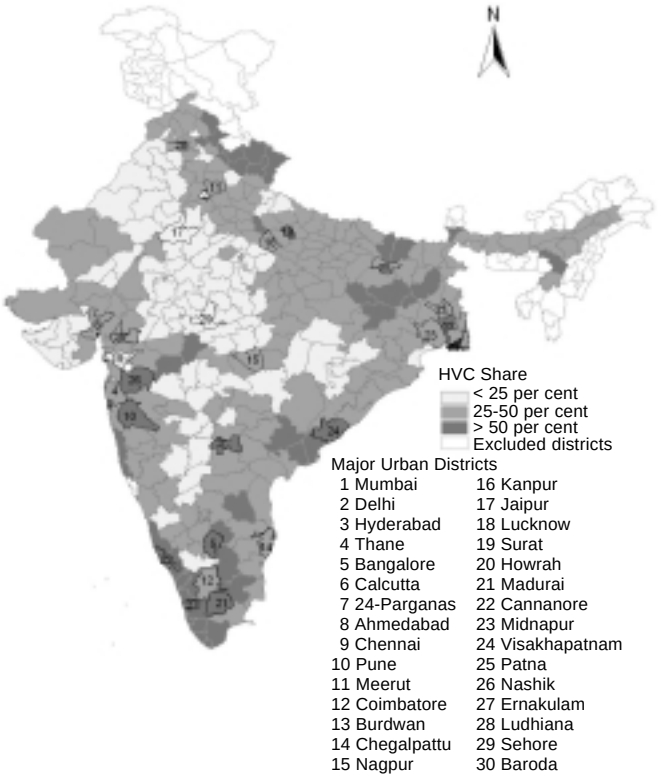
Source: Mahendra Dev et al (2004).

Table 2: Share of Different High Value Agricultural Regions in Total Area, Production and Population: TE1998

(in per cent)

	HVC Regions		
	Intensive	Moderate	Extensive
No of districts	18.1	54.1	27.8
Share in net cropped area	11.3	53.1	35.6
Share in value of agricultural output	14.0	57.9	28.1
Share in value of output of high value commodities	24.6	59.3	16.1
Share in total population	19.7	60.3	20.0
Share in urban population	24.9	54.1	20.9

Figure 1: Share of High Value Commodities, India, 1998
(Fruits, Vegetables, Milk and Meat)



Nature and Speed of High Value of Agriculture

There are considerable differences in the commodity composition of high value agriculture across the identified HVC regions (Table 4). Fruits are more important than any other high value commodity in the intensive HVC region. Milk, vegetables and poultry are other important high value commodities in this region. Rice is the dominant cereal here. In the moderate and extensive HVC regions dairying is the most important constituent of high value agriculture. Vegetables, fruits and monogastrics (poultry and pig) are next in importance. Cereals account for 44 and 41 per cent of the value of agricultural output in the moderate and extensive HVC regions, with the difference that rice is important in moderate and wheat in the extensive HVC region.

Regionally, production of fruits is concentrated mainly on the east and west coast and in the north-west and north-east regions of the country. Concentration of vegetables is higher in the northern, eastern and north-eastern parts. The north-western region has the lowest concentration of vegetables. Dairying is concentrated largely in the northern and western parts of the country and some pockets of the south-west. Meat and egg production has a larger concentration in the eastern, north-eastern and southern parts. Some pockets in the west, closer to big cities, also have high intensity of meat production. Meat species, however, are different; poultry is dominant in the south and small ruminants in the east and the west.

High value agriculture is growing faster compared to the rest of agriculture. Between 1980 and 1998 high value agriculture grew at an annual rate of above 4.0 per cent in the intensive and moderate HVC regions. Growth was sluggish in the extensive HVC region compared to the rest of agriculture there. The growth rates however vary widely by commodity. Except vegetables and pig meat, all other high value commodities registered a growth of between 4 and 6 per cent a year in the intensive HVC region. In the moderate HVC region most of the livestock products increased at an annual rate of between 5 and 7 per cent. Fruits also witnessed a good growth here. Pig meat production increased faster than any other high value commodity in the extensive HVC region. Poultry products, milk and fruits increased at an annual rate of 4 per cent or more in this region.

It is however interesting to observe that despite sluggish growth in high value agriculture, overall growth in the agricultural sector was higher in the extensive HVC region. Here, growth was driven by cereals and oilseeds that have a larger share in the value of output of the agricultural sector.

To better understand the growth dynamics of high value agriculture, its share in the agricultural output in a district in TE1998 was plotted against its share in TE1982 (Figure 2). The points falling on or closer to the diagonal line indicates no (or a small) change in the share of HVCs during this period. In other words, high value agriculture has been growing parallel to rest

Table 3: Mean Values of Selected Characteristics of Intensive, Moderate and Extensive High Value Agricultural Regions: TE 1998

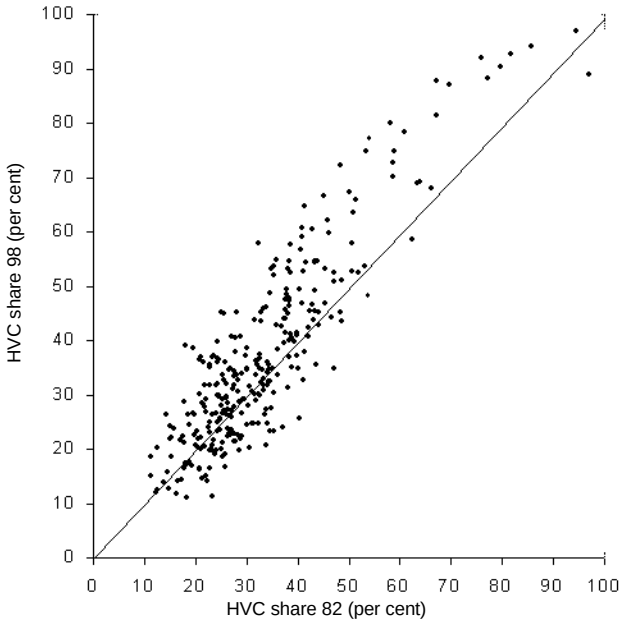
Characteristics	HVC Regions		
	Intensive	Moderate	Extensive
Share of high value agriculture (percentage of gross value of agricultural output)	61	35.7	19.9
Population density (persons/sq km)	426	370	227
Urban population (per cent)	31.5	22.3	26.0
Size of landholding (ha)	0.9	1.5	2.6
Smallholders (per cent)	88.3	80.3	60.6
Average normal rainfall (mm)	1660	1195	952
Gross cropped area irrigated (per cent)	29.1	40.7	35.7
Area under high yielding crop varieties (percentage of gross cropped area)	27.7	43.8	26.7
Fertiliser use (kg/ha of gross cropped area)	98.1	88.4	62.4
Level of mechanisation (No of tractors/1,000 ha of gross cropped area),	4.4	9.6	8.8
Agricultural markets (No/10,000 sq km of geographical area)	27.1	22.0	21.6
Roads (km/sq km of geographical area)	0.7	0.5	0.4

Table 4: Share of HVCs in Agricultural Output and Annual Compound Growth Rates[1]: TE 1998 (at 1980-82 prices)

Commodities	Share in Agricultural Value (Per Cent)			Growth (Per Cent/Annum)		
	Intensive	Moderate	Extensive	Intensive	Moderate	Extensive
Rice	17.6	23.9	11.9	0.8	3.0	3.5
Wheat	3.8	14.4	20.3	2.4	3.0	4.2
Coarse cereals	5.3	5.7	8.5	0.5	0.9	1.0
Pulses	2.3	3.8	9.0	1.6	1.1	2.4
Oilseeds	4.5	6.6	19.1	3.9	5.0	8.3
Sugar cane	4.8	8.3	6.2	1.8	2.7	4.2
Cotton	1.3	1.7	5.1	5.6	3.4	3.6
Fruits	24.4	7.3	2.1	4.8	4.2	4.4
Vegetables	11.9	7.8	2.9	2.4	2.2	1.6
Crops sub-sector	75.9	79.5	85.1	2.5	2.9	4.0
Milk	17.3	16.3	13.4	5.2	4.4	3.6
Large ruminant meat	0.7	0.3	0.1	4.5	5.3	3.1
Small ruminant meat	1.8	1.5	0.5	4.1	6.7	3.6
Pig meat	0.2	0.2	0.0	2.5	6.4	9.4
Poultry meat and eggs	4.7	2.3	0.8	5.7	6.3	4.5
Livestock sub-sector	24.7	20.5	14.9	5.2	4.8	3.7
Agricultural sector	100.0	100.0	100.0	3.1	3.2	3.9
High value commodities	61.0	35.7	19.9	4.4	4.0	3.4

Note: (1) Compound growth rates are between 1980 and1998 (at 1980-82 constant prices).

Figure 2: Districtwise Share of HVCs to Total Value, 1998 and 1982



of the agriculture in such districts. The points above the diagonal line show increasing share (faster growth) of high value agriculture and vice versa. All these patterns are observed in this figure. As expected, in most districts in the intensive region of high value agriculture increased during this period. In the moderate and extensive HVC regions the number of districts showing an increasing and a declining share is almost equal. The slow growth in some districts could be due to numerous factors such as inadequate access to markets and transportation and labour scarcity.

V
Role of Urbanisation and Roads

The characterisation of regions in the previous sections gives an indication of the importance of urbanisation and infrastructure in the growth of high value agriculture. To further probe their role it is hypothesised that the incidence of high value agriculture becomes thin as we move away from the major urban centres and national highways. Urbanisation plays multiple roles. Apart from being a major driver of demand, urban districts have a higher concentration of agricultural markets, roads and processing infrastructure. In other words, producers nearer to the urban centres have better access to markets and face less transaction costs. The hypothesis is tested by mapping high value agriculture vis-à-vis urbanisation and national highways. The statistical validity of the mapping is tested by running a modified Tobit model,[2] with the share of high value agriculture in a district as the dependent variable, and urbanisation, roads and other important factors as explanatory variables.

To better understand the relationship between high value agriculture and urbanisation, districts with more than 1.5 million urban population were identified as major urban districts. The districts surrounding these were classified as near-urban, and others as far-urban. Accordingly, about 10 per cent of the districts in the country are classified as urban, 30 per cent as near-urban and the rest as far-urban (Table 5). The urban districts have about 20 per cent of the total population, but house more than 41 per cent of the urban population in the country. And as expected, about 56 per cent of the population in these districts is urban, which is much higher than that in near-urban and far-urban districts.

Figure 1 also shows the incidence of high value agriculture superimposed with urbanisation. There is a close correspondence between the two with a few exceptions. The incidence of high value agriculture declines with distance from urban centre. In the urban districts high value agriculture accounts for 43 per cent of the value of agricultural output, compared to 35 per cent in the near-urban and 32 per cent in the far-urban districts (Table 6).

An analysis by commodity also reveals that the incidence of high value agriculture declines with the distance from urban centre, except in the case of fruits, which appear to be more prominent in near-urban districts. The association of dairying with urbanisation is somewhat weak, which can be attributed to the widespread cooperative network in rural areas. It may however be noted that although the incidence of high value agriculture is higher in urban districts, it does not adversely affect cereal-food security as is suggested by the small difference in the share of cereals in the value of agricultural output.

Notwithstanding locational differences, high value agriculture is growing faster than rest of the agriculture and almost at the same rate (around 4 per cent) in urban, near-urban and far-urban districts. Growth behaviour of its constituents, however, is

Table 5: Share of Urban, Near-urban and Far-urban Districts in Area, Production and Population – TE 1998

Item	District groups		
	Urban	Near-urban	Far-urban
Relative importance			
No of districts	31	91	187
Share in net cropped area (per cent)	10.3	31.4	58.3
Share in total population (per cent)	20.1	30.2	49.7
Share in urban population (per cent)	41.2	21.7	37.2
Selected indicators			
Population density (persons/sq km)	725.0	350.3	278.6
Urban population (per cent)	55.6	19.6	20.4
Agricultural markets (No/10,000 sq km of geographical area)	30.0	24.9	18.6
Roads (km/sq km of geographical area)	0.7	0.6	0.4

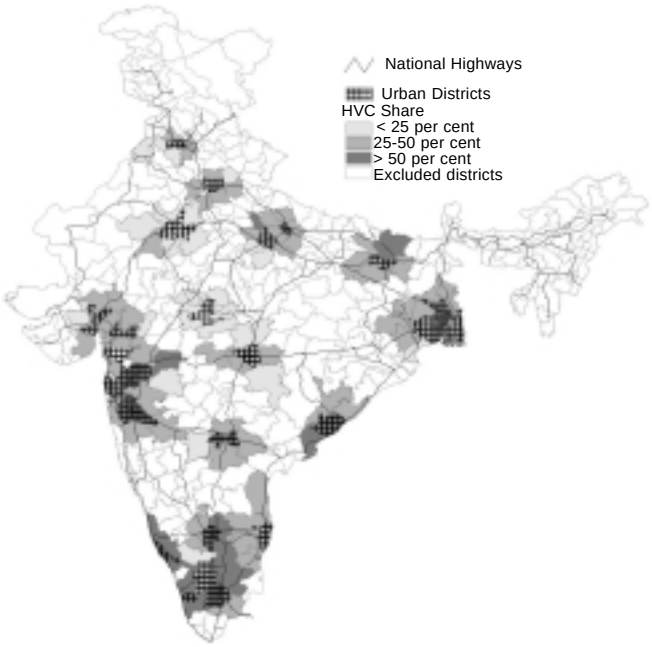
Table 6: Percentage Share of HVCs in Agricultural Output in Different District Groups and Annual Compound Growth Rates[1] – TE 1998

(at 1980-82 prices)

Commodities	Urban	Near-urban	Far-urban	Urban	Near-urban	Far-urban
	Share in Agricultural Value (Per Cent)			Growth (Per Cent/Annum)		
Rice	24.0	19.0	19.0	3.6	2.8	2.4
Wheat	11.0	13.0	16.0	2.7	3.0	3.8
Coarse cereals	5.0	7.0	7.0	0.2	0.8	1.1
Pulses	3.0	5.0	6.0	1.5	2.2	1.5
Oilseeds	6.0	10.0	11.0	6.3	6.3	6.6
Sugar cane	8.0	8.0	6.0	2.9	2.9	2.9
Cotton	1.0	3.0	3.0	0.6	3.6	4.0
Fruits	9.0	10.0	7.0	4.2	4.4	4.6
Vegetables	10.0	7.0	6.0	1.6	2.8	2.1
Crops sub-sector	76.0	81.0	82.0	2.9	3.1	3.2
Milk	17.0	14.0	15.0	4.9	4.3	4.1
Large ruminant meat	0.5	0.3	0.2	5.7	4.7	4.5
Small ruminant meat	1.4	1.4	1.1	7.0	4.8	6.1
Pig meat	0.1	0.1	0.1	6.8	6.0	4.9
Poultry meat and eggs	4.2	2.4	1.6	7.5	6.2	4.8
Livestock sub-sector	24.0	19.0	18.0	5.5	4.6	4.3
Agricultural sector	100.0	100.0	100.0	3.4	3.4	3.4
High value commodities	43.0	35.0	32.0	4.1	4.1	3.9

Note: 1 Compound growths are between 1980 and 1998 (at 1980-82 constant prices).

Figure 3: National Highways and Share of HVC, 1998
(Urban and Urban Surrounded Districts)



different. Livestock products, especially meat and eggs, grew faster in the urban districts mainly because of faster growth in poultry production. Growth in milk production though higher in the urban districts, the near-urban and the far-urban districts did not lag behind. Fruits and vegetable production witnessed faster growth in all the district groups. Vegetable production recorded the fastest growth in the near-urban (2.8 per cent), followed by far-urban (2.1 per cent) and urban districts (1.6 per cent).

Existence of demand is a necessary but not a sufficient condition for growth of high value agriculture. Most of the high value commodities being perishable, require immediate transportation to the markets/consumption centres, or storage, or transformation into less perishable forms through processing. Thus, infrastructure, particularly transport, is an important prerequisite for the growth of high value agriculture in near-urban districts.

To understand the impact of transportation on the incidence of high value agriculture we superimposed the national highways network passing through urban to near-urban districts (Figure 3). Near-urban districts were then grouped into three categories, based on the number of national highways passing through them ie, zero highways, one highway, and two or more highways. It is found that 25 per cent of the near-urban districts are not connected with any highways, 45 per cent are connected with one and 21 per cent with two or more highways (Table 7). From Table 7 we find that in the near-urban districts connected with one or more highways, HVCs had a higher share in total value of production. High value agriculture also appears to be growing faster in the districts connected with highways.

Whether the influence of urbanisation and roads[3] is statistically significant, is tested using a modified Tobit model. The results are presented in Table 8. As expected, both urbanisation and roads have a significantly positive influence on high value agriculture. So is the influence of veterinary institutions an important infrastructure in the development of animal husbandry. On the other hand, mechanisation as a proxy for cereal production technology (fertilisers, high-yielding varieties and irrigation) has a negative effect. It may be recalled that the level of mechanisation is higher in irrigated areas, with less endowment of labour. High value agriculture, particularly production of vegetables and fruits, is labour-intensive, and labour scarcity thus appears to be an important constraint in expansion of HVCs in such areas. This is also corroborated by the positive and significant coefficient with the incidence of small holders. Further, high value agriculture is more prominent in rain-fed areas. Unlike crop production technology, animal production technology (cross-breeding) has a positive effect on high value agriculture.

The estimates of the Tobit model confirm that urbanisation and infrastructure are important drivers of intensification/growth of high value agriculture. The growth is likely to benefit millions of smallholders by augmenting opportunities for income and employment [Joshi et al 2004].

VI
Impact on Farm Economy

It is well established that the production of high value commodities is more remunerative as compared to staples. Table 9 compares the per hectare value of output of high value agriculture

Table 7: Impact of National Highways on Diversification within Urban-Surrounded District Groups
(Per Cent Share of High Value Commodities)

	Number of National Highways					
	Zero		One		Two or more	
No of Near-urban Districts	25		45		21	
	1982	1998	1982	1998	1982	1998
Fruits	4.4	4.9	10.3	11.2	7.6	10.9
Vegetables	6.9	6.1	8.7	7.4	5.9	6.7
Milk	13.4	14.8	11.9	14.1	12.7	15.5
Ruminant meat	0.9	1.2	1.3	2.0	1.8	1.7
Non-ruminant meat	1.2	1.5	1.6	2.9	2.4	3.2
All commodities	26.8	28.4	33.9	37.6	30.3	37.8

Table 8: Results of the Modified Tobit Model[1]

Explanatory Variables	Equation 1		Equation 2[2]	
	Coefficient	t-ratio	Coefficient	t-ratio
Urban population (per cent)	0.235	5.00	0.281	5.68
Smallholders (per cent)	0.383	10.26	0.354	8.97
Road density (km/100 sq km)	0.006	0.31	0.065	3.48
Crossbred cattle (per cent)	0.284	6.46	-	-
Veterinary institutions (No/10,000 livestock units)	0.187	6.20	0.267	9.09
Mechanisation (No of tractors/1,000ha)	-0.359	-5.86	-0.172	-2.99
Annual normal rainfall (mm)	0.405	3.47	0.662	5.67
Constant	-5.339	-1.80	-9.510	-3.09
Sigma	10.895	24.86	11.607	24.86
R^2	0.60		0.55	
Adjusted R^2	0.59		0.54	

Notes: 1 Estimates based on district level data. N= 309.
2 Excluding endogenous variable, crossbred cattle.

Table 9: Value of Output from High Value Agriculture
Rs/ha (at 1980/82 prices)

Region/Location	Total Agricultural Sector*	High Value Commodities
Region		
Intensive	6159	3719
Moderate	5253	1842
Extensive	3798	731
Location		
Urban	5122	2901
Near-urban	3730	1792
Far-urban	2866	1357

Note: * Crops and livestock.

vis-à-vis the average of all commodities. The value of agricultural output/ha of gross cropped area declines as we move away from intensive to extensive HVC regions. The difference is huge; per ha value of output of high value commodities in the intensive HVC region is about five times larger as compared to that in the extensive HVC region. Further, as the incidence of high value agriculture is higher in urban and near-urban districts, the per ha value of output from the agricultural sector as well as from high value commodities is higher there.

Besides, as observed in the previous sections, high value agriculture is concentrated in areas with a larger proportion of smallholders and has been growing faster than the rest of the agricultural sector. This would accelerate overall growth of the agricultural sector and have positive effects on the equity, as some activities like dairying that are concentrated among the smallholders [Birthal and Rao 2002]. Further, the production of most HVCs is labour-intensive [Joshi et al 2004, Barghouti et al 2004] and effects of the expansion of high value agriculture on employment are expected to be enormous.

VII
Conclusions and Policy Implications

Sustained economic growth and increasing urbanisation are fuelling rapid growth in the demand for high value food commodities like fruits, vegetables, milk, meat, eggs and fish. Producers are responding positively to the emerging demand patterns by altering their production portfolio. On average, high value agriculture accounts for about 40 per cent of the total value of agricultural output. Although high value agriculture is widespread in the country, there are substantial spatial differences. Intensive high value agriculture is practised in about 11 per cent of the area, mainly in the coastal and hill regions. On more than half of the area, high value agriculture is extensive in nature and confined mostly to the central and north-western regions. Irrigated regions in the north and the east have a moderate incidence of high value agriculture. Nevertheless, high value agriculture is increasing faster than the rest of agriculture everywhere.

Characteristics of intensive high value agriculture, in terms of commodity, agroclimate, land and labour endowments, are distinct. Fruits are the most important in the intensive HVC regions, followed by milk, vegetables and poultry. In the extensive HVC regions, milk is the major commodity with vegetables, fruits and poultry being next in the order. In general, high value agriculture is more prevalent in areas with high rainfall, low level of irrigation and mechanisation, smaller land holdings and higher endowment of labour.

Urbanisation is an important determinant of intensification and growth of high value agriculture and infrastructure facilitates it. In general, the density of roads and markets is higher in the intensive HVC regions. Better connection between the urban demand centres and near-urban districts through national highways facilitates production of HVCs.

High value agriculture generates better returns. Land productivity increases with increasing diversification towards HVCs. So does the per capita value of agricultural output. The above

findings imply that high value agriculture is likely to emerge as an important source of agricultural growth, which has started showing signs of fatigue mainly due to the deceleration in yield growth of foodgrains. High value agriculture-led growth is expected to be more equitable as smallholders have a greater tendency to diversify.

Nevertheless, high value agriculture may come under stress for want of adequate technology, infrastructure and policy support. High value agriculture has greater production and market risks, and there is clearly a need to provide a cushion to producers against these risks. Mitigating production risks would require improved technologies, quality inputs and formal insurance mechanisms, which hitherto have a thin spread and are not easily accessible to producers, especially smallholders.

High value agriculture is capital-intensive, while the producers, especially smallholders, have limited resources of their own to invest. This implies increasing participation of financial institutions in high value agriculture to sustain the growth momentum.

Access to markets is critical to the growth of high value agriculture. In general, markets for HVCs are concentrated largely in the urban centres. This increases costs associated with the transfer of produce from rural production centres to urban markets, more so for the smallholder producers in remote areas. Further, the prices of most HVCs are volatile and fall drastically even with a small increase in their arrivals at the market place. Options to mitigate market risks and reduce transaction costs include establishment of special markets for HVCs in rural areas and promotion of private sector participation in agriculture through institutions like producers' associations, cooperatives and contract farming [Eaton and Shepherd 2001, Deshingkar et al 2003]. It may be noted that some state governments have amended their marketing acts to facilitate participation by the private sector in agricultural marketing. Besides, the central government is also increasingly investing in roads and highways to improve connectivity between rural and urban areas.

The infrastructure requirement of high value agriculture is different from that of other food and non-food commodities. Being perishable, high value food commodities require refrigerated transport, cold storage and immediate processing. These however are woefully inadequate. Considerable investment is required to facilitate such infrastructure.

Price support to agriculture, particularly to rice and wheat, is considered to be one of the important impediments to diversification towards HVCs, which do not receive any such support [World Bank 2004]. While price support to HVCs is not feasible due to their perishability/short shelf-life and huge quality differences, the withdrawal of price support from other commodities involves sensitivities of political economy. This requires an in-depth analysis of the impact of doing away with the administered prices of rice, wheat and other commodities on the diversification towards high value agricultural commodities.

Recently, the government of India has taken some policy initiatives to give a boost to high value agriculture. The focus is largely on strengthening the backward linkages through food processing. Important initiatives include doing away with licensing requirement for food industry; (ii) automatic approval of 51 per cent foreign equity and 100 per cent for non-resident Indians; (iii) establishment of free trade and export processing zones; (iv) reduction in the number of items reserved for small-scale industry; (v) reduction in import and excise duties and corporate taxes; (vi) permission to financial institutions to finance contract farming schemes; and (vii) reimbursement of funds to food processing units up to 10 per cent of the purchase, limited to Rs 1 million a year. These measures are gradually attracting the private sector to participate in high value agriculture. EPW

Email: p.partha@cgiar.org

Notes

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1 The excluded states are Jammu and Kashmir, Arunachal Pradesh, Meghalaya, Manipur, Nagaland, Sikkim and Tripura.

2 The Tobit model is best suited to deal with truncated dependent variables bounded between a given maximum and minimum value [Gujarati 1995].

3 Apart from urbanisation and roads, many other variables like intensity of agricultural markets (No/10,000 sq km), veterinary institutions (No/1,00,000 standardised livestock units), fertiliser use (kg/ha), area under high-yielding varieties (per cent), gross irrigated area (per cent), mechanisation (No of tractors/1,000 ha), crossbred cattle (per cent), landholding size (ha), per cent of smallholders, normal rainfall (mm) and length of growing period (days) were also included in the model. However, owing to the problem of multicollinearity, only a few of these were retained in the final estimation.

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