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High-Value Agriculture in India: Past Trends and Future Prospects¹

Vijay Paul Sharma² and Dinesh Jain³

Given the declining share of traditional agricultural commodities in production, consumption and trade, horticulture and other non-traditional high-value agriculture represent an important area of potential income growth in rural areas. The high-value agriculture-led-growth strategy also provides significant scope for achieving greater commercialization of smallholder agriculture. Despite the potential, the contribution of high-value agricultural exports is still small but increasing. This paper examines the past and existing performance and identifies likely challenges and opportunities for high-value-agriculture in the country.

The findings of the study reveal a structural shift in consumption pattern away from cereals to high-value agricultural commodities, both in rural and urban areas, in the last two decades. This shift in dietary patterns across states and income classes is also observed. The results reveal a relatively strong and growing demand for livestock products and fruits and vegetables in both rural and urban areas. The average expenditure as well as share of beverages has increased by about six times in both rural and urban areas. Due to shift in demand pattern towards high-value crops, the farmers have also responded to market signals and gradually shifting production-mix to meet the growing demand for high-value commodities. This is reflected in the changing share of high value crops in total value of output from agriculture. The share of high-value commodities/products (fruits and vegetables, livestock products, fisheries) increased from 37.3 percent in Triennium Ending (TE) 1983-84 to 41.3 percent in TE 1993-94 and reached a level of 47.4 percent in TE 2007-08. The trade in high-value products has also increased during the last decade. Overall, fresh fruits and vegetables exports represent a very small share of domestic production and agricultural exports but have increased significantly. During the 2000s, the growth rate in value of exports of rice, sugar, marine products, tea, etc. declined, while high-value exports (fruits and vegetables, floriculture, meat, processed fruit juices) grew by about 18 percent annually. However, Indian exports face many constraints in major importing countries on account of quality and food safety issues. The rising demand for high-value commodities, particularly fruits and vegetables and livestock products has led to an increase in imports of many commodities like fresh fruits. While there is an opportunity for increasing exports of high-value products but there is a huge and increasing domestic demand which needs to be tapped.

The study suggests that a future road map for high-value agriculture development should focus on investment in technology development and dissemination, basic infrastructure, improvement of technical capacity of producers and other players in the value chain, institutional support in core functions of production, logistics and marketing through concerted public sector support and active public-private partnerships, and provision of quality inputs, in particular planting materials for fruits and seeds for vegetables.

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Introduction

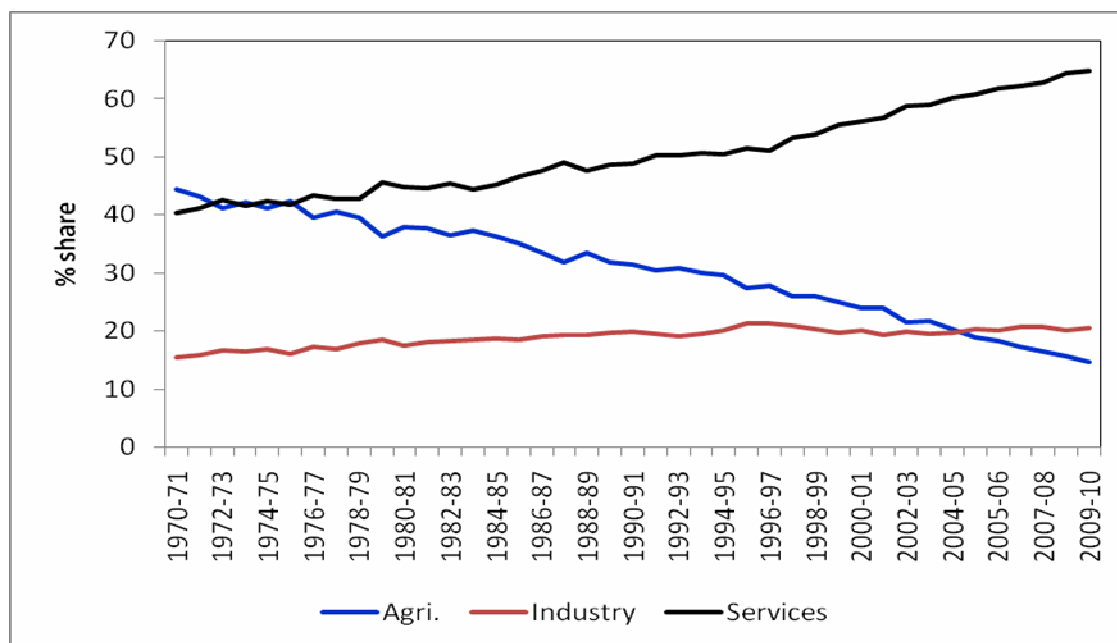
The contribution of agricultural sector to national Gross Domestic Product (GDP) has continued to decline over the years; while that of other sectors, particularly services, has increased. In 1970-71 agriculture contributed about 44 percent of GDP, declined to 31.4 percent and 14.6 percent in 1990-91 and 2009-10 (at 2004-05 prices), respectively (Figure 1). In terms of composition, out of a total share of 14.6 per cent of the GDP from agriculture and allied sectors in 2009-10, agriculture alone accounted for 12.3 per cent, followed by forestry and logging at 1.5 per cent and fisheries at 0.8 per cent (CSO, 2011). The share of agricultural exports in total export value declined from about 18.5 percent in 1990-91 to about 10.6 percent in 2009-10, while share of agricultural imports to total national imports increased from 2.8 percent in 1990-91 (pre-reforms period) and reached a high of 8.2 percent in 1998-99 and declined to about 4.4 percent in 2009-10 (Gol, 2010). Nevertheless, agriculture remains a major source of employment, absorbing about 52 percent of the total national work-force in 2004-05, down from about 70 percent in 1971.

In the recent decades, there have been substantial changes in the patterns of production, consumption, and trade in Indian agriculture. One is the shift in production and consumption from foodgrains to high-value agricultural commodities such as fruits and vegetables, milk and milk products, meat, eggs, fish, and processed food products. Trade in high-value products is increasingly displacing exports of traditional commodities, such as rice, sugar, tea, coffee, tobacco, etc. Thus, during the 2000s, the growth rate in value of exports of rice, sugar, marine products, tea, etc. declined, while high-value exports (fruits and vegetables, floriculture, meat, processed fruit juices) grew by about 18 percent annually.

Given the declining share of traditional commodities in production, consumption and trade, horticulture and other non-traditional, high-value, agricultural crops represent an important area of potential income growth in rural areas. The high-value agriculture-led-growth strategy also provides significant scope for achieving greater commercialization of

smallholder agriculture. Despite the potential, the contribution of high-value agricultural exports is still small but increasing. This study aims to study the past and existing performance, identify likely challenges and opportunities for high-value-agriculture, defined as fruits and vegetables, livestock and fisheries, in the country, determinants of growth of high value agriculture and changing consumption patterns using secondary data as well as through selected case studies.

Figure 1. Changing sectoral shares of GDP (at 1999-00 prices) in India: 1970-71 to 2009-10



Source: National Accounts Statistics 2010 and earlier issues, Central Statistical Organisation, Ministry of Statistics and Programme Implementation, Govt. of India

The study starts with an overview of production and trade patterns and trends in these sub-sectors in India over the past 2-3 decades in Section 2, followed by an overview of changing consumption trends and patterns and analysis of main factors influencing these changes in Section 3. Temporal and Spatial changes in area, production and productivity of fresh fruits and vegetables are discussed in Section 4. Concluding observations and broad policy implications are discussed in Section 6.

Section 2: Past and Existing Performance of High Value Agriculture

Throughout the world, major shifts in dietary patterns are occurring, even in the consumption of basic staples towards more diversified diets both in urban and rural areas as well as among rich and poor households. Rising income, urbanization, a change in dietary preferences, socio-demographic factors, increased awareness about the health benefits of fruits and vegetables, food industry marketing and policies of trade liberalization over the past two decades have been major market drivers for the growth of high value agriculture. To meet the changing demands, production systems are also moving towards high value crops, but extent and pattern of such shifts vary across regions/states due to agro-climatic, socio-economic and demographic factors. In this section, the progress and potential of high-value agriculture is examined at all-India and state levels.

2.1 Trends in Area and Production of Major Crops/Crop Groups

During the last three decades net area sown declined from 142 million hectares in Triennium Ending (TE) 1983-84 to 140.8 million hectares in TE 2008-09, whereas total cropped area increased from 176.4 million hectares to 194 million hectares during the same period (Table 1). The area under foodgrains declined by about 6 million hectares between TE 1983-84 and TE 2008-09 and this decline in area under foodgrains reduced the share of foodgrains in total cropped area from about 73 percent in TE 1983-84 to about 63.8 percent in TE 2007-08 (Table 2). The area under pulses has remained almost stagnant at about 23 million hectares, while area under wheat has increased by 4.6 million hectares, rice by 3.7 million hectares. The biggest loser has been coarse cereals where the area under cultivation has declined from 41.5 million hectares in TE 1983-84 to 33.6 million hectares in TE 1993-94 and 27.9 million hectares in TE 2008-09. The share of coarse cereals in total cropped area fell from 23.7 percent in early-1980s to 14.8 percent in TE 2007-08.

During the last two decades, foodgrain production increased from 177.4 million tones in TE 1993-94 to 227.8 million tones in TE 2009-10, or by over 28 percent (Table 1). However, the highest increase was observed in case of cotton (>200% increase), followed by fruits and vegetables (97%), condiments and spices (66%) and wheat (39%). Pulses recorded the lowest increase in production, from 12.7 million tones in TE 1993-94 to 14.6 million tones in TE 2009-10.

Table 1. Trends in area and production of major crops/crop groups: TE 1983-84 to TE 2008-09

Crops	Area (million ha)			Production (million tonnes)		
	TE 1983-84	TE 1993-94	TE 2008-09	TE 1983-84	TE 1993-94	TE 2009-10
Rice	40.1	42.3	43.8	53.5	75.9	95.0
Wheat	23.5	24.3	28.1	41.9	57.6	80.0
Coarse cereals	41.5	33.6	27.9	30.9	31.1	38.2
Pulses	23.4	22.4	23.0	12.1	12.7	14.6
Foodgrains	128.5	122.6	122.8	138.4	177.4	227.8
Oilseeds	18.5	26.0	26.8	11.6	20.1	27.5
Sugarcane	3.2	3.6	4.6	183.3	237.2	303.7
Fruits & vegetables	5.1	8.3	13.6	-	95.6	188.7
Condiments & spices	2.2	2.3	2.6	-	2.5	4.15
Cotton ⁴	7.9	7.5	9.7	7.3	10.6	24.1
Net area sown	142.0	142.2	140.8	-	-	-
Total cropped area	176.4	184.8	194.0	-	-	-

Source: Agricultural Statistics at a Glance 2010 and previous issues, Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India, New Delhi.

The decline in area under foodgrains resulted in increase in area under other crops. The largest beneficiary of this decline were oilseeds during the decade on 1980s, when area under oilseeds increased from 18.5 million hectares in TE 1983-84 to 26 million hectares in TE 1993-94 but area under oilseeds remained stable between TE 1993-94 and TE 2008-09. The share of oilseeds in total cropped area increased significantly from less than 10 percent in early-eighties to 14.8 percent in early nineties, which marginally declined to about 14.3 percent in TE 2007-08. The area under cotton, which declined by about half a million hectares between TE 1983-84 and TE 1993-94, increased by more than 2 million hectares between TE 1993-94 and TE 2008-09. Another beneficiary of decline in area under foodgrains was high-value crops mainly fruits and vegetables. The area under fruits and vegetables increased by about 8.5 million hectares between TE 1983-94 and TE 2007-08. The share of area under fruits and vegetables in total cropped area, which was less than 3

⁴ Cotton production is in million bales of 170 kg each

percent in TE 1983-84 increased to over 5 percent in TE 2007-08. The above results clearly show that crop pattern shifted towards oilseeds, sugarcane and fruits and vegetables during the 1980s, whereas in the 1990s and 2000s, the shift was more towards fruits and vegetables, cotton and sugarcane and other non-food crops.

The compound annual growth rates presented in Table 2 reveal that fruits and vegetables witnessed the highest growth rate (3.4%), followed by oilseeds (3%) and sugarcane (1.35%) during the 1980s. The main reason for significant growth in area under oilseeds during the 1980s was Technology Mission on Oilseeds and complete protection to domestic industry from imports. During the 1990s, area under fruits and vegetables again witnessed the highest growth rate (2.5%), followed by cotton (2.18%) and sugarcane (1.91%). Area under fruits and vegetables grew at an annual compound growth rate of 5.3 percent during the 2000s, followed by cotton (3.12%), oilseeds (2.57%) and wheat and sugarcane (about 1.3%). The main factors responsible for significant growth in area under fruits and vegetables include higher return relative to other crop groups, higher demand for fruits and vegetables, big push from the government through National Horticulture Mission and Technology Mission for Integrated Development of Horticulture in North-East and Himalayan States. In case of cotton, the increase in area under cotton, production and productivity was mainly technology-driven (introduction of B_t cotton in 2002-03) as well as higher profitability compared with other competing crops. The average value of output of major crop groups per unit of area is presented in Table 3. It is evident from the table that per hectare value of output of fruits and vegetables was the highest (Rs. 1,08,785), followed by condiments and spices (Rs. 65,561) and sugarcane (Rs. 43,362) at 1999-2000 prices in the TE 2007-08. Average productivity of fruits and vegetables was about eight times higher compared with cereals. Per hectare value of output from pulses was the lowest during all the periods under study. The average productivity of all crop groups improved between TE 1993-94 and TE 2007-08 but the increase was the highest in case of fibres (67.7%), followed by condiments and spices (56.5%) and fruits and vegetables (23.1%). One of the major reasons for the highest increase in average productivity of fibres was significant increase in yield of cotton.

2.2 Dynamics of Indian Agriculture: High-Value Agriculture Growth Patterns

The relative importance of foodgrains has declined during the past two decades. At the all-India level, the share of foodgrains in total value of output from agriculture and allied

sectors (excluding forestry and logging) has fallen from 31.3 per cent (at 1999-00 prices) in TE 1983-84 to 26 percent in TE 2003-04 and reached a level of 24.7 percent in TE 2007-08 (Table 4). The decline in share was more pronounced in case of cereals, where it declined from 26.6 percent in TE 1993-94 to 21.7 percent in TE 2007-08, whereas share of pulses declined from 4 percent to 3 percent during the same period.

Table 2. Dynamics of Indian Agriculture: All India Share and Growth Rates of Major Crops/Crop Groups

Crops	Share in total cropped area (%)			Compound annual growth rate (%)		
	TE 1983-84	TE 1993-94	TE 2007-08	1980s	1990s	2000s
Rice	22.81	22.94	22.62	0.6	0.78	-0.70
Wheat	13.24	13.20	14.24	0.36	1.40	1.30
Coarse cereals	23.68	18.48	14.84	-1.49	-1.61	-2.14
Total cereals	59.72	54.62	51.69	-0.29	-0.02	0.21
Pulses	13.36	12.56	12.08	0.09	-0.64	0.83
Foodgrains	73.09	67.18	63.78	-0.19	0.03	0.37
Oilseeds	9.77	14.80	14.34	3.02	-0.87	2.57
Sugarcane	1.97	2.12	2.48	1.35	1.91	1.29
Fruits & vegetables	2.91	3.82	5.10	3.38	2.5	5.3
Cotton	4.39	4.13	4.68	-0.97	2.18	3.12
Others	7.87	7.95	9.63	-	-	-

Source: Computed from *Agricultural Statistics at a Glance 2010 and previous issues*, Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India, New Delhi.

Table 3. All India productivity of major crops/crop groups (1999-00 prices)

Crops	TE1983-84	TE 1993-94	TE 2007-2008
Foodgrains	7480	10419	12709
Cereals	7687	11125	13810
Pulses	6553	7352	8102
Oilseeds	9458	10413	12666
Fruits & Vegetables	84178	81723	108785
Sugarcane	30573	35100	43362
Fibres	10184	13865	23246
Condiments & spices	33054	41880	65561
All crops	13385	16518	22969

Sources: (i) *Land Use Statistics at a Glance 199-2000 to 2008-09*, Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India, New Delhi.

(ii) *Agricultural Statistics at a Glance 2010 (previous issues)*, Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India, New Delhi.

Due to shift in demand pattern towards high value crops, the farmers are also responding to market signals and gradually shifting production-mix to meet the growing demand for high-value commodities. This is reflected in the changing share of high value crops in total value of output from agriculture (Table 4). There is a clear shift from foodgrains towards fruits and vegetables, livestock products and fisheries. The share of high-value commodities/products (fruits and vegetables, livestock products, fisheries) increased from 37.3 percent in TE 1983-84 to 41.3 percent in TE 1993.94 and reached a level of 47.4 percent in TE 2007-08.

At the all-India level, the importance of livestock products has also increased. The share of livestock in total value of agricultural output has increased from 20.6 per cent in TE 1983-84 to 23.9 percent in TE 1993-94 and 26.1 percent in TE 2007-08. Among livestock products, contribution of milk has increased at a faster rate from 12.7 percent in TE 1983-84 to 17.4 percent in 2007-08 compared with meat (from 3.4% to 4.5%). The share of fisheries has also increased from 2.7 percent in TE 1983-84 to 4.6 percent in TE 2003-04 but marginally declined to 4.4 percent in TE 2007-08.

India is one of the major producers of fruits and vegetables with an estimated production of 188.7 million tonnes (64.3 million tones of fruits and 124.2 million tones of vegetables) in TE

2008-09. At all-India level, the share of fruits and vegetables in the total value of agricultural output increased from 14.1 per cent in TE 1983-84 to 15.4 per cent TE 1993-94 and 16.9 percent in TE 2007-08. This has happened largely due to increase in area and marginal improvements in productivity of fruits and vegetables. The increase in share of high value crops in total value of output from agriculture was slow between TE 1983-84 and 1993-94 and accelerated in the post reforms period.

Trends in growth rates of value of output from agriculture and allied sectors given in Table 4 provide interesting insights. During the eighties, fisheries witnessed the highest growth (6%) followed by oilseeds (5.6%), condiments and spices (4.7%) and livestock (4.6%). The crop sector grew at a lower rate of 2.5 percent, cereals recorded 3.2 percent growth, and pulses grew at 1.7 percent, lowest among all crops/sub-sectors. However, during the nineties almost all crops groups/sub-sectors except fruits and vegetables and condiments and spices, experienced deceleration in growth rates. Output of fruits and vegetables increased at much faster rate (6.3%) during the nineties compared to growth rate (2.2%) in the 1980s as well as other crop groups/sub-sectors. During the 1990s, condiments and spices also witnessed acceleration in rate of growth in output. The livestock sector grew at an annual compound growth rate of 3.7 percent (milk 4.3% and meat 2.6%) compared with 4.6 percent in the eighties. However, during the 2000s performance of crop sector improved and growth rate increased from 1.8 percent in 1990s to 2.4 percent in 2000s. Growth rate in fibres was the highest (17.2%), mainly because of B_t cotton effect, followed by oilseeds (6.4%). Foodgrains output increased by about 2.4 percent while rate of growth in livestock sector was almost same (3.8%) as during the 1990s. There was slow-down in growth of fisheries (2.9% in 2000s compared with 4.7% in 1990s), milk output (3.6%) and condiments and spices (3.5%). Growth rate of fruits and vegetables was also lower (3.5%) in the 2000s compared to growth rate (6.3%) in the 1990s. It is evident from the above analysis that high growth of high value agriculture achieved during the 1990s could not be maintained in the 2000s mainly because of slow down in growth of fruits and vegetables and fisheries sector. However, the crop sector grew at about 3.5 percent during the 2000s because of better performance of fibres, cereals, pulses and oilseeds in the recent years.

Table 4. Dynamics of Indian Agriculture: Changing shares of major crop groups

	Share in value of output from agriculture (%)				Compound Annual Growth Rate (%)		
	TE 1983-84	TE 1993-94	TE 2003-04	TE 2007-08	1980s	1990s	2000s
Foodgrains	31.3	30.6	26.0	24.7	3.0	1.8	2.4
Cereals	26.3	26.6	22.7	21.7	3.2	2.0	2.5
Pulses	5.0	4.0	3.3	3.0	1.7	0.5	2.2
Oilseeds	5.3	6.7	5.2	5.8	5.6	0.4	6.4
Fruits & Vegetables	14.1	13.6	16.7	16.9	2.2	6.3	3.5
Livestock	20.6	23.9	25.9	26.1	4.6	3.7	3.8
Milk	12.7	15.4	17.4	17.4	5.2	4.3	3.6
Meat	3.4	4.4	4.5	4.5	5.2	2.6	3.9
Fisheries	2.7	3.9	4.6	4.4	6.0	4.7	2.9
Fibres	3.0	2.9	2.2	3.6	2.6	0.4	17.2
Condiments & spices	2.3	2.6	3.2	3.1	4.7	5.0	3.5
Crop Sector	76.7	72.3	69.5	69.5	2.5	3.0	3.5
High-value agriculture	37.3	41.3	47.2	47.4	3.9	4.6	3.6
Agri. & allied sectors	100.0	100.0	100.0	100.0	3.0	3.2	3.5

Source: CSO (2010)

State Level Trends and Patterns

High value agriculture is a major contributor to the economy in many states. The share of fruits and vegetables and livestock products in value of output from agriculture (crop + livestock sector) is given in Table 5.

Fruits and vegetables contribute more than 30 percent to value of output from agriculture in states like Himachal Pradesh, Orissa, West Bengal, Jammu and Kashmir, Bihar and North-east states. Between TE 1995-96 and 2005-06, share of fruits and vegetables increased in all states except Assam and Rajasthan, which witnessed marginal decline in its share. Himachal Pradesh recorded the highest (11.2%) increase in share of fruits and vegetables, followed by West Bengal (10.2%), and Bihar including Jharkhand (7.7%). Other states which experienced more than all India increase (3.6%) in share of fruits and vegetables were Kerala, Orissa, Madhya Pradesh, Karnataka, Andhra Pradesh and Uttar Pradesh.

Table 5. Share of fruits and vegetables and livestock sector (%) in total value of output from crop and livestock sector: State Level Analysis

State/U.Ts	Fruits & Vegetables		Livestock		F&V + Livestock	
	TE 1995-96	TE 2005-06	TE 1995-96	TE 2005-06	TE 1995-96	TE 2005-06
Andhra Pradesh	10.3	14	22.7	34.3	33	48.3
Assam	26.1	22.9	17.8	20	43.9	42.9
Bihar	24.6	30.2	30.5	36.1	55.1	66.3
Bihar ⁵ + Jharkhand	24.6	32.3	30.5	33.8	55.1	66.1
Chhattisgarh	NA	16.3	NA	36.3	NA	52.6
Gujarat	11	11.8	23.9	23.9	34.9	35.7
Haryana	3.3	6.5	31.2	31.2	34.5	37.7
Himachal Pradesh	29.9	41.1	31.7	31.3	61.6	72.4
Jammu & Kashmir	34	33.9	33.8	38.4	67.8	72.3
Jharkhand	NA	39.5	NA	25.8	NA	65.3
Karnataka	19.3	23.2	18.9	20.5	38.2	43.7
Kerala	14.8	22.1	28.2	22.3	43	44.4
M.P. + Chhattisgarh	5.2	9.9	22.4	26.9	27.6	36.8
Madhya Pradesh	5.2	7.7	22.4	23.7	27.6	31.4
Maharashtra	18.2	22.7	22.7	20.2	40.9	42.9
Orissa	33.6	40.5	9.6	14.8	43.2	55.3
Punjab	3.7	4.8	30.3	32.5	34	37.3
Rajasthan	1.5	1.4	30.5	35.8	32	37.2
Tamil Nadu	20.6	22.6	22.2	31	42.8	53.6
UP + Uttarakhand	9.3	13	23.8	26.9	33.1	39.9
Uttar Pradesh	9.3	12.4	23.8	26.8	33.1	39.2
Uttarakhand	NA	23.9	NA	30.2	NA	54.1
West Bengal	25.3	35.5	26.3	22.9	51.6	58.4
Arunachal Pradesh	31.3	24.4	18	27.1	49.3	51.5
Manipur	23.7	29.5	26	27.7	49.7	57.2
Meghalaya	22.2	37.7	43.3	30.5	65.5	68.2
Mizoram	20.5	15.7	25.3	30.9	45.8	46.6
Nagaland	16.3	12.9	27.7	35.9	44.0	48.8
Sikkim	12.5	33.7	19.1	17.1	31.6	50.8
Tripura	80.2	41.3	15.7	15	95.9	56.3
India	14.6	18.2	24.7	27.2	39.3	45.4

Source: CSO (2008)

⁵ In order to have precise/valid comparison across different time periods, we have considered newly created states independently as well as by including these states in the original state (Bihar, Madhya Pradesh and Uttar Pradesh), e.g. Bihar and Jharkhand separately and also by combining Bihar and Jharkhand.

The share of livestock sector increased from 24.7 percent in TE 1995-96 to 27.2 percent in the TE 2005-06 at all India level. In Jammu & Kashmir, Bihar, Rajasthan, Andhra Pradesh, Punjab, Himachal Pradesh, Haryana, and Tamil Nadu, share of livestock sector is more than 30 percent (higher than national average). The highest increase in share of livestock was witnessed in Andhra Pradesh (11.6%), followed by Tamil Nadu (8.8%), Bihar (5.6%) and Rajasthan (5.3%). Some other states like Orissa, Jammu and Kashmir, Madhya Pradesh (including Chhattisgarh), and Uttar Pradesh also recorded increase in share of livestock in total value of output. The high value agriculture (fruits & vegetables and livestock sector) is the largest contributor to state economy in hill states like Himachal Pradesh (72.4%) and Jammu & Kashmir (72.3%) and other states such as Bihar (66.1%), West Bengal (58.4%), Orissa (55.3%) and Tamil Nadu (53.6%) compared with national average of 45.4 percent in the TE 2005-06.

Trends in growth rate in value of output from vegetables and fruits has witnessed a significant slowdown in large number of states during the 2000s, while very few states namely, Gujarat, Punjab and some North-eastern states saw some acceleration in growth rates (Table 6). Jharkhand registered the highest growth (23.8%) in value of output from vegetables and fruits during the 2000s, followed by Gujarat (19.6%), Chhattisgarh (15.2%), Himachal Pradesh (14.2%), Andhra Pradesh (13.1%), Punjab (12.5%), Kerala (10.2%) and Orissa (10.2%). Jammu and Kashmir, Uttarakhand, Tamil Nadu and Maharashtra also had more than national growth rate (6%) in production of fruits and vegetables. Assam, Bihar, Karnataka and some North-eastern states had negative growth in value of output from fruits and vegetables. Sikkim has seen the highest acceleration in growth rate from 13.1 percent in 1990s to 44.3 percent in 2000s, while in case of Manipur growth rate increased from 8.7 to 22.7 percent and in Gujarat from 10.1 to 19.6 percent. Maharashtra and West Bengal, two important horticulture states, have seen significant deceleration in growth rate during 2000s which is a matter of concern.

Table 6. Trend growth rates (%) in value of output (current prices) from fruits and vegetables in major states

State/U.Ts	F&V				Livestock		
	1980s	1990s	2000s	1991-92 to 2005-06	1990s	2000s	1991-92to 2005-06
Andhra Pradesh	9.3	16.3	13.1	12.4	15.2	8.3	14.1
Assam	17.4	11.6	-0.3	7.1	8.8	8.9	7.7
Bihar	25.7	10.9	-0.6	7.2	6.0	15.3	5.4
Bihar + Jharkhand	25.7	12.7	5.4	10.3	8.5	13.7	7.5
Jharkhand	NA	NA	23.8	NA	NA	6.8	NA
Gujarat	9.7	10.1	19.6	10.7	12.7	10.8	10.6
Haryana	7.5	26.0	3.0	16.4	11.2	4.7	8.8
Himachal Pradesh	17.5	15.1	14.2	14.4	13.7	11.5	12.1
Jammu & Kashmir	24.6	15.0	9.7	11.1	13.1	4.4	10.9
Karnataka	25.7	13.0	-1.8	8.8	13.7	-1.6	8.5
Kerala	14.4	14.4	10.2	9.0	13.8	-4.0	6.4
Madhya Pradesh	15.6	21.7	5.9	11.6	10.8	5.7	4.7
M.P. + Chhatisgarh	15.6	26.0	9.6	17.3	15.1	7.9	9.0
Chhattisgarh	NA	NA	15.2	NA	NA	12.7	NA
Maharashtra	19.3	14.6	7.5	12.1	11.8	7.0	8.7
Orissa	11.5	13.3	10.2	10.5	14.3	11.2	12.5
Punjab	20.9	10.0	12.5	8.9	13.4	5.0	9.7
Rajasthan	16.7	22.7	3.5	9.3	15.7	9.1	12.2
Tamil Nadu	16.1	14.5	7.6	7.9	13.0	5.3	9.2
Uttar Pradesh	7.0	17.5	1.1	12.5	10.9	7.6	9.2
U.P. + Uttarakhand	7.0	19.1	1.8	13.7	11.6	7.6	9.8
Uttarakhand	NA	NA	8.6	NA	NA	6.4	NA
West Bengal	15.9	20.4	4.1	14.3	9.9	6.0	7.7
Arunachal Pradesh	35.3	-3.5	0.8	1.3	6.3	5.6	9.4
Manipur	8.0	8.7	22.7	11.8	7.2	7.4	7.3
Meghalaya	10.6	24.9	3.9	17.7	9.4	3.0	7.6
Mizoram	38.0	23.4	-14.1	10.0	7.4	3.2	6.6
Nagaland	8.5	34.7	-39.5	16.4	9.9	18.1	12.5
Sikkim	10.4	13.1	44.3	15.7	5.7	7.5	6.5
Tripura	15.6	16.6	-2.0	13.3	15.0	7.7	11.8
Pondicherry	13.1	-4.4	-2.3	5.8	10.1	14.8	8.4
India	14.3	15.3	6.0	11.2	12.0	7.0	9.7

Source: Computed from CSO (2008)

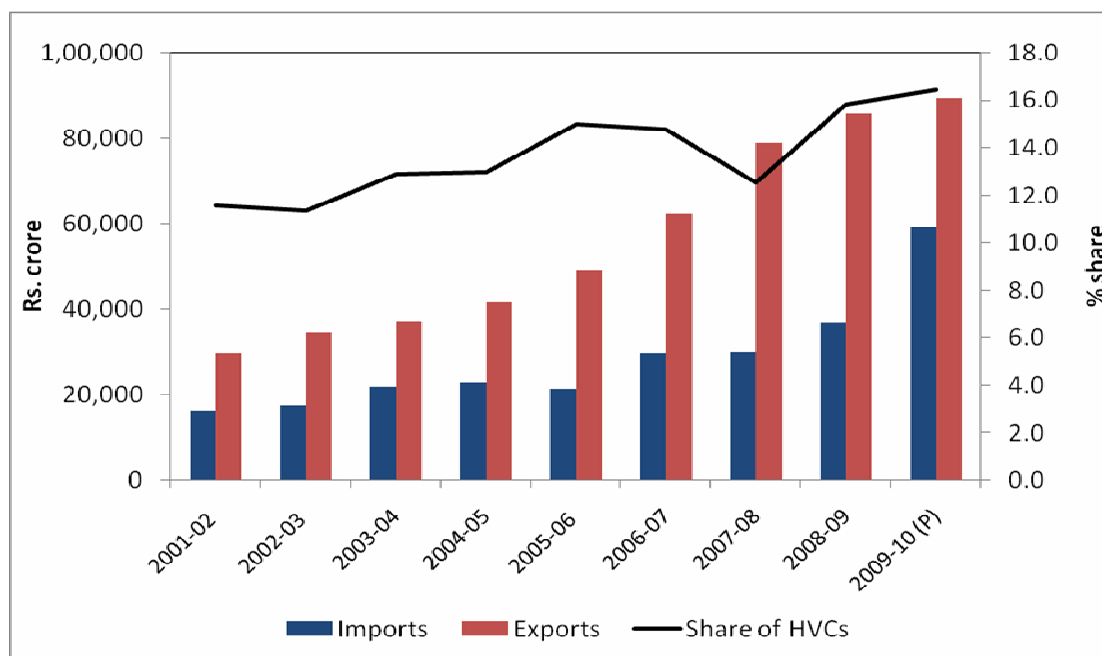
Growth rate in value of output from livestock sector has also seen a significant deceleration in 2000s in many states. Bihar including Jharkhand was the only major state that saw acceleration in growth rate from 8.5 percent in 1990s to 13.7 percent in 2000s. At all-India level, growth rate declined from 12 percent to 7 percent in 2000s. Between 2001-02 and 2005-06 Bihar, Chhattisgarh, Himachal Pradesh, Orissa, and Gujarat experienced rapid

growth in production of livestock products, exceeding 10 percent annual growth rate. Other states like Rajasthan, Assam, Andhra Pradesh, Uttar Pradesh, Maharashtra, and Madhya Pradesh including Chhattisgarh had higher growth rate than national average (7%) in the 2000s. However, growth rate turned out to lower than national average in major states like Punjab, Haryana, Tamil Nadu, Madhya Pradesh and West Bengal.

2.3 Trends and Composition of Indian Agricultural Trade

Trends in imports and exports of agricultural commodities during the last decade are presented in Figure 2. The exports of agriculture and food products increased from about Rs. 29.7 thousand crore in 2001-02 to Rs. 89.5 thousand crore in 2009-10 at an annual compound growth rate of 16.3 percent, which accounts for about 11 percent of total Indian exports. The share of high-value agricultural products in total agricultural exports has increased from about 11.5 percent in early 2000s to 16.4 percent in 2009-10. Agricultural imports have increased significantly from 16.3 thousand crore in 2001-02 to 59.4 thousand crore in 2009-10 at an annual growth rate of 14.8 percent. The share of agricultural imports in national imports is about 4.4 percent. Indian agricultural exports are significantly higher than agricultural imports.

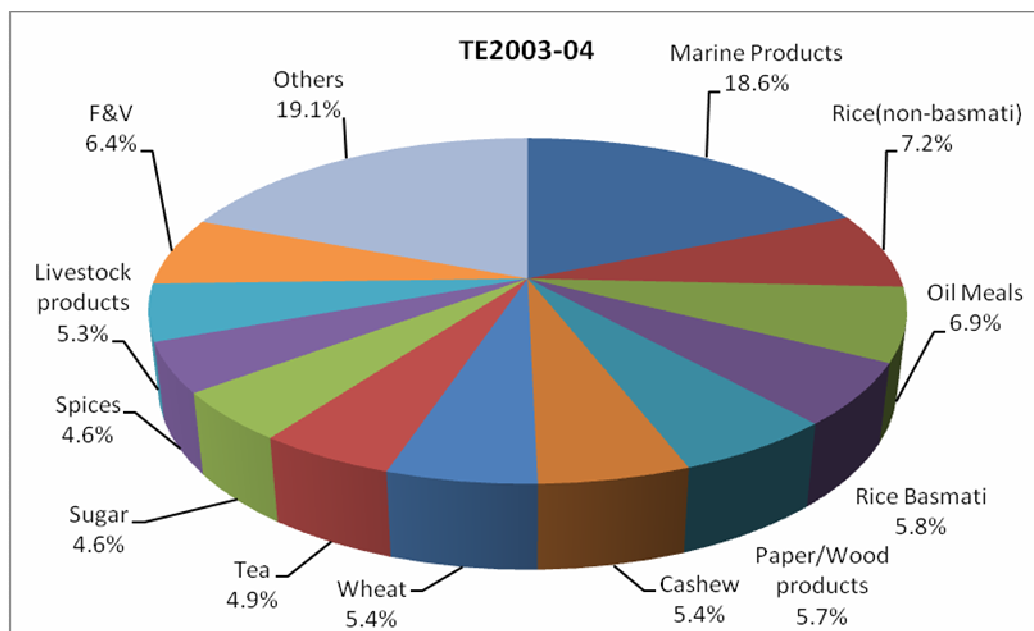
Figure 2. Trends in imports and exports of agricultural commodities and share of high-value commodity exports in total agricultural exports

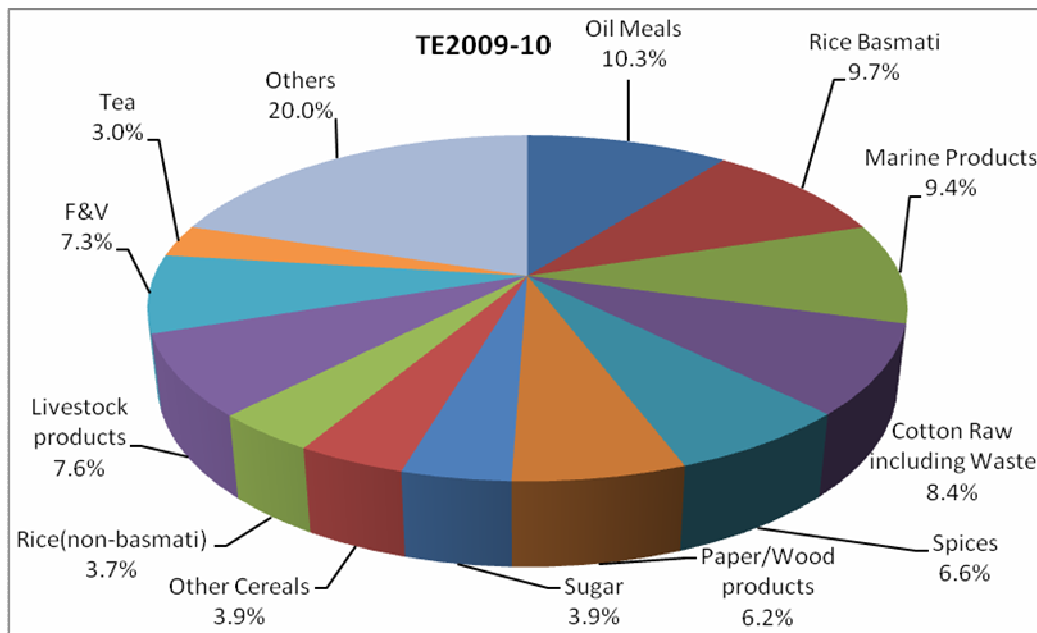


Source: Economic Survey (2010-11 & earlier issues)

Among the country's major products exported include rice, oil meals mainly soybean meal, marine, cotton, and spices (Figure 3). Marine products, which constituted about 18.6 percent of total agricultural exports in TE 2003-04, lost its share and accounted for 9.4 percent of total agricultural exports in TE 2009-10. Other products, which lost their share include rice (non-basmati from 7.2 percent to 3.7 percent, cashew, wheat, and tea, while rice basmati, cotton, spices, livestock products and fresh fruits and vegetables increased their share in export basket between Te 2003-04 and 2009-10. Imports of agriculture and food products into India grew by 14.8 percent reaching Rs. 59.4 thousand crore in 2009-10. Approximately, 42 percent of these imports were edible oils, most notably palm and soybean oil, whereas pulses accounted for 16.8 percent of agricultural imports in TE 2009-10 (Figure 4). Overall, India experienced a trade surplus in agriculture and food products during the last decade. The trade surplus in TE 2009-10 was about Rs. 42.7 thousand crore, a 279 percent increase from TE 2003-04.

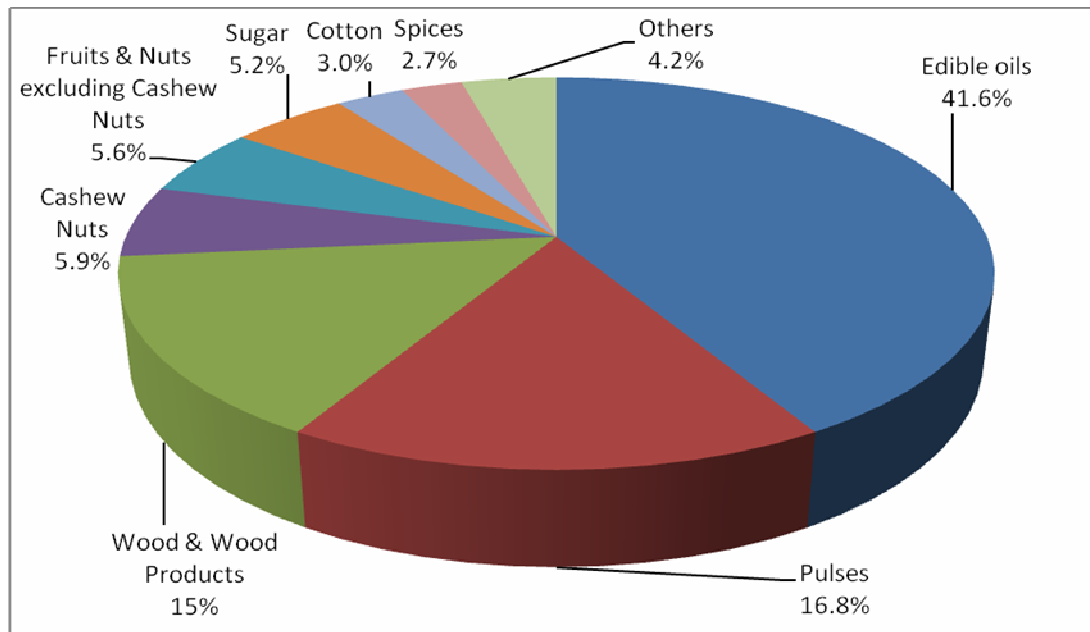
Figure 3. Commodity composition of agricultural exports in India: TE 2003-04 and 2009-10





Source: Economic Survey (2010-11 & earlier issues)

Figure 4. Commodity composition of agricultural imports into India: TE 2009-10



Source: Economic Survey (2010-11 & earlier issues)

Section 3: Food Consumption Trends and Drivers: Increasing Importance of High Value Commodities

3.1 Changes in Food Consumption Pattern: All-India Analysis

The marked rise in availability of food and rising income have been accompanied by changes in the composition of diet. The process involved in such dietary change appears to follow a pattern involving two main stages (Kearney, 2010). In the first stage, known as the 'expansion' effect, the main change is in terms of increased energy supplies, with these extra calories coming from cheaper foodstuffs of vegetable origin (Smil 2000). The second stage, called the 'substitution' effect, results in a shift in the consumption of foodstuffs with no major change in the overall energy supply. This shift is primarily from staples like cereals to livestock products (milk and dairy products, meat, and eggs), fish, fruits and vegetables, etc. In contrast to the first stage, this one is region/country-specific and is influenced by culture, religious traditions and other socio-economic factors. In particular, such traditions can influence the extent to which livestock products substitute fruits and vegetables and the specific types of meat and animal products consumed. This section analyses changes in food consumption pattern in India during the last two decades.

The average monthly per capita consumer expenditure (MPCE) in 2007-08 stood at Rs. 1471.54 in urban and Rs. 772.36 in rural India (Table 7). The per capita total consumption expenditure in urban areas was about 90 percent higher than that of the rural areas, while in case of food expenditure it was about 44 percent higher. Between 1987-88 and 2007-08, the highest increase in MPCE was observed in non-food expenditure in both rural and urban areas. Among food items, beverages registered the highest increase (>5 times) in expenditure, followed by fruits and vegetables (about 5 times), milk and milk products and eggs, fish and meat (4.5 times) in rural households. The expenditure on cereals and cereal substitutes has increased by about 3.5 times between 1987-88 and 2007-08. In case of urban households, the highest increase in MPCE was on vegetables (5.9 times), followed by beverages, etc. (5.4 times), fruits and eggs, fish and meat by over 5 times. Cereals and cereal substitutes expenditure increased by only three times.

Table 7. Changes in expenditure on food consumption of rural and urban consumers in India, 1987-88 to 2007-08

(Rs./capita/month at current prices)

<i>Item groups</i>	<i>43rd Round 1987-88</i>	<i>50th Round 1993-94</i>	<i>55th Round 1999-00</i>	<i>61st Round 2004-05</i>	<i>62nd Round 2005-06</i>	<i>63rd Round 2006-07</i>	<i>64th Round 2007-08⁶</i>
Rural							
Cereals & cereal substitutes	41.54	68.40	108.11	101.04	106.72	115.26	124.56
Pulses & their products	6.27	10.70	18.50	17.18	20.02	22.67	23.70
Edible oils	7.88	12.50	18.16	25.72	25.46	27.22	33.29
Milk & milk products	13.63	26.70	42.56	47.31	50.94	56.23	60.18
Eggs, fish & meat	5.11	9.40	16.14	18.60	24.31	24.32	26.31
Vegetables	8.23	17.00	28.98	34.07	37.88	43.06	48.53
Fruits & nuts	2.57	4.90	8.36	10.42	11.75	12.47	13.56
Beverages etc.	6.18	11.70	20.38	25.37	26.10	30.67	33.60
Others	9.41	16.50	27.61	27.89	29.97	31.52	31.31
Total Food	100.82	177.80	288.80	307.60	333.15	363.42	395.04
Total Non-food	57.28	108.30	197.36	271.57	291.38	331.74	341.03
Total expenditure	158.10	286.10	486.16	579.17	624.53	695.16	736.07
Urban							
Cereals & cereal substitutes	37.14	64.60	105.92	106.34	110.31	119.30	131.13
Pulses & their products	8.44	13.90	24.25	22.51	25.57	30.06	31.20
Edible oils	13.23	20.10	26.81	36.37	35.02	37.52	46.43
Milk & milk products	23.84	44.90	74.17	83.30	84.94	97.49	106.64
Eggs, fish & meat	8.85	15.50	26.78	28.47	32.28	34.20	39.47
Vegetables	13.12	25.00	43.90	46.84	49.73	56.87	64.34
Fruits & nuts	6.27	12.20	20.68	23.65	25.52	28.00	31.02
Beverages etc.	16.82	33.00	54.28	65.31	68.32	74.42	85.75
Others	12.02	21.10	34.05	34.62	36.13	39.39	38.63
Total food	139.73	250.30	410.84	447.41	467.82	517.25	574.61
Total non-food	110.19	214.00	444.08	657.19	702.78	795.25	889.11
Total expenditure	249.92	464.30	854.92	1104.60	1170.60	1312.50	1463.72

Source: Computed from NSS Report No. 530: Household Consumer Expenditure in India, 2007-08

⁶ For precise comparison of 64th round estimates with earlier round estimates, the 64th round estimates – Rs. 9.29 of rural per capita consumer expenditure on account of cooked meals received as assistance or payment were deducted from 64th round estimates of (i) beverages, etc. (ii) total food and (iii) total expenditure, as such meals were not covered in consumer expenditure in earlier rounds.

The share of food in total consumer expenditure has fallen from 63.8 percent in 1987-88 to 53.7 percent in 2007-08 in rural areas whereas in urban areas the decline is steep and it has fallen from about 60 percent to 39.3 percent. In contrast the share of non-food expenditure has increased significantly both in rural and urban areas but the increase has been much faster in urban areas. Recent data from 64th Round of NSSO for the year 2007-08 show that cereals continue to remain by far the most important food source in the country, contributing 31.5 per cent of food expenditure in rural areas and 22.8 per cent in urban areas (Table 8). Their share in total food expenditure varies markedly between rural and urban areas as well as across states. The share of cereals in food expenditure has declined from 41.2 percent in 1987-88 to 31.5 percent in 2007-08 in rural areas, while in urban areas it has declined from 26.6 to 22.6 percent during the same period. It is expected that the share of cereals in food expenditure will continue to decline both in rural and urban areas.

Table 8. Share of expenditure on food (%) in total monthly per capita consumer expenditure

	1987-88	1993-94	1999-00	2005-06	2007-08
	<i>Rural</i>				
Cereals & their substitutes	41.2	38.5	37.4	32.0	31.5
Pulses & their products	6.2	6.0	6.4	6.0	6.0
Edible oils	7.8	7.0	6.3	7.6	8.4
Milk & milk products	13.5	15.0	14.7	15.3	15.2
Egg, fish & meat	5.1	5.3	5.6	7.3	6.7
Vegetables	8.2	9.6	10.0	11.4	12.3
Fruits & nuts	2.5	2.8	2.9	3.5	3.4
Fruits & Vegetables	10.7	12.3	12.9	14.9	15.7
Beverages, etc.	6.1	6.6	7.1	7.8	8.5
Total Food	63.8	62.1	59.4	53.3	53.7
Non-Food	36.2	37.9	40.6	46.7	46.3
	<i>Urban</i>				
Cereals & their substitutes	26.6	25.8	25.8	23.6	22.8
Pulses & their products	6.0	5.6	5.9	5.5	5.4
Edible oils	9.5	8.0	6.5	7.5	8.1
Milk & milk products	17.1	17.9	18.1	18.2	18.6
Egg, fish & meat	6.3	6.2	6.5	6.9	6.9
Vegetables	9.4	10.0	10.7	10.6	11.2
Fruits & nuts	4.5	4.9	5.0	5.5	5.4
Fruits & Vegetables	13.9	14.9	15.7	16.1	16.6
Beverages, etc.	12.0	13.2	13.2	14.6	14.9
Total Food	55.9	53.9	48.1	40.0	39.3
Non-Food	44.1	46.1	51.9	60.0	60.7

Source: Computed from NSS Report No. 530: Household Consumer Expenditure in India, 2007-08

The pulses are of major nutritional importance, particularly in India where they constitute a staple food along with cereals and main source of protein. However, the share of pulses and their products has remained almost stable at about 6 percent in rural areas and 5.5 percent in urban areas. One of the main reasons for stable/declining share of pulses in food intake is low domestic availability of pulses as pulses production has remained constant and per capita availability has declined during the last 2-3 decades.

Livestock products including meat, eggs and milk and dairy products such as butter, ice cream, and cheese and fish have shown rising consumption trends during the last 2 decades. The consumption expenditure on milk and milk products is next to cereals and is rising over the years in the country. The average expenditure on milk and milk products is much higher compared to expenditure on eggs, fish and meat mainly due to food habits in the country. The share of milk and milk products has increased from 13.5 percent to 15.2 percent in rural areas whereas in urban areas it has increased from 17.1 percent to 18.6 percent. The share of levels of egg, fish and meat in consumption expenditure has also increased in India.

Consumer expenditure trends for fruits and vegetables depict very significant increase in the country. The share of vegetables and fruits in consumer expenditure has increased from 10.7 percent in 1987-88 to 15.7 in 2007-08 in rural and from 13.9 percent to 16.6 percent in urban India. Among fruits and vegetables, share of vegetables is higher and in case of rural areas vegetables are third important food item after cereals and milk and milk products. The average expenditure as well as share of beverages has increased by about six times in both rural and urban areas. In urban areas, beverages are the third important food item with average expenditure of Rs.93.57 in 2007-08. The share of edible oils in consumer expenditure has increased in rural areas but declined in urban areas.

However, among different income groups, considerable variability is apparent, with some food items showing small increase, and others experiencing quite marked increases in consumption of high value products. The average food expenditure in low income group (bottom 30% expenditure group) increased at faster rate compared with high income group in both rural and urban areas (Table 9). In case of low income group, the highest increase in expenditure was observed in case of beverages, refreshments and processed foods, followed by livestock products consumption, and fruits and vegetables in rural areas, while in urban areas, highest increase in food expenditure was again in case of beverages, refreshment and processed food, followed by milk and milk products, meat, fish and eggs

and fruits and vegetables. Almost a similar pattern was observed in urban areas but rate of increase was much higher in rural areas compared with urban areas.

Table 9. Changing food consumption pattern (Rs./capita/month) of poor and rich in rural and urban areas in India

	Lower expenditure group (30%)			Upper expenditure group (30%)		
	Rural					
	1993-94	2007-08	% Change	1993-94	2007-08	% Change
Cereals	213.65	319.89	49.73	319.01	428.47	34.31
Pulses & Products	27.79	49.99	79.88	67.93	102.42	50.77
Edible Oils	28.73	68.15	137.21	76.57	134.31	75.41
Milk & Milk Products	25.02	56.33	125.14	239.08	348.22	45.65
Meat, Fish & Eggs	15.02	38.03	153.20	68.01	133.93	96.93
Vegetables	42.66	105.01	146.16	98.06	192.18	95.98
Fruits & Nuts	5.34	13.16	146.44	45.78	82.77	80.80
Beverages, processed foods, etc.	17.41	64.37	269.73	81.69	219.06	168.16
Total Food	411.30	774.04	88.19	1113.37	1768.58	58.85
	Urban					
	1993-94	2007-08	% Change	1993-94	2007-08	% Change
Cereals	213.39	326.64	53.07	293.46	463.35	57.89
Pulses & Products	35.90	69.28	92.98	83.80	130.44	55.66
Edible Oils	43.93	95.57	117.55	123.49	184.50	49.40
Milk & Milk Products	54.55	134.48	146.53	357.65	543.86	52.06
Meat, Fish & Eggs	27.91	68.37	144.97	107.79	174.80	62.17
Vegetables	55.20	128.65	133.06	161.22	263.06	63.17
Fruits & Nuts	12.49	30.16	141.47	115.95	188.57	62.63
Beverages, etc.	40.90	107.63	163.15	308.81	561.44	81.81
Total Food	536.12	1043.25	94.59	1665.27	2648.03	59.02

Source: Computed from NSS Report No. 530: Household Consumer Expenditure in India, 2007-08

The above data clearly shows that food habits are changing in both rural and urban areas and demand for high value products including beverages and processed products has

increased significantly. This provides an opportunity for the farming community to take advantage of rising demand for these products and diversify into high-value agriculture.

3.2 State-level Trends and Patterns

The changes in the monthly per capita expenditure on high value food products (milk and milk products, meat, eggs & fish, and fruits and vegetables) over two time periods (1993-94 and 2007-08) in rural and urban areas in different states were worked out and the same are presented in Tables 10 and 11. A considerable variability in share of high value products is apparent across different states, with some food items showing small increase in some states, and others experiencing quite marked increases in consumption of high value products. For example, expenditure on milk and milk products varied from about 3 percent in Orissa to about 45 percent in Haryana. The expenditure on milk and dairy products was significantly higher in northern and western states like Haryana, Punjab, Rajasthan, Gujarat and Uttar Pradesh, while expenditure on meat, eggs and fish is higher in southern and eastern states such as Kerala, Assam, West Bengal, Andhra Pradesh, Orissa and Tamil Nadu. The share of expenditure on fruits and vegetables has increased in all states except Kerala, which recorded small decline in consumption, between 1993-94 and 2007-08. Similarly most of the states witnessed an increase in share of expenditure on milk and milk products and livestock products. Although share of cereals in food expenditure has declined significantly but expenditure on cereals was still a major item of food expenditure. Almost a similar pattern of expenditure was found in urban areas.

Table 10. Share of expenditure on food (%) and high value commodities in Rural India: State level analysis

	Cereals	Pulses	Milk & milk products	Meat, fish and eggs	F&V	Total Food	Non-food
	1993-94						
Andhra Pradesh	41.2	6.5	8.9	7.6	11.2	59.6	40.4
Assam	48.6	3.8	6.2	11.6	12.8	72.3	27.7
Bihar	51.9	6.3	10.5	3.7	11.9	71.0	29.0
Gujarat	24.9	7.0	21.0	1.6	13.8	67.1	32.9
Haryana	21.2	4.3	42.5	0.8	9.9	60.1	39.9
Karnataka	36.8	7.2	11.0	5.4	13.0	62.0	38.0
Kerala	30.8	3.5	8.6	14.0	17.0	60.5	39.5
Madhya Pradesh	43.1	8.4	13.4	2.9	11.0	61.2	38.8
Maharashtra	30.8	8.8	11.0	5.3	13.4	59.5	40.5
Orissa	57.3	4.0	3.5	6.1	14.3	68.1	31.9
Punjab	18.2	6.2	35.3	1.4	11.6	57.9	42.1
Rajasthan	28.9	4.5	35.1	1.2	8.5	62.3	37.7
Tamil Nadu	39.4	6.7	7.2	6.8	12.4	62.8	37.2
Uttar Pradesh	35.2	8.3	20.3	2.7	12.1	61.5	38.5
West Bengal	50.7	3.2	5.7	9.9	13.2	66.8	33.2
India	38.5	6.3	15.0	5.3	12.3	63.2	36.8
	2007-08						
Andhra Pradesh	26.6	6.6	11.0	8.8	15.6	52.0	48.0
Assam	36.8	5.5	6.2	16.9	16.1	59.9	40.1
Bihar	42.1	5.9	11.2	4.5	15.8	59.7	40.3
Gujarat	22.6	6.1	23.2	1.7	14.6	53.9	46.1
Haryana	18.4	4.0	44.8	0.9	11.7	50.0	50.0
Karnataka	42.6	5.5	6.5	6.0	17.2	58.9	41.1
Kerala	26.3	6.6	10.6	7.1	13.7	50.5	49.5
Madhya Pradesh	22.8	4.3	9.4	17.5	17.4	40.8	59.2
Maharashtra	33.6	7.7	16.6	2.5	13.6	51.0	49.0
Orissa	42.0	5.1	3.2	7.8	17.4	58.2	41.8
Punjab	18.1	6.5	35.6	0.7	13.1	43.6	56.4
Rajasthan	27.0	3.9	30.4	1.2	11.8	53.9	46.1
Tamil Nadu	20.7	7.8	8.9	9.3	15.5	50.3	49.7
Uttar Pradesh	32.2	7.4	17.5	3.0	15.2	53.0	47.0
West Bengal	28.0	8.0	19.4	4.0	15.2	50.8	49.2
N-E States	35.5	3.8	4.9	20.0	17.7	54.2	45.8
UTs	20.1	6.6	10.6	11.5	15.9	49.0	51.0
India	30.8	6.1	14.9	6.5	15.4	52.3	47.7

Source: Computed from NSS Report No. 530: Household Consumer Expenditure in India, 2007-08

Table 11. Share of expenditure (%) on food and high value commodities in Urban India: State level analysis

	Cereals	Pulses	Milk & milk products	Meat, fish and eggs	F&V	Total Food	Non-food
	1993-94						
Andhra Pradesh	33.3	6.4	12.8	7.3	12.0	53.8	46.2
Assam	33.7	4.2	9.5	13.8	14.5	59.7	40.3
Bihar	36.4	6.3	13.9	5.8	13.8	62.9	37.1
Gujarat	19.4	6.0	23.2	2.1	14.7	58.4	41.6
Haryana	19.2	4.8	34.1	1.3	14.8	53.9	46.1
Karnataka	29.4	6.6	14.7	6.1	13.2	55.7	44.3
Kerala	24.8	3.6	10.4	15.0	16.6	53.9	46.1
Madhya Pradesh	28.0	7.7	18.6	3.5	13.9	52.9	47.1
Maharashtra	21.8	6.0	17.4	6.1	15.7	53.0	47.0
Orissa	34.4	5.1	8.6	8.7	17.1	57.8	42.2
Punjab	16.9	6.3	30.1	1.8	15.0	53.0	47.0
Rajasthan	22.4	4.6	29.9	2.2	13.2	56.7	43.3
Tamil Nadu	29.9	6.7	11.5	7.7	12.9	54.6	45.4
Uttar Pradesh	25.3	6.9	22.8	3.6	15.1	56.0	44.0
West Bengal	30.5	3.6	10.6	13.2	14.7	55.9	44.1
India	25.8	5.9	17.9	6.2	14.9	54.7	45.3
	2007-08						
Andhra Pradesh	24.7	6.2	14.6	8.1	15.6	36.9	63.1
Assam	29.9	5.3	9.2	16.3	16.3	46.7	53.3
Bihar	32.5	5.5	15.0	4.5	17.6	46.9	53.1
Gujarat	19.0	5.7	23.9	1.7	16.5	42.6	57.4
Haryana	16.7	4.2	33.9	1.6	15.6	39.3	60.7
Karnataka	22.5	5.2	13.9	7.0	13.5	36.7	63.3
Kerala	19.0	3.9	10.2	18.4	17.9	36.1	63.9
Madhya Pradesh	24.5	6.8	21.3	2.5	16.7	39.8	60.2
Maharashtra	21.2	0.2	17.2	6.6	17.5	36.9	63.1
Orissa	27.0	0.0	9.4	8.7	17.7	42.3	57.7
Punjab	17.6	1.0	32.8	0.8	15.6	36.8	63.2
Rajasthan	23.2	0.2	29.4	2.0	15.0	42.4	57.6
Tamil Nadu	19.3	0.5	13.5	8.9	15.0	38.9	61.1
Uttar Pradesh	26.0	6.5	20.7	3.8	16.7	43.2	56.8
West Bengal	25.2	4.0	9.1	17.0	17.2	42.6	57.4
N-E States	30.2	4.2	8.2	19.9	17.8	43.9	56.1
UTs	18.5	4.9	19.6	5.7	15.1	36.5	63.5
India	22.5	5.7	18.3	6.8	16.4	39.6	60.4

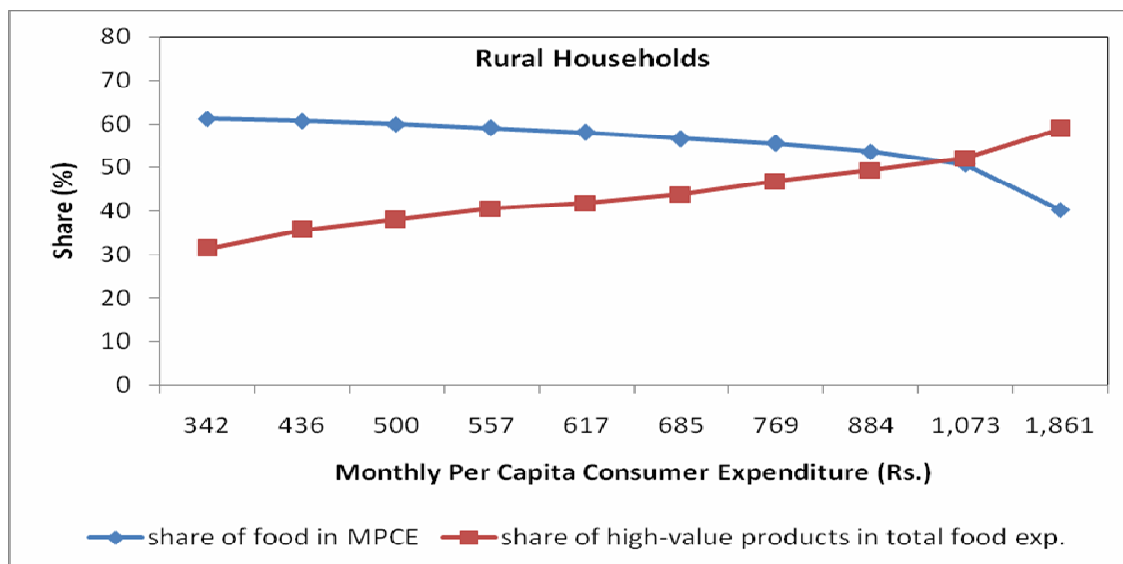
Source: Computed from NSS Report No. 530: Household Consumer Expenditure in India, 2007-08

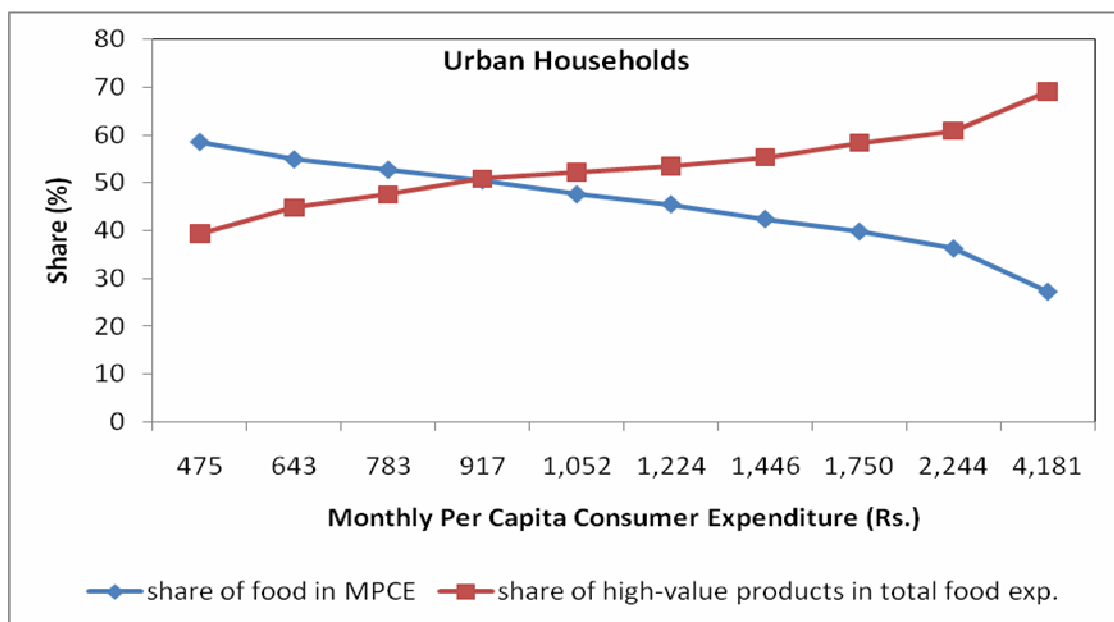
3.3 Engel Model of Food Consumption and Expenditure

While food demand is expected to increase with income, the food share of total budget is expected to decline as income increases. As described in the previous section, rising income and improved access to greater variety of food is expected to change the food consumption patterns, especially in the middle income group. Studies of food demand in India consistently find that Indian households tend to consume more high value products such as milk and dairy products, fruits and vegetables, meats, poultry, and fish as their incomes rise, while their consumption of traditional staple grains remains stable or declines (Kumar 1995, Gandhi and Mani, 1995, Meenakshi, 1996, Kumar and Mathur, 1996, Radhakrishna, 2005, Singh and Mathur, 2008)..

In this section the NSSO data are used to analyze the consumption pattern of food in the country. Consumer response to changes in factors affecting demand is measured by elasticity. For example, income elasticity measures the responsiveness of quantity demanded to a unit change in income, while price elasticity measures the responsiveness of the quantity demanded to a unit change in price. When income elasticity for a product is greater than one, the product is considered to be a luxury good and accounts for increasing proportion of total expenditures with increase in income. When income elasticity of demand is less than one, the product is considered to be a necessary good and accounts for a smaller proportion of total expenditures as income rises.

Figure 5. Importance of food expenditure and high-value product expenditure, rural and urban households, by expenditure level, 2007-08





Source: Computed from NSS Report No. 530: Household Consumer Expenditure in India, 2007-08

Food is necessity that accounts for about half of total consumption expenditure of poor households, but share of food spending declines as households gain more income (Figure 5). The wealthiest rural households devoted about 40 percent of their expenditure while the poorest households spent about 61 percent of their consumption expenditure on food. As their incomes rise, households tend to change the composition of their diet. For low-income rural households, about 30 percent of food expenditure is on high-value products (milk and milk products, meat, eggs & fish, fruits, vegetables and beverages, etc.) while high-income group households spend about 60 percent of food expenditure on high-value products (Figure 5). Almost a similar trend was observed in case of urban households. These consumption patterns reflect a transition from starch-based to fruits and vegetables and animal protein based diet as income rises.

The Engel curve is most commonly expressed as the relationship between household expenditure on an item and household income. Several functional forms are possible for estimation of Engel curves. Most empirical estimates assume a log-linear relationship between quantity consumed and income but it is important to do some exploratory analysis of data for selecting a function. The exploratory analysis of data found that the log-linear

relationship does not fit the data well. The log-linear relationship assumes constant income elasticity over all income levels but the data indicate that income elasticity falls as income grows. Several authors have found similar non-linear patterns in Engel curves estimated for food consumption patterns in India and the World (Gandhi & Mani, 1995, FAO, 1972, Rae, 1998).

We tried four non-linear functional forms, namely, log-log inverse, log-inverse, log-quadratic, and semi-logarithmic, for computing expenditure elasticities of demand for various food items. Engel equations were estimated for each available high-value food category for urban and rural households using ordinary least squares. In our regressions, we treated total monthly per capita consumer expenditure (MPCE) as proxy for income.

Log-log inverse form of Engel equation, which allows the income elasticity to vary with income, provided the best fit as both parameters are statistically significant in most equation and the R^2 values are very high. Since elasticities may vary with income, they were calculated at three representative income levels (low: bottom 20%, middle income: 40-60% and high: top 20%) for rural and urban households and results are presented in Tables 12 and 13.

Consistent with past findings, our results indicate that low-income households spend a greater proportion of their total expenditure on food compared with rich households. For all food subgroups, poor households exhibit a greater responsiveness, as given by the expenditure elasticity, to change in expenditure levels compared with high-expenditure households. For all income levels, households indicate comparatively lower income elasticities for staple products such as cereals than for high-value products such as milk and milk products, eggs, fish and meat, and fruits and vegetables in both rural and urban areas. However, the difference between the elasticities for the lower value staples and the high-value products are larger for low-income households than for the high-income households. For example, the difference between estimated elasticity for cereal and dairy ranged from 0.74 for high-income group to 2.54 for low-income group households, while difference between elasticity for cereals and eggs, fish and meat for the two groups are 0.71 and 1.14, respectively in rural households. This again illustrates that low income consumers in rural areas are more willing to change their consumption patterns as income changes.

Table 12. Expenditure shares and expenditure elasticity of food sub-categories in rural households

	Low income	Middle income	High income	All classes	Low income	Middle income	High income	All classes
	Budget shares (%)				Elasticity			
Cereals	43.0	34.3	24.1	30.7	0.47	0.30	0.14	0.25
Milk & milk products	6.2	12.1	19.7	14.9	3.01	1.93	0.88	1.57
Egg, fish & meat	4.7	6.0	7.6	6.5	1.61	1.23	0.85	1.10
Fruits & Vegetables	14.9	14.6	14.6	14.6	0.90	0.77	0.64	0.72
Vegetables	13.7	12.7	10.9	12.0	0.81	0.60	0.39	0.53
Fruits	1.2	1.9	3.7	2.6	2.15	1.75	1.36	1.62
Total Food	60.9	57.8	44.1	52.3	1.00	0.80	0.61	0.74

Source: Computed from NSS Report No. 530: Household Consumer Expenditure in India, 2007-08

The elasticities decline as income increases for nearly every food category in urban areas (Table 13). For example, elasticity of high-value products (milk and milk products, eggs, fish and meat, and fruits) is relatively high for low-income urban households (milk and milk products (1.77), eggs, fish and meat (1.19) and fruits (1.69) but declines to 0.54, 0.38 and 1.02 for high-income urban households, respectively. The elasticity for cereals which account for most calories consumed by Indians – are very low at all income levels, although they show a tendency to decrease from 0.38 for low-income households to 0.16 at high income levels. Demand for livestock products (meat and dairy products) is strongly related to income at low income levels, but the relationship weakens as income grows. The elasticities for milk and milk products and fruits exceed those of eggs, meat and fish mainly due to large vegetarian population. The elasticities for all products for urban households are lower than rural households.

Table 13. Expenditure shares and expenditure elasticity of food sub-categories in urban households

	Low income	Middle income	High income	All classes	Low income	Middle income	High income	All classes
	Budget shares (%)				Elasticity			
Cereals	33.1	25.1	16.3	22.4	0.38	0.25	0.16	0.22
Milk & milk products	11.4	17.6	20.8	18.3	1.77	1.07	0.54	0.55
Egg, fish & meat	6.4	7.2	6.5	6.8	1.19	0.72	0.38	0.88
Fruits & Vegetables	14.7	15.1	15.5	15.2	0.88	0.60	0.57	0.65
Vegetables	12.7	11.9	9.6	11.0	0.78	0.52	0.33	0.44
Fruits	2.0	3.2	5.9	4.2	1.69	1.30	1.02	1.19
Total Food	56.4	47.6	30.4	39.5	0.81	0.66	0.56	0.62

Source: Computed from NSS Report No. 530: Household Consumer Expenditure in India, 2007-08

The results clearly show that consumers' demand for items like dairy products, eggs, meat and fish and fruits and vegetables is much more responsive to income increases than is demand by consumers with higher income in both rural and urban areas. While a growing segment of high-income consumers can pay higher prices for food commodities/products, many low-income consumers may be adversely affected by increased food prices. The increased demand for high-value products will continue to be an important driver for food markets in India, creating many opportunities to producers and processors but recent increase in food prices especially high-value products such as fruits and vegetables and livestock products might have adverse impact on its growth. The households with low incomes are highly price sensitive in food purchase decisions and may be adversely affected by increased food prices.

Section 4: Growth in Fresh Fruits and Vegetables in India

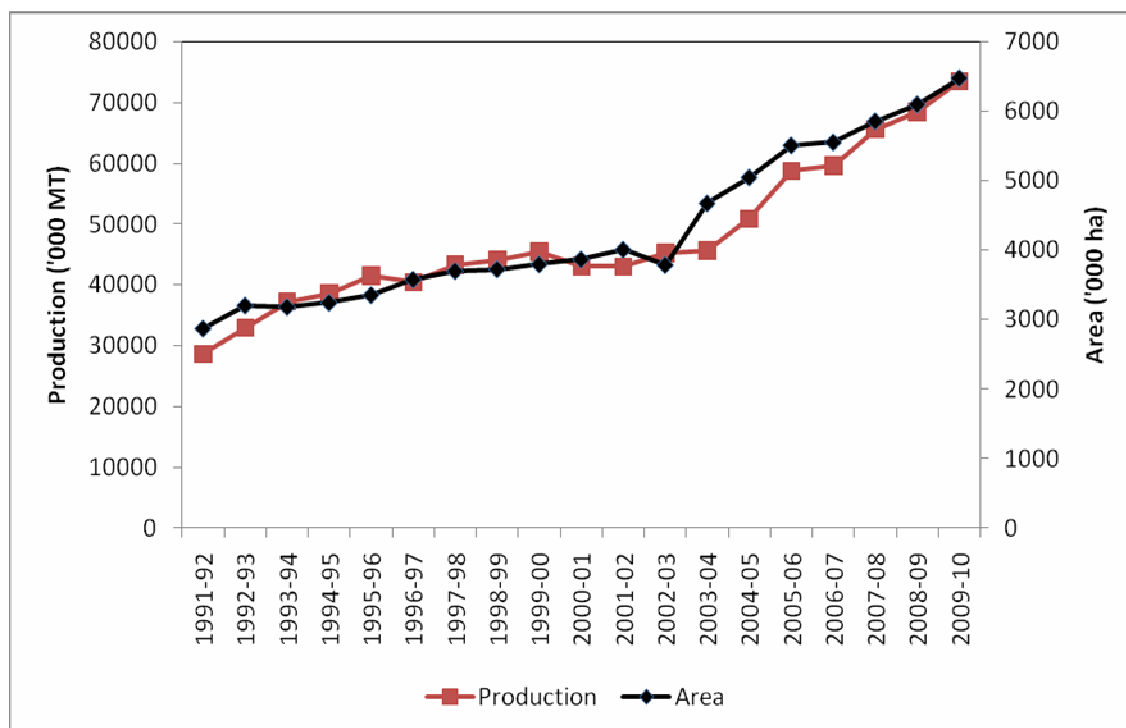
Of the available 194 million hectares of available land for agriculture (total cropped area), the area under fruits and vegetables is about 8 percent. Given the abundance of natural resources like soils and moderate climate, India is capable of producing wide variety of fruits (the tropical and sub-tropical, or even temperate fruits) and vegetables. India is the second largest producer of the fruits and vegetables in the world after China. The area under fruits and vegetables has increased from about 8.5 million hectares in 1991-92 to 14.7 million hectares in 2009-10, while production has increased from about 87 million tonnes to nearly 210 million tonnes. The per capita consumption of fruits and vegetables has also increased during the last two decades. Since the 1980s the international trade in fruits and vegetables has expanded rapidly. Several researchers (Joshi, et. al. 2006, Chand, et. al. 2007, Gulati, 2007, Birthal, et. al. 2008, Chand, et. al. 2008) have examined issue related to diversification of agriculture and progress and potential of horticulture in the country. This section gives a brief account of fruits and vegetables economy of India. This is examined in terms of the area, production and productivity of major fruits and vegetables at the national level as well as in various states.

4.1 Temporal and Spatial Changes in Production and Trade in Fresh Fruits

Production of fresh fruits has shown an impressive growth in the country. The estimated production of fruits during 2010-11 was about 75.8 million tonnes. The trends in area and production of fruits in India are presented in Figure 7. The area under fruits has increased from about 3 million hectares in the TE1993-94 to about 6.2 million hectares in TE2009-10, while production has more than doubled from 32.9 million tonnes to about 69 million tonnes during the same period. The compound annual growth rate in area under fruits increased from 3.1 percent in 1990s to 4.4 percent during the 2000s, whereas production grew at much faster rate of 7.4% in 2000s compared with 4.4% in 1990s (Table 14). However, variability in area and production of fruits was higher in 2000s than 1990s. It is interesting to note that area expansion has been a major contributor to increased production. The productivity of fruits increased from about 10.6 tonnes per hectare in TE 1993-94 to 11.3 tonnes in TE 2009-10. The growth rate in fruit productivity decelerated from 1.2 percent in 1990s to 0.6 percent in 2000s. Slow growth in productivity is a cause of

concern and needs to be addressed through appropriate technological, institutional and economic policies.

Figure 7. Trends in area and production of fruits in India: 1991-92 to 2009-10



Source: Indian Horticulture Database, National Horticulture Board, Ministry of Agriculture, Govt. of India, Gurgaon.

The principal types of fruits which are produced in significant volumes are bananas, mango, citrus oranges and other citrus fruits, papaya, guava and apple (Figure 8). In volume terms, domestic production is dominated by banana (36.9%), mangoes (20.1), followed by citrus (12.4%), papayas (4.9%), guava (3.2%) and apple (3%). Overall, production growth has experienced about 4.2 percent growth per annum over the last two decades.

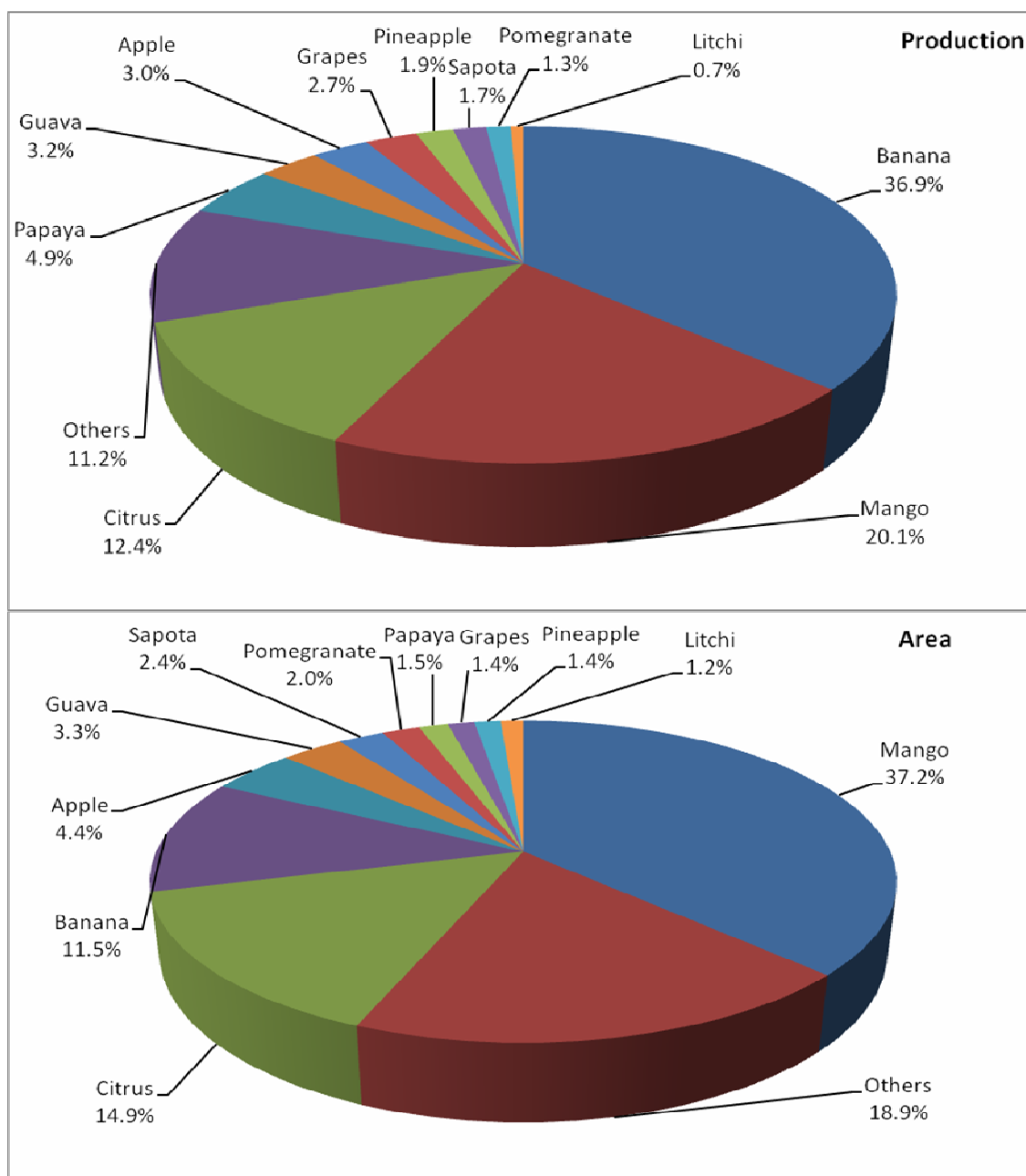
Figure 14. Trends in growth rate and variability in area, production and yield of fruits in India

	Compound annual growth rate (%)			Coefficient of variation (%)		
	Area	Production	Yield	Area	Production	Yield
1990s	3.1	4.4	1.2	9.5	13.5	6.7
2000s	6.7	7.4	0.6	17.6	19.6	6.1
All period	4.4	4.2	-0.2	26.1	25.4	6.8

Source: Computed from Indian Horticulture Database, National Horticulture Board, Ministry of Agriculture, Govt. of India, Gurgaon.

In terms of area, mango occupies the first position accounting for 37.2 percent of total area under fruits in the TE 2009-10, followed by citrus fruits (14.9%), banana (11.5%), apple (4.4%) and guava (3.3%). Other fruits such as sapota, pomegranate, papaya, grapes, pineapple and litchi occupy about 10 percent of area. Overall, area under fruits has increased at an annual compound growth rate of 4.2 percent during the last two decades.

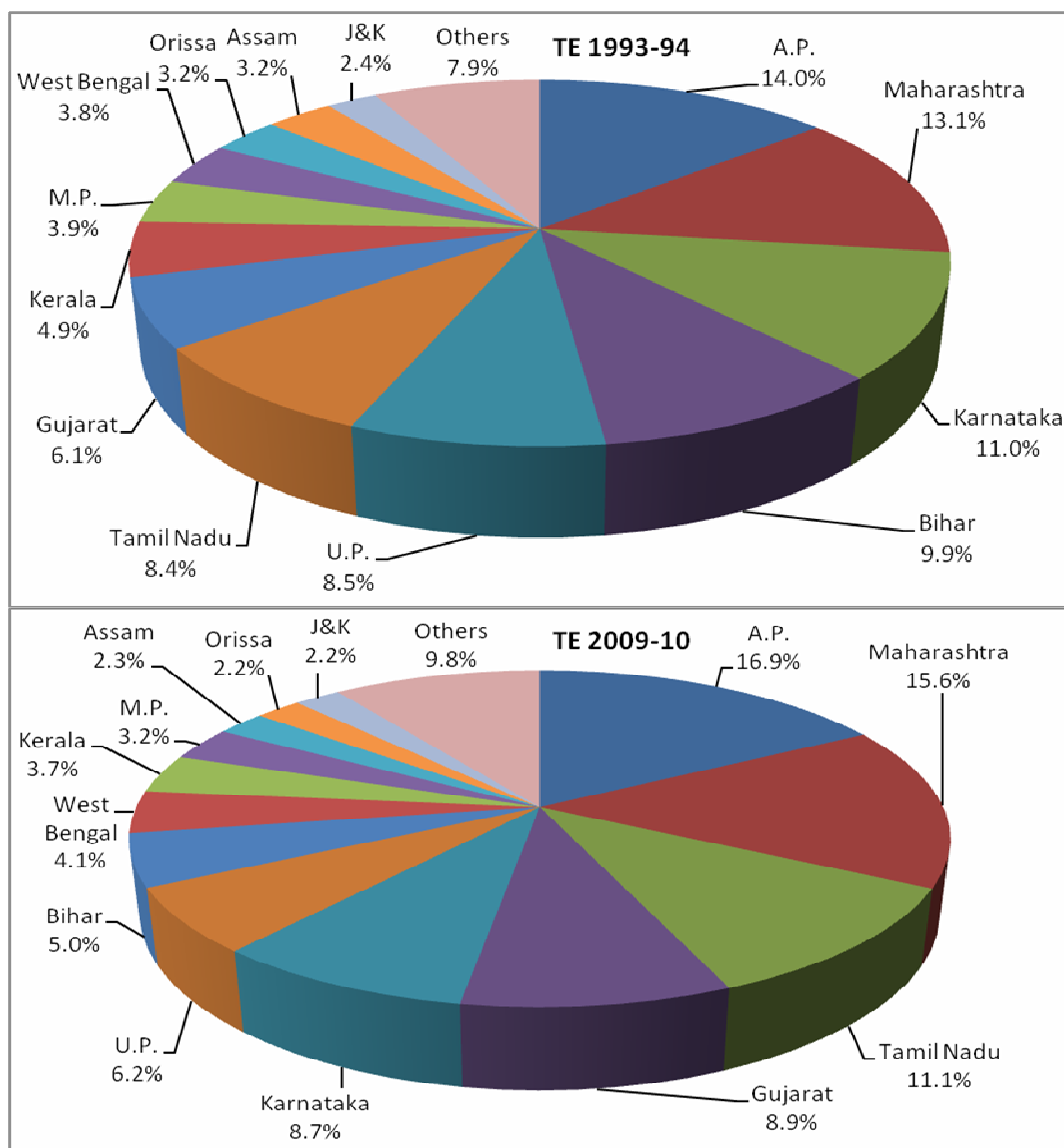
Figure 8. Area and production shares of major fruits in India in TE 2009-10



Source: Indian Horticulture Database, National Horticulture Board, Ministry of Agriculture, Govt. of India, Gurgaon.

Andhra Pradesh is the largest producer of fruits in India with an estimated share of 16.9 percent in TE2009-10, followed by Maharashtra (15.6%), Tamil Nadu (11.1%), Gujarat (8.8%) and Karnataka (8.7%). Other important fruit producing states are Uttar Pradesh, Bihar, West Bengal, Kerala and Madhya Pradesh.

Figure 9. Production of fruits in India by states (percent, TE 1993-94 and 2009-10)



Source: Indian Horticulture Database, National Horticulture Board, Ministry of Agriculture, Govt. of India, Gurgaon.

Banana is the most widely grown fruit in India with estimated production of about 25.5 million tonnes in TE2009-10 from an area of 712 thousand hectares. Tamil Nadu is the largest producer with a production share of 23.2 percent followed by Maharashtra (19.8%), Gujarat (13.7%) and Andhra Pradesh (10.8%). Other important banana growing States are

Karnataka, Bihar, Madhya Pradesh, West Bengal and Assam, each contributing more than 3 percent to national banana production (Table 15). Mango occupies second position amongst the fruit crops in terms of production. The total production of mango in the country in TE2009-10 was about 13.9 million tones from an area of 2.27 million hectares. Andhra Pradesh is the largest grower of mangoes with a production share of 25.7 percent. The other main mango producing states are Uttar Pradesh (24.9%), Karnataka (10.1%), Bihar (7.7%), Tamil Nadu (5.3%) and Gujarat 5.0%). Citrus fruits occupy third position amongst the fruit crops in terms of production. The total production of citrus in the country in TE2009-10 was about 8.8 million tones from an area of 926 thousand ha. Andhra Pradesh is the largest grower of citrus with a production share of (42.4%), followed by Maharashtra (18.1%), Punjab (9.6%) and Madhya Pradesh (7.2%). These four states account for more than 70 percent of national production of citrus fruits. Papaya is the fourth largest fruit crop in the country. The production of papaya in the year TE2009-10 was about 3.5 million tonnes from an area 92 thousand ha. Andhra Pradesh is the largest producer (40.9%) of papaya followed by Gujarat (19.6%), Karnataka (11.7%), and West Bengal (9.6%). Jharkhand is the main producer of guava in the country accounting for about 30 percent of total production. The other main guava growing states are Uttar Pradesh, Maharashtra, Bihar, West Bengal, Punjab, Madhya Pradesh, Andhra Pradesh and Gujarat. Apple, a temperate fruit, is grown in Jammu & Kashmir and Uttarakhand and these three states account for more than 99 percent of production. The other important fruit crops grown in the country are grapes, pineapple, sapota, pomegranate, and litchi and production shares of major producers are given in Table 15.

Table 15. Leading fruit producing States in India: TE2009-10

Fruit	Major Producers
Banana	Tamil Nadu (23.2%), Maharashtra (19.8%), Gujarat (13.7%), Andhra Pradesh (10.8%), Karnataka (7.6%), Bihar (5.4%), Madhya Pradesh (4.6%), West Bengal (3.7%), Assam (3.4%), Kerala (1.8%),
Mango	U.P. (24.9%), Andhra Pradesh (25.7%), Karnataka (10.1%), Bihar (7.7%), Tamil Nadu (5.3%), Gujarat (5.0%), Maharashtra (4.8%), West Bengal (4.2%), Orissa (3.1%), Kerala (3.0%)
Citrus	Andhra Pradesh (42.4%). Maharashtra (18.1%), Punjab (9.6%), Madhya Pradesh (7.2%), Gujarat (4.1%), Rajasthan (3.3%), Karnataka (3.0%), Orissa (2.6%), Bihar (2.4%), Assam (2.2%)

Papaya	Andhra Pradesh (40.9%), Gujarat (19.6%), Karnataka (11.7%), West Bengal (9.0%), Chhattisgarh (4.7%), Assam (3.6%), Madhya Pradesh (2.6%), Tamil Nadu (2.0%)
Guava	Jharkhand (30.0%), Uttar Pradesh (16.4%), Maharashtra 11.2%), Bihar (10.5%), West Bengal (7.5%), Punjab (7.1%), M.P. (5.6%), Gujarat (6.9%), Andhra Pradesh (6.7%), Karnataka (6.0%), Tamil Nadu (4.2%), Orissa (3.2%)
Apple	Jammu & Kashmir (69.0%), Himachal Pradesh (24.0%), Uttarakhand (6.5%)
Grapes	Maharashtra (70.0%), Karnataka (18.8%), Tamil Nadu (4.9%), Andhra Pradesh (3.3%), Punjab (1.4%)
Pineapple	West Bengal (21.7%), Assam (16.2%), Karnataka (13.6%), Bihar (9.3%), Tripura (8.4%), Meghalaya (7.7%), Kerala (7.2%), Manipur (6.4%), Nagaland (3.7%)
Sapota	Karnataka (24.1%), Maharashtra (22.8%), Gujarat (20.1%), Andhra Pradesh (14.4%), West Bengal (3.1%)
Pomegranate	Maharashtra (67.8%), Karnataka (16.4%), Andhra Pradesh (8.2%), Gujarat (5.6%)
Litchi	Bihar (49.4%), West Bengal (18.2%), Jharkhand (6.6%), Assam (8.2%), Punjab (4.7%)

Source: NHB (2011)

Temporal changes in area, production and yield of fruits in major producing states in the country are presented in Table 16. Out of 20 major fruit producing states and North-eastern States, Bihar and Kerala recorded decline in area under fruits while all other states increased area under fruit crops between TE 1999-00 and TE 2009-10. In case of production, all states except Karnataka witnessed an increase in fruits production. However, some important states like Maharashtra, Karnataka, Orissa, Punjab and North-eastern states has decline in crop yield. The increase in fruits production during the last 10 years is mainly the result of area expansion and contribution of yield has been very marginal. The highest increase in production between TE 1999-00 and 2009-10 was observed in Gujarat (2.7 times), followed by Andhra Pradesh (2.3 times), Tamil Nadu (2.1 times), Himachal Pradesh (2 times), and West Bengal (2 times) and contribution of yield has been significant in increased production.

Table 16. Changes in area, production and yield of fruits in Major states of India

	TE 1999-00			TE 2009-10		
	Area	Production	Yield	Area	Production	Yield
Andhra Pradesh	579	5221	9	730	12180	16.7
Assam	108	1239	11.5	107	1484	13.9
Bihar+Jharkhand	127	3808	30.1	113	3913	34.6
Gujarat	136	2312	17	169	6155	36.4
Haryana	13	194	15.5	14	269	19.2
Himachal Pradesh	58	280	4.9	77	573	7.4
J&K	51	983	19.5	70	1494	21.3
Karnataka	199	5450	27.4	295	5371	18.2
Kerala	391	1544	4	363	2512	6.9
M.P. + Chhatisgarh	66	1365	20.8	84	2158	25.7
Maharashtra	410	7561	18.5	711	10790	15.2
NE States excluding Assam	55	1059	19.4	84	1565	18.6
Orissa	250	1512	6.1	295	1551	5.3
Punjab	40	814	20.6	61	1201	19.7
Rajasthan	19	278	14.6	26	528	20.3
Tamil Nadu	308	3684	12	386	7704	20
Uttar Pradesh	320	4293	13.4	323	4584	14.2
West Bengal	148	1374	9.3	205	2801	13.7

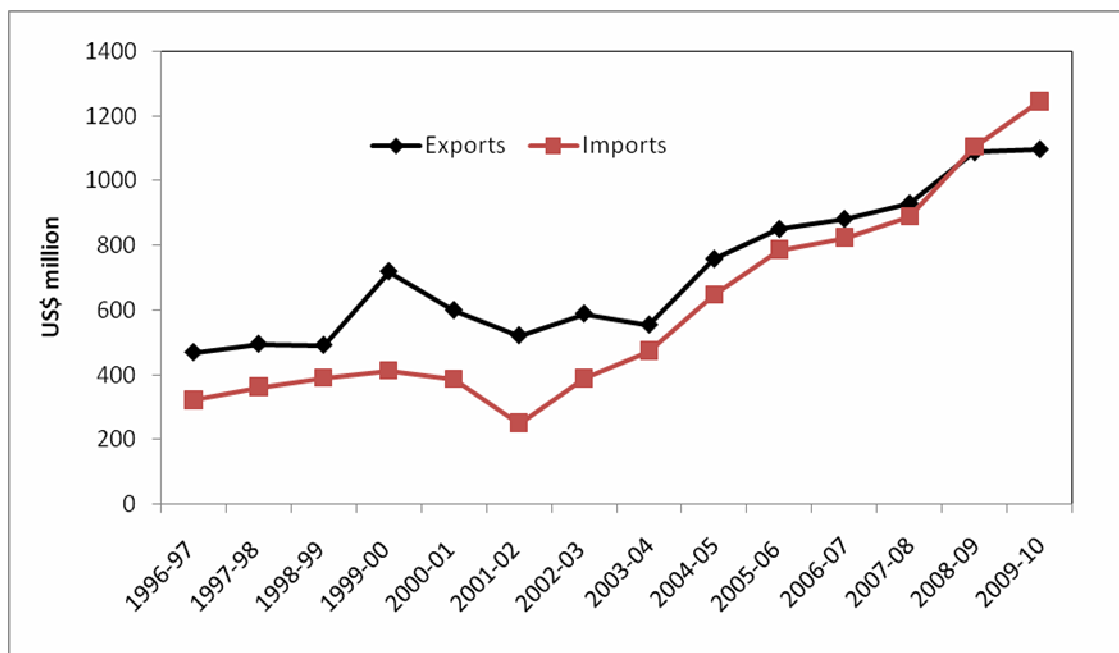
Source: Indian Horticulture Database, National Horticulture Board, Ministry of Agriculture, Govt. of India, Gurgaon.

4.2 Trade in Fruits in India

Fresh fruit exports represent overall a very small share of domestic production (0.69%) and agricultural exports. The trends in exports and imports of edible fruits and nuts in India are presented in Figure 9. The exports of edible fruits and nuts (Chapter No 08) has increased at an annual compound growth rate of 6.7 percent from US\$485 million in TE 1998-99 to US\$ 1037.7 million in TE 2009-10. The growth rate in exports of edible fruits and nuts has been much lower than India's total exports growth rate of 16.5 percent during the period from 1996-97 to 2009-10. Despite great potential for export of fresh fruits from India, exports have not increased significantly in the post-reforms period. India also imports edible fruits and nuts. The imports have increased faster than exports, from US\$388 million in TE 1998-99 to US\$ 1081 million in TE 2009-10, at an annual compound growth rate of 11.3 percent. Among all major fruits and nuts imported, share of coconuts, Brazil nuts and cashew nuts is

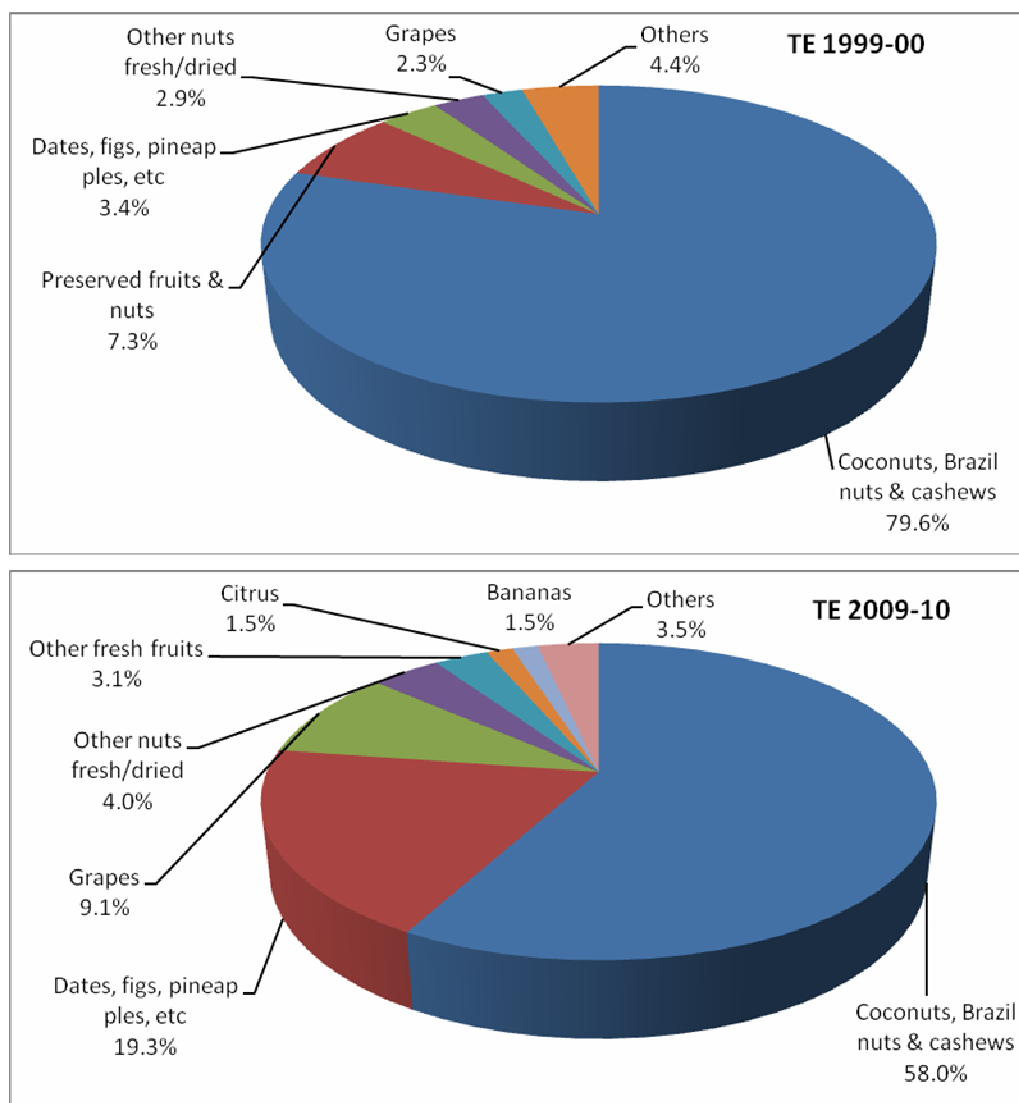
the highest (51%), followed by other nuts and dates, figs and pineapples. The imports of fresh apples, pears and quinces have increased from 0.2 percent to 7.4 percent between TE 1999-00 and TE 2009-10.

Figure 9. Trends in exports and imports of edible fruits and nuts in India



Source: Export Import Data Bank Version 6.0 – TRADESTAT, Department of Commerce, Ministry of Commerce and Industry, Govt. of India, data accessed from <http://commerce.nic.in/eidb/default.asp>, March 2011

Among all major fruits exported share of coconuts, Brazil nuts and cashew nuts is the highest (58%) in the TE 2009-10, however the share has declined between TE 1999-00 and 2009-10 (Figure). Other major fruits exported include dates, figs, pineapples, guava (19.3%), grapes (9%) and citrus and bananas (1.5% each). The share of share of grapes and dates, figs and pineapples, etc. has increased significantly while share of coconut, Brazil nuts and cashews has declined.

Figure 10. Export shares of major fruits in total exports of edible fruits and nuts in India

Source: Export Import Data Bank Version 6.0 – TRADESTAT, Department of Commerce, Ministry of Commerce and Industry, Govt. of India, data accessed from http://commerce.nic.in/eidb/default.asp_in March 2011

4.3 Growth Trends in Major Fresh Vegetables in India

In case of vegetables, while remaining modest, production growth in 2000s is slightly better (6.4%) than 1990s (5.2%) with average per annum growth of 4.5 percent over the period since 1991-92 (Table 17). The area under vegetables has increased from 5.17 million hectares in TE 1993-94 to over 8 million hectares in TE 2009-10 while production has increased from 62.7 million tonnes to over 131 million tonnes during the same period (Figure 11). The estimated production of vegetable in the year 2010-11 is expected to be 141.35 million tonnes. The average yield per hectares has increased from 12.2 tonnes to 16.4

tonnes. Productivity growth is better than fruits productivity with average per annum growth of 1.7 percent since 1991-92. Over the past two decades, production gains have come about with expansion in area and yield increases have also contributed to increased vegetable production in the country unlike fruits where contribution of yield has been negligible.

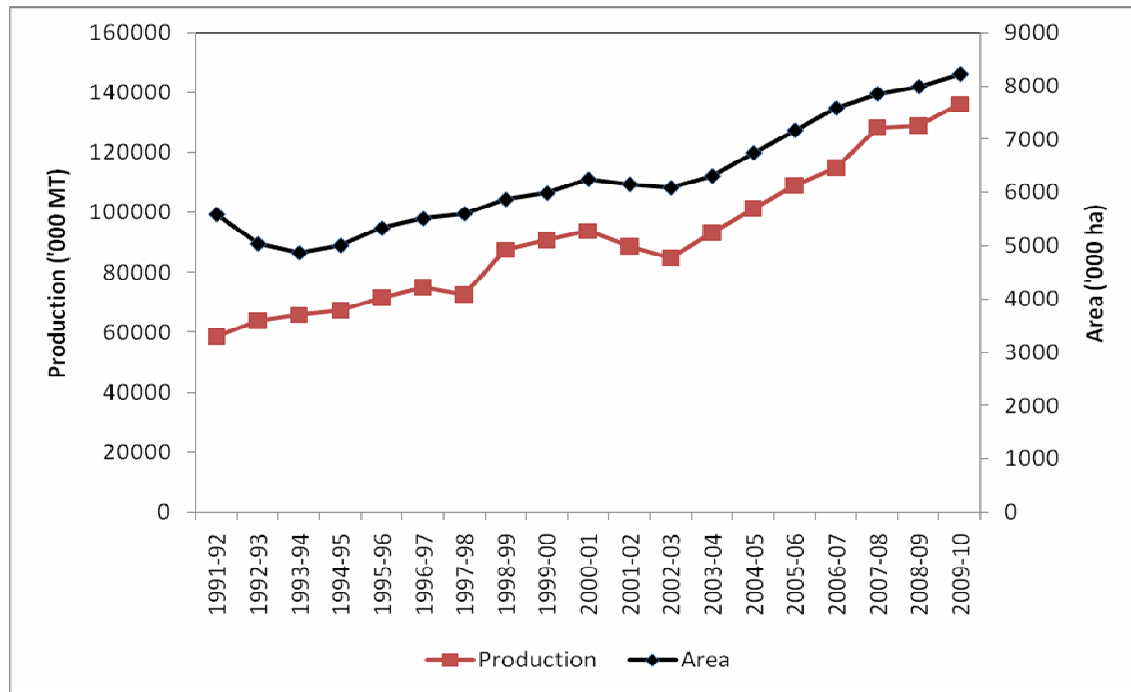
The major vegetables produced mainly for domestic consumption in India are potato, onion, tomatoes, brinjal, tapioca, cabbage, cauliflower, okra and peas (Figure 12). Potato is most widely grown vegetable crop in India and has the largest share (25.3%) in total vegetable production in India, followed by onion (10.2%), tomatoes (8.6%) and brinjal (7.6%). Potato, onions, tomatoes, brinjal and okra account for more than half of area under vegetable cultivation in the country.

Table 17. Trends in growth rate and variability in area, production and yield of vegetables in India

	Compound annual growth rate (%)			Coefficient of variation (%)		
	Area	Production	Yield	Area	Production	Yield
1990s	2.1	5.2	3.0	8.2	16.2	10.2
2000s	4.3	6.4	2.1	11.6	17.3	6.0
All period	2.8	4.5	1.7	16.6	25.7	10.3

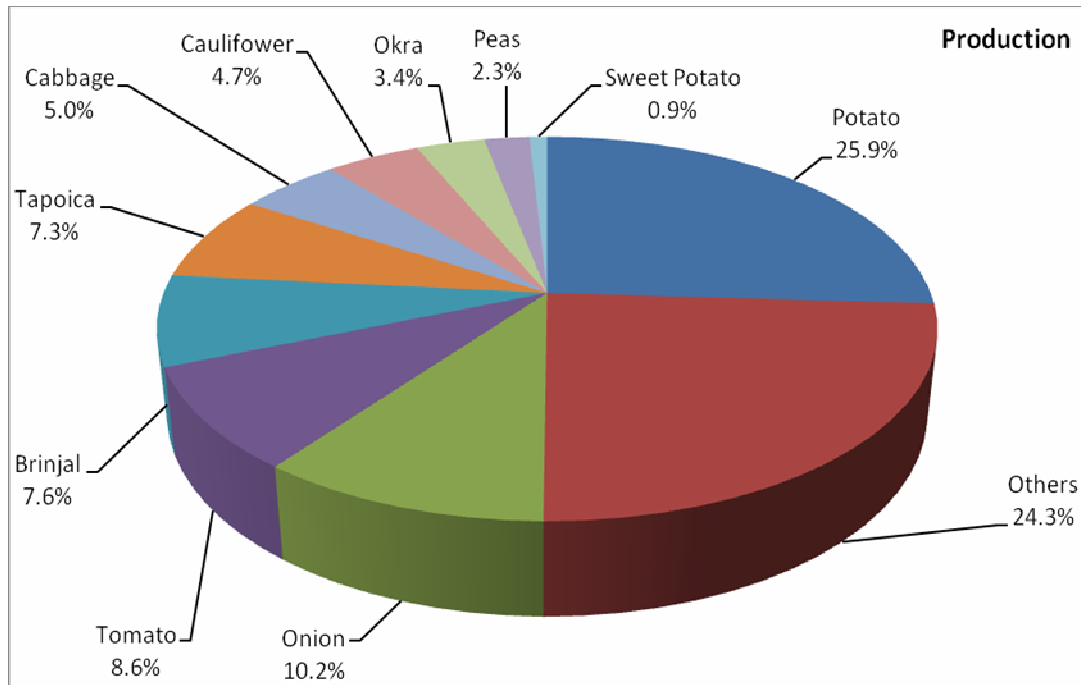
Source: Computed from Indian Horticulture Database, National Horticulture Board, Ministry of Agriculture, Govt. of India, Gurgaon

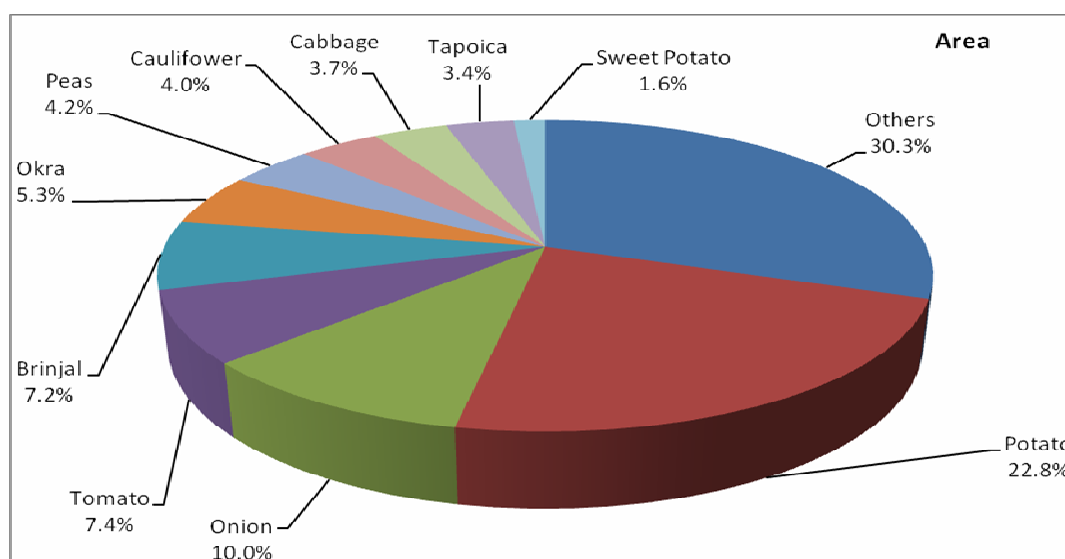
Figure 11. Trends in area and production of vegetable crops in India



Source: Indian Horticulture Database, National Horticulture Board, Ministry of Agriculture, Govt. of India, Gurgaon.

Figure 12. Area and production shares of major vegetables in India in TE 2009-10

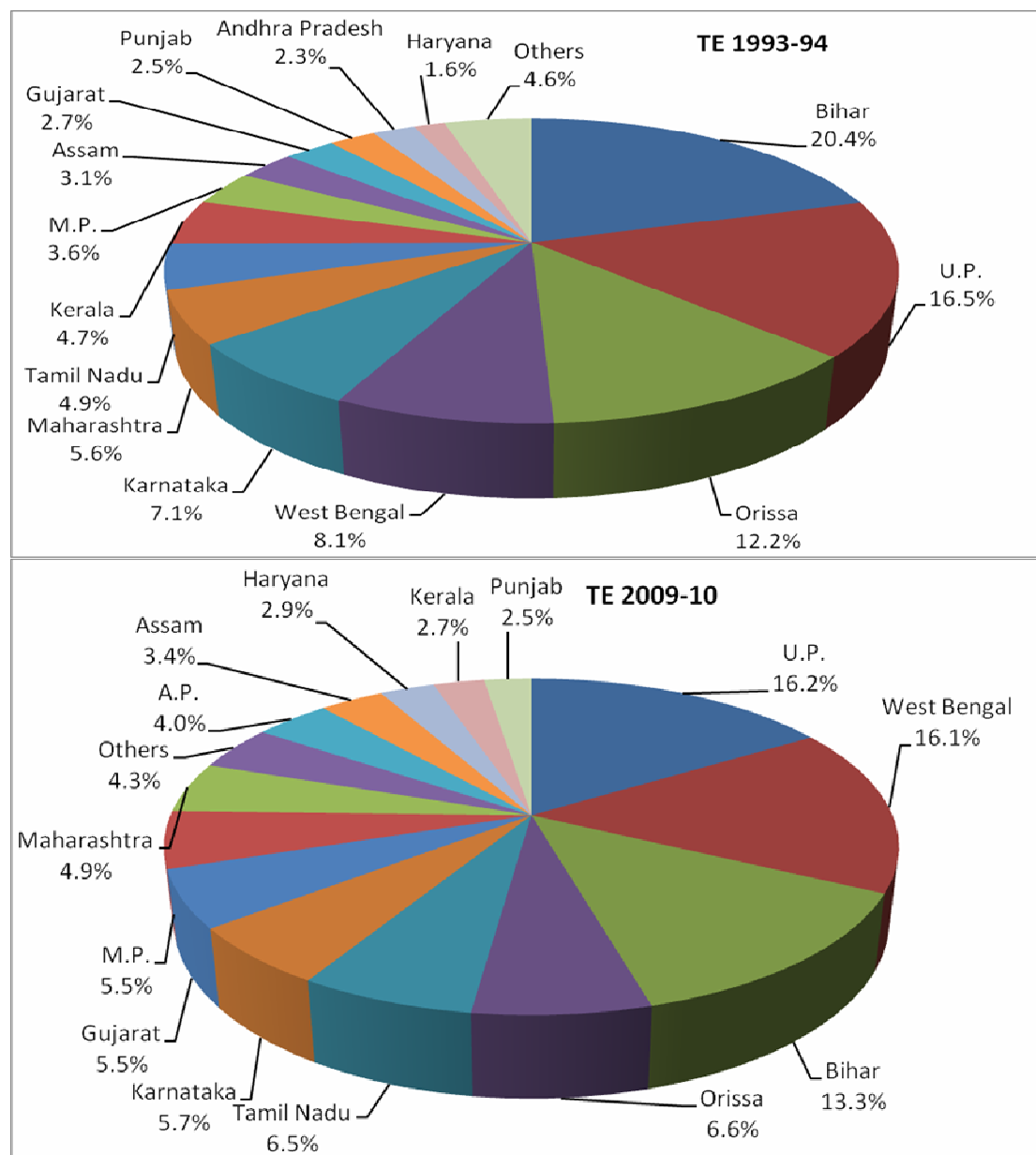




Source: Indian Horticulture Database, National Horticulture Board, Ministry of Agriculture, Govt. of India, Gurgaon.

Production share shifts of major vegetable producing states between TE 1993-94 and 2009-10 are given in Figure 13. Uttar Pradesh (including Uttarakhand) was the largest producer of vegetables in India with estimated share of 16.2 percent in national production in the TE 2009-10, followed by West Bengal (16.1%), Bihar (including Jharkhand) 10.7 percent Orissa (6.6%), Tamil Nadu (6.5%), Karnataka (5.7%), Gujarat (5.5%). Other important vegetable producers are Madhya Pradesh, Maharashtra, Assam, Andhra Pradesh, Haryana, Kerala and Punjab. Between TE 1993-94 and TE 2009-10, Bihar lost its share from 20.4 percent to 13.3 percent while share of Orissa fell from 12.2 to 6.6 percent. Major gainers were, West Bengal, Gujarat, Tamil Nadu, Andhra Pradesh and Assam.

Potato is most widely grown vegetable in the country both in terms of acreage and production. The total production of potato in the country in TE2009-10 was 35.2 million tonnes. Uttar Pradesh is a leading potato growing states in the country with a production share of 33.4 percent, followed by West Bengal (27.1%) and Bihar (15.6%). Top five producers account for more than 80 percent of total production in the country (Table 18). Onion occupies second position amongst the vegetable crops in terms of production. The total production of onion in the country in TE2009-10 was more than 13.2 million tonnes from an area of about 804 thousand hectares. Maharashtra is the largest grower of tomato with a production share of 28 percent. The other main onion growing states are Karnataka (20.7%), Gujarat (11.9%) and Bihar (7.4%).

Figure 13. Production of vegetables in India by states (percent, TE 1993-94 and 2009-10)

Source: Indian Horticulture Database, National Horticulture Board, Ministry of Agriculture, Govt. of India, Gurgaon.

Tomato occupies third position amongst the vegetable crops in terms of production. The total production of tomato in the country in TE2009-10 was about 11.3 million tones from an area of about 600 thousand ha. Karnataka is the largest grower of tomato with a production of 1.5 million tonnes. The other main tomato growing states are Andhra Pradesh, Orissa, Bihar, West Bengal and Maharashtra accounting for 13.2, 12.1, 8.9, 8.9 and 7.6 percent share, respectively.

Table 18. Leading producers of major vegetable crops in India: TE2009-10

Vegetables	Major Producers
Potato	Uttar Pradesh (33.4%), West Bengal (27.1%), Bihar (15.6%), Punjab (5.3%), Gujarat (4.4%), Madhya Pradesh (2.0%), Assam (1.7%)
Onion	Maharashtra (28.0%), Karnataka (20.7%), Gujarat (11.9%), Bihar (7.4%), Madhya Pradesh (6.3%), Rajasthan (3.8%), Andhra Pradesh (4.9%), Tamil Nadu (2.3%), Haryana (2.6%), Uttar Pradesh (2.6%), Orissa (2.1%), West Bengal (2.1%), Jharkhand (2.0%)
Tomato	Karnataka (13.7%), Andhra Pradesh (13.2%), Orissa (12.1%), Bihar (8.9%), West Bengal (8.9%), Maharashtra (7.6%), Gujarat (6.9%), Chhattisgarh (4.2%), Madhya Pradesh (3.2%), Jharkhand (3.6%), Tamil Nadu (3.4%), Himachal Pradesh (3.1%), Haryana (2.7%), Uttar Pradesh (2.4%)
Brinjal	West Bengal (27.1%), Orissa (19.7%), Bihar (11.6%), Gujarat (10.4%), Andhra - Pradesh (5.1%), Maharashtra (4.7%), Chhattisgarh (3.5%), Karnataka (3.6%), Madhya Pradesh (2.6%)
Okra	West Bengal (18.1%), Bihar (16.4%), Orissa (14.2%), Andhra Pradesh (10.2 %), Gujarat (9.2%), Jharkhand (8.6%), Chhattisgarh (4.6%), Maharashtra (3.7%), Uttar Pradesh (2.6%), Haryana (2.6%)
Peas	Uttar Pradesh (51.3%), Madhya Pradesh (8.5%), Jharkhand (6.3%), Himachal Pradesh (7.6%), West Bengal (4.4%), Punjab (4.0%), Chhattisgarh (2.2%), Uttarakhand (2.5%), Haryana (2.7%), Bihar (2.2%), Jammu & Kashmir (2.0%),
Cauliflower	West Bengal (27.4%), Bihar (16.7%)' Orissa (10.5%), Haryana (7.1%), Jharkhand (5.8%), Gujarat (5.3%), Chhatisgarh (4.0%), Madhya Pradesh (2.8%), Punjab (2.8%), Uttar Pradesh (2.7%), Delhi (1.9%)
Cabbage	West Bengal (30.5%), Orissa (14.5%), Bihar (10.0%), Gujarat (6.4%), Jharkhand (4.3%), Chhattisgarh (3.1%), Haryana (2.9%), Karnataka (2.6%), Madhya Pradesh (2.1%), Himachal Pradesh (2.0%), Andhra Pradesh (2.0%), Tamil Nadu (1.0%)
Tapioca	Tamil Nadu (66.9%), Kerala (28.2%), Andhra Pradesh (3.9%)
Sweet Potato	Orissa (38.1%), Uttar Pradesh (23.0%), West Bengal (21.1%), Karnataka (3.0%), Assam (2.9%), Madhya Pradesh (2.3%), Chhattisgarh (2.0%)

Source: NHB (2011)

Brinjal is the fourth largest vegetable crop in the country. The production of brinjal in the year TE2009-10 was about 10.2 million tones from an area 591 thousand ha. West Bengal is the largest producer (27.1%) of brinjal followed by Orissa (19.7%), and Bihar (11.6%). The other main states growing brinjal are Gujarat, Andhra Pradesh, Maharashtra, Chhatisgarh and Karnataka. The other important vegetable crops grown in the country are okra, peas,

cauliflower, cabbage, tapioca, sweet potato, beans, pumpkin, bottlegourd, cucumber, carrot, radish, etc. The share of major producers of okra, peas, cauliflower, cabbage, tapioca and sweet potato are given in Table. .

Changes in area, production and yield of vegetable crops in different states are presented in Table 19. It is evident from the table that between TE 1999-00 and 2009-10, all states experienced significant increase in production of vegetables. The vegetable production in Gujarat more than doubled during this period while other states like Rajasthan, Himachal Pradesh, Andhra Pradesh, Jammu & Kashmir, Haryana, Bihar and Madhya Pradesh witnessed more than 50 percent increase in production. It is also interesting to note that majority of the States recorded significant increase in productivity of vegetable crops and contribution of productivity to increased vegetable production has been much higher compared with area increases.

Table 19. Changes in area, production and yield of vegetables in Major states of India, TE 1999-00 and TE 2009-10

	TE 1999-00			TE 2009-10		
	Area	Production	Yield	Area	Production	Yield
Andhra Pradesh	229.3	2857.8	12.4	232.7	4856.5	20.9
Assam	181.3	2891.3	18.8	321.3	3946.8	12.3
Bihar + Jharkhand	388.3	10545.7	33.5	404.3	17246.0	42.7
Gujarat	154.7	2998.7	19.5	261.3	6757.5	25.9
Haryana	48.7	2146.0	44.1	55.0	3512.5	64.5
Himachal Pradesh	35.0	678.1	19.4	33.0	1188.4	36.0
Jammy & Kashmir	16.0	690.4	43.1	18.7	1169.9	62.8
Karnataka	251.0	5577.7	22.4	309.3	6856.8	22.1
Kerala	192.0	2643.3	13.8	158.0	3407.5	21.6
M.P. + Chhatisgarh	237.7	3817.7	16.2	311.0	6205.5	19.9
Maharashtra	308.3	5033.0	16.3	353.3	6323.6	18.0
Orissa	389.0	8210.8	23.3	577.0	8287.5	14.4
Punjab	111.7	2290.2	20.6	108.7	2900.2	49.3
Rajasthan	81.0	430.5	5.3	116.7	792.8	6.8
Tamil Nadu	211.7	5705.3	27.0	233.7	7913.2	34.0
U.P. + Uttarakhand	678.0	14842.1	21.9	795.3	20013.4	25.2
West Bengal	1124.7	17756.2	15.8	1311.3	20767.0	15.8
North-eastern states excluding Assam	141.0	1031.5	7.3	137.3	1113.9	8.6
Other smaller states & UTs	19.0	961.4	50.8	19.7	913.9	46.5

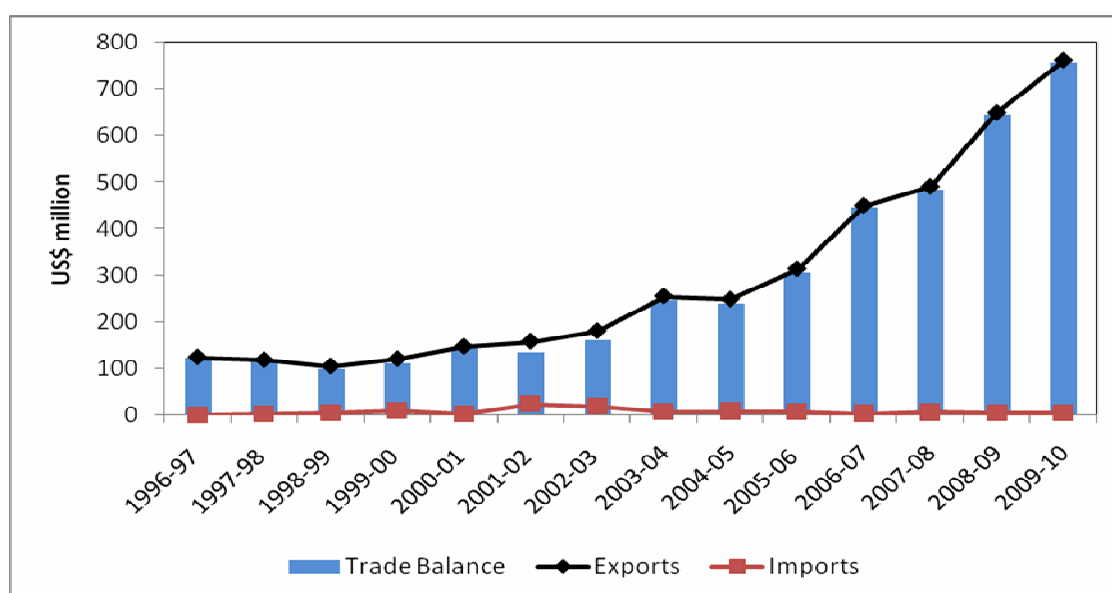
Source: Indian Horticulture Database, National Horticulture Board, Ministry of Agriculture, Govt. of India, Gurgaon.

4.4 Trade in Fresh Vegetables

Overall, fresh vegetable exports represent a very small share (1.69%) of annual total vegetable production in the country. Exports of vegetables (excluding pulses) have increased significantly at an annual compound growth rate of about 17 percent from US\$116 million in TE 1998-99 to US\$634 million in TE 2009-10. The total vegetable exports reached a record high of US\$ 761.9 million in 2009-10, largely due to a significant increase in the exports of onions (Figure 14). While there has been growth in fresh vegetable exports in the past decade, the trend has accelerated during the 2000s.

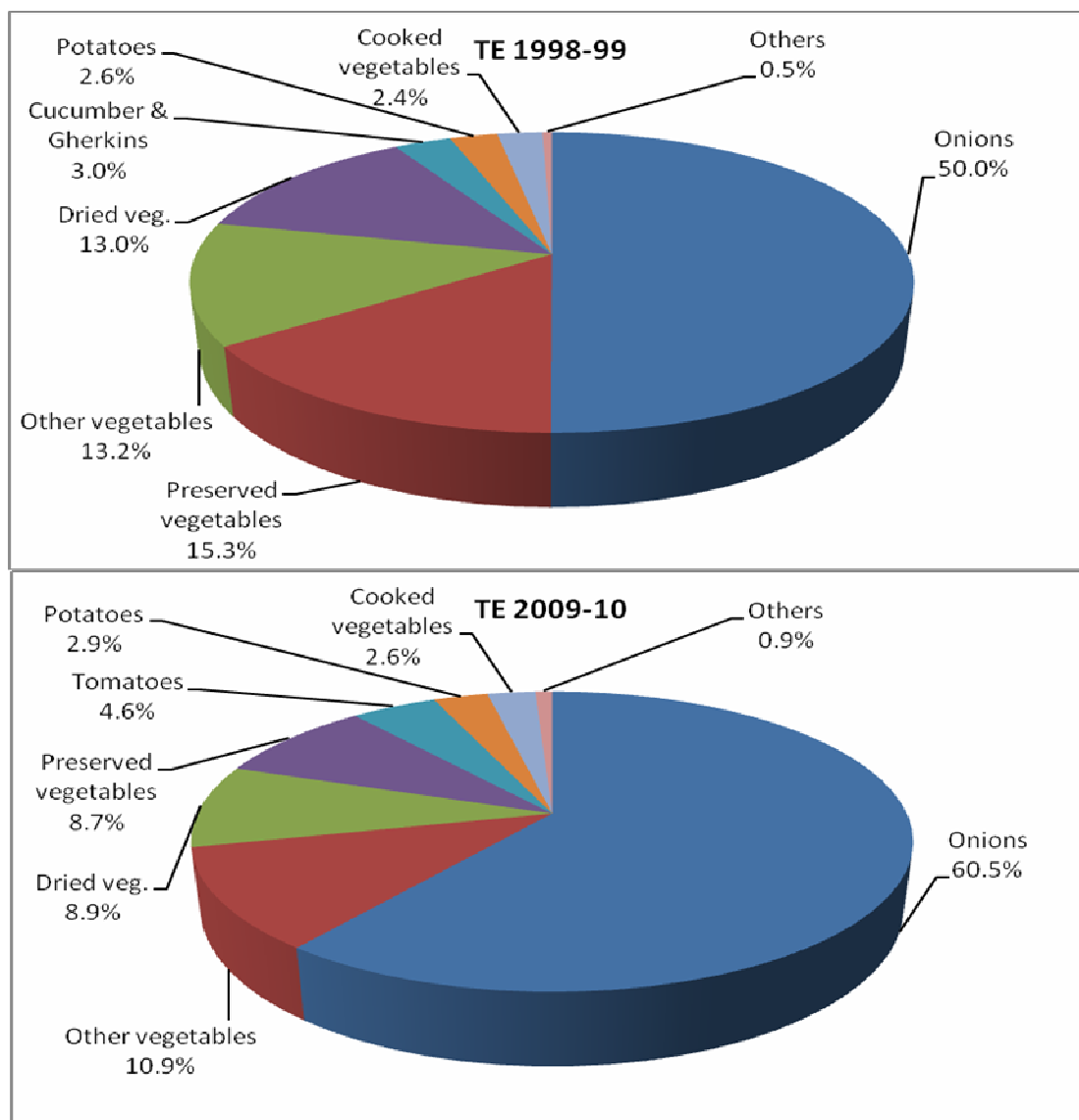
In terms of the product composition of exports, in 2009-10, onions accounted for 60.5 percent of total export values, followed by preserved vegetables (15.3%). During the last 10 years share of onions has increased from 50 percent to 60.5 percent and share of tomatoes has increased from 0.1 percent to 4.6 percent. The share of potatoes has remained more or less the same (<3%). Imports of vegetables are negligible compared with exports. However, as per Indian Trade Classification (HS), Chapter 7 (edible vegetables and certain roots and tubers) also includes Heading No. 0713, which includes data for imports of dried leguminous vegetables, shelled, whether or not skinned or split (pulses). In the present analysis we have excluded pulses to get an idea of export potential of fresh vegetables.

Figure 14. Trends in exports and imports of vegetables in India: 1996-97 to 2009-10



Source: Export Import Data Bank Version 6.0 – TRADESTAT, Department of Commerce, Ministry of Commerce and Industry, Govt. of India, data accessed from <http://commerce.nic.in/eidb/default.asp> in March 2011

Figure 15. Share of major vegetables in total exports of vegetables in India: TE 1998-99 and TE 2009-10



Source: Export Import Data Bank Version 6.0 – TRADESTAT, Department of Commerce, Ministry of Commerce and Industry, Govt. of India, data accessed from <http://commerce.nic.in/eidb/default.asp>, in March 2011

Despite the potential of high-value agriculture discussed in the earlier sections, the productivity and quality of most of high-value crops is much below the world average and post-harvest losses are quite high. The major factors contributing to low productivity and high losses include, old and unproductive fruit plantations, non-availability of appropriate planting material, poor post-harvest management, and non-integration of markets.

Section 5: Concluding Observations and Policy Implications

As the economy develops, high-value agriculture becomes increasingly important, both as a share in agricultural output and in the food basket. In the recent decades, there have been substantial changes in the patterns of production and consumption in India. One is the shift in production and consumption from foodgrains to high-value agricultural commodities such as fruits and vegetables, milk and milk products, meat, eggs, fish, and processed food products. Trade in high-value products is increasingly displacing exports of traditional commodities, such as rice, sugar, tea, coffee, tobacco, etc.

The findings reveal a structural shift in consumption pattern away from cereals to high-value agricultural commodities, both in rural and urban areas, in the last two decades between 1987-88 and 2007-08. This shift in dietary patterns across states and income classes is also observed. From the available evidence it appears that even poor households have tended to change their consumption pattern towards high-value products. The results reveal a relatively strong and growing demand for livestock products and fruits and vegetables in both the rural and urban areas. The expenditure on livestock products exceeded that of cereals in 2007-08 in the urban areas, while in rural areas it was lower than expenditure on cereals. Among the livestock products in the food expenditure, milk and milk products were much higher than eggs, fish and meat. The average expenditure as well as share of beverages has increased by about six times in both rural and urban areas. The results clearly show that food habits are changing in both rural and urban areas and demand for high value products including beverages and processed products has increased significantly.

Estimated income elasticities of demand for livestock products and fruits at the mean were well above one in rural areas and are much higher in low income households. In case of urban areas, the elasticity is higher than one for fruits in all income groups while in case of livestock products it is greater than one for low income households. For all income levels, households indicate comparatively lower income elasticities for staple products such as cereals than for high-value products such as milk and milk products, eggs, fish and meat, and fruits and vegetables in both rural and urban areas. However, the difference between the elasticities for the lower value staples and the high-value products are dramatically larger for low-income households than for the high-income households. It is evident that consumers' demand for items like dairy products, eggs, meat and fish and fruits and

vegetables is much more responsive to income increases than is demand by consumers with higher income in both rural and urban areas. The increased demand for high-value products will continue to be an important driver for food markets in India, creating many opportunities to producers and processors but recent increase in food prices especially high-value products might have adverse impact on its growth. The households with low incomes are highly price sensitive in food purchase decisions and may be adversely affected by increased food prices.

Due to shift in demand pattern towards high value crops, the farmers have also responded to market signals and gradually shifting production-mix to meet the growing demand for high-value commodities. This is reflected in the changing share of high value crops in total value of output from agriculture. There is a clear shift from foodgrains towards fruits and vegetables, livestock products and fisheries. The share of high-value commodities/products (fruits and vegetables, livestock products, fisheries) increased from 37.3 percent in TE 1983-84 to 41.3 percent in TE 1993-94 and reached a level of 47.4 percent in TE 2007-08. The trade in high-value products has also increased during the last decade. Overall, fresh fruits and vegetables exports represent a very small share of domestic production and agricultural exports but have increased significantly. During the 2000s, the growth rate in value of exports of rice, sugar, marine products, tea, etc. declined, while high-value exports (fruits and vegetables, floriculture, meat, processed fruit juices) grew by about 18 percent annually. However, Indian exports face many constraints in major importing countries on account of quality and food safety issues. Due to rising demand for high-value commodities, particularly fruits and vegetables is rising in the country, which has led to steep increase in imports of many commodities like fresh fruits. While there is an opportunity for increasing exports of high-value products but there is a huge and increasing domestic demand which could be tapped by improving productivity, quality and efficiency.

The overview provided in this study suggests that a future road map for high-value agriculture development should focus on investment in technology development and dissemination, basic infrastructure, improve the technical capacity of producers and other players in the value chain, institutional support in core functions of production, logistics and marketing through concerted public sector support and active public-private partnerships, and provision of inputs, in particular planting materials for fruits and seeds for vegetables.

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