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## Performance of Crop Sector in Gujarat during High Growth Period: Some Explorations<sup>§</sup>

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### Abstract

The share of agricultural sector in Gujarat's net domestic product has declined to less than one-fifth, indicating that the state economy is witnessing a structural transformation. Post-liberalization, cropping pattern has favoured wheat, cotton, spices, fruits, vegetables, floriculture and medicinal plants. Despite a secular decline in the share of agricultural sector and sharp fluctuations in its output and income, the decade of 2000s could mark a very high growth phase. Economywide gross domestic product had shown a structural break in 2002-03, giving credence to the notion that agricultural sector has been the driving force behind acceleration of the overall economic growth. After 2000-01, unprecedented increase in physical output and monetary value of crops has been attained. Adoption of high-yielding varieties of food crops and Bt cotton have been the main factors behind the revolutionary growth. However, factors responsible for fluctuations in output of these crops need a careful attention. Technological advancement needs to encompass a wider range of crops as to moderate negative deviations in output, and calls for a scientific approach to sustain the high growth trajectory.

**Key words:** Agricultural growth, crop sector, cropping pattern, Gujarat

**JEL Classification:** Q10, Q16

### Background

Agriculture occupies a prominent position in Gujarat. It engages nearly half of the rural workforce (52%) despite a decline in its share in the state net domestic product to less than one-fifth. An off-shoot of the ongoing process of liberalization in Gujarat is the distortion of the agriculture-industry linkages and severe resource degradation. Although the overall growth of 9.7 per cent per annum has been recorded during 2000s, the sectoral patterns of growth have been far from uniform.

Agricultural economy of the state exhibits following major characteristics. To begin with, the agro-climatic features of Gujarat are fairly diverse, with rainfall varying from 340 mm (Western arid region) to 1800 mm (Southern hills)<sup>1</sup>. This supports a varied

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§ The paper is based on research study titled "Identifying Features of High Agricultural Growth in Gujarat in the Recent Period", funded by Department of Economic Analysis & Research, NABARD, Mumbai.

<sup>1</sup> Gujarat is divided into seven agro-climatic regions: (1) Southern Hills (Dangs and Valsad districts), having humid climate and 1793 mm average rainfall; (2) Southern Gujarat (Surat and Bharuch districts) with semi-arid climate, with 974 mm rainfall; (3) Middle Gujarat (Vadodara, Kheda and Panchmahal districts) having semi-arid climate, with 904 mm rainfall; (4) Northern Gujarat (Ahmedabad, Mehsana, Gandhinagar, Sabarkantha and Banaskantha districts) semi-arid climate and average rainfall of 735mm; (5) North-west Arid (Kutch district) having extremely arid climate and 340 mm rainfall; (6) North Saurashtra (Amreli, Bhavnagar, Surendranagar, Jamnagar and Rajkot districts) having semi-arid climate with 537 mm of average rainfall, and (7) South Saurashtra (Junagadh district); climate here is dry sub-humid with 844 mm average rainfall.

cropping pattern in the state. Cultivation of crops in each agro-climatic sub-division is conditioned by water availability among others. Nearly 20 per cent of the area of Gujarat is considered drought-prone, with high rainfall variability. The net cultivated area comprises 52 per cent of the reported area. As most of the arable land has been brought under cultivation, net sown area has ceased to grow. Land is increasingly becoming a binding constraint to agricultural expansion. Irrigation helps improve land productivity via crop intensification. Cropping intensity increased from 105 per cent in early-1960s to 113 per cent until early-1990s. By early-2000s, the cropping intensity declined to 111 per cent. A noticeable rise was seen in a few pockets in the middle and south Gujarat, while it continued to decline in the Saurashtra region. However, by late-2000s, the overall cropping intensity again rose (118%) mainly due to enhanced water availability for irrigation.

The other noteworthy feature of the land-use pattern is that forests occupy only 9.7 per cent of the reported area in Gujarat as compared to the national average of 21 per cent. Gujarat's agriculture, besides

being weather dependent, is dominated by small landholdings. In 1995-96, the average size of operational holdings was 2.6 ha, which further declined to 2.2 ha in 2005-06. Of the total holdings, 63 per cent are of less than or equal to 2 ha.

Following the context, rest of the paper describes features of high growth of crop sector experienced during 2000s. Section 2 discusses changes in the cropping pattern and the facilitating factors. Section 3 highlights the sources of crop output growth in terms of contributions of area and productivity. Concluding remarks are made in the final section.

### Shifts in Cropping Pattern

Analysis of the cropping pattern in Gujarat brings out some unusual features. Up to early-1990s, *bajra* (pearl millet) and *jowar* (sorghum) were the main foodgrain crops, and cotton and groundnut were the main non-foodcrops. Some significant changes have taken place in crop pattern of Gujarat in the post-liberalization period (Table 1). Area under cereals which was around 40 per cent of the gross cropped area (GCA) in the early-1980s, declined to 36 per cent

**Table 1. Changes in cropping pattern in Gujarat: TE 1982-83 to TE 2009-10**

Crop	TE 1982-83	TE 1987-88	TE 1992-93	TE 1997-98	TE 2003-04	TE 2009-10
Rice	5.44	5.78	6.12	6.67	5.99	6.18
Jowar	10.19	10.65	6.18	3.98	1.71	1.32
Bajra	13.80	14.82	13.32	11.8	9.56	6.50
Wheat	5.64	4.26	5.42	5.83	5.20	9.17
Maize	2.82	3.48	3.51	3.80	4.36	3.55
All cereals	40.27	40.64	35.52	32.76	27.27	26.77
Gram	0.96	0.71	0.84	0.98	0.78	1.48
Arhar	2.86	3.97	3.97	3.54	2.92	2.26
All pulses	7.87	8.43	8.66	8.11	7.04	6.79
Foodgrains	48.14	49.07	44.18	40.86	34.31	34.11
Groundnut	19.79	17.78	17.62	16.57	17.89	15.80
Sesamum	1.22	1.29	2.39	2.53	3.39	2.16
Castor	1.79	2.12	3.14	3.79	3.02	3.43
All oilseeds	24.65	23.63	26.67	25.99	26.89	23.79
Sugarcane	1.02	1.27	1.62	2.13	1.84	1.76
Cotton	14.06	12.42	10.65	14.00	15.42	20.48
Tobacco	1.10	1.29	1.29	1.22	0.86	0.45
Spices	1.22	1.00	1.82	1.58	2.18	4.41
Other crops	9.81	11.32	13.77	14.22	18.50	15.00
GCA ('000 ha)	10883	9484	10750	11088	10948	11787

Source: Crop & Season Reports, Department of Agriculture, GoG (Various years)

during TE 1992-93. Currently, the share of cereals is only 27 per cent (a decline of about 7 lakh ha since TE 1992-93). Area share of *bajra* that had remained constant at around 13 per cent till early-1990s has reduced to half in TE 2009-10. Similarly, area under *jowar* declined from 6.2 per cent of GCA to only 1.3 per cent during this period. On the other hand, average area under wheat has more than doubled, from 5.7 lakh ha in TE 1992-93 to nearly 11 lakh ha in TE 2009-10 and now shares 34 per cent of the total cereal area. Area under rice has remained more or less stable at 5-6 per cent of the GCA. Acreage under groundnut that was 18-19 per cent of GCA throughout the 1980s, has declined to 15.8 per cent in the recent period. Castor has gained from 1.8 per cent of GCA in TE 1982-83 to 3.4 per cent presently.

Substantial shifts in area under cotton have been witnessed during the post-reforms period. In early-1980s, cotton was the dominant cash crop occupying 14 per cent of the GCA. By early-1990s, its share dropped to 11.9 lakh ha comprising 10.6 per cent of GCA. Since then, its share has improved considerably. The share of cotton has doubled and reached 20.5 per cent by TE 2009-10. About 12.2 lakh ha of area has been diverted from other crops, mainly coarse cereals and pulses, towards cotton in the post-reform period. Other crops that are substituting coarse cereals, pulses and oilseeds (to a lesser degree) are the spices, fruits, vegetables, floriculture and medicinal plants. The total area under spices rose from around 2 lakh ha in TE 1992-93 to 5.2 lakh ha in TE 2009-10. Fruits and vegetables currently occupy an area of 7.5 lakh ha. High-value crops such as spices, fruits, vegetables, medicinal plants, etc. occupy one-fifth of the GCA. The share of these crops was 8 per cent in TE 1982-83, which rose to 14 per cent TE 1992-93 and further to 15 per cent in TE 2009-10.

These trends suggest that cropping pattern in the state has changed in favour of superior, more remunerative cereals like wheat and high-value crops such as oilseeds, cotton, spices, fruits and vegetables, floricultural and medicinal plants. Groundnut and cotton, being the main cash crops, have retained their dominant position in the cropping pattern. Area under coarse cereals has declined because of their lack of competitiveness over other crops. On the other hand, area under oilseeds such as castor, mustard and sesame has expanded significantly, mainly as these crops

provide better returns and promote value-added agribusiness enterprises. Castor also has a high level of global demand. India imports about half of its demand for edible oils and the international prices are a determining factor of the prices of the oilseeds. Overall, cropping pattern in the state after mid-1990s is responding to the forces of globalization. Commercialization does show the signs of deepening, as the crops having greater market-orientation are consolidating their share in the farm economy of Gujarat. Crops such as cotton, oilseeds, fruits, vegetables, spices and flowers, amenable to processing and value addition, are on the increase. This calls for expansion of post-harvest facilities (including foreign investments in processing, refrigerated transport and cold storage). These crops inherently provide higher returns per unit of land, resulting in higher incomes and employment generation in the rural areas.

Gujarat is at the forefront of national exports of floricultural products, spices, castor, sesame, cotton, psyllium and processed fruits and vegetables, indicating comparative advantage of Gujarat in these products. Such developments were given policy support in the Gujarat Agro-Vision 2010 document that emphasized relationship between primary and secondary sectors through development of agro-industries. It has also been felt that barren and wastelands that occupy nearly 26 lakh ha could be well utilized by diverting less-productive dryland crops to horticultural crops. The Government of Gujarat has adopted strategies that are geared to overcome constraints faced in cultivation of these crops. Some of them are:

- Supply of good quality planting material (grafts, saplings and seeds) for horticultural crops
- Introduction of new crops
- Cultivation on waste/fallow land, border plantation, inter-cropping and crop rotation
- Increasing productivity by using sophisticated technology such as micro-irrigation systems
- Promoting corporate/contract farming, export-oriented production practices
- Strengthening of marketing societies. Provide training to farmers for post-harvest packaging and orchard management. Establishment of export zones for onions and fruits & vegetables processing.

The above steps intend to increase area, production and productivity of horticultural crops and are a part of various horticultural development programmes implemented during the XI<sup>th</sup> Five-Year Plan.

Shifting landscape of agriculture towards high-value and or high-yielding crops has been facilitated by irrigation development. As against 32 per cent of net cultivated area under irrigation in the period TE 1999-2000, the net irrigated area increased to nearly 42 per cent of the sown area in TE 2006-07. The dominant source of irrigation is through underground sources (78%), only 18 per cent is by canals and 4 per cent is by other sources such as tanks, and river lift. Recurrent droughts, introduction of high-yielding varieties and incentive-oriented pricing policy paved the way for extensive use of groundwater for farming. Groundwater with subsidized power to the farm sector had played an important role in sustaining the agrarian economy of North Gujarat. Here 90 per cent of the total irrigated area is served by groundwater resources. Over-exploitation of groundwater has caused drying of open wells in parts of North Gujarat. Falling groundwater table has resulted in increased initial investment in tubewell construction and has also added to variable costs of energy used for lifting water and well maintenance. It is reported that in North Gujarat the cost of irrigation amounts to nearly 36 per cent of the total input costs, with the result that the net return per unit of land for crops such as cotton and wheat remains the lowest in this region in comparison to other regions of Gujarat (Ranade and Kumar, 2004).

The high cost associated with groundwater irrigation is affecting profitability of agriculture. Needless to add, groundwater over-exploitation with severely depleting water levels has serious equity implications. Shaheen and Shiyani (2005) in a study on access to groundwater in districts of North Gujarat have shown that Mehsana has the presence of company bore-wells in which farmers are shareholders. Economic access to groundwater in Mehsana is highly skewed towards small and marginal farmers. Farmers having low shares in bore-wells have been found to be better-off than farmers with higher shares in terms of access to resource, relative to their share of investment in bore-wells. Formation of irrigation companies is an important mechanism for equity redistribution in this region as the small and fragmented landholdings make individual ownership of wells unviable. In fact,

economic access to groundwater is skewed towards large farmers in Banaskantha where such informal bore-well organisations are absent, but the wells are shared within the family. In Gujarat, the total replenishable groundwater resource in 2005 was 17.3 km<sup>3</sup>/year, utilizable groundwater resource for irrigation was 15.6 km<sup>3</sup>/year and net draft was 10.2 km<sup>3</sup>/year.

Gujarat has potential to develop irrigation for 5.9 million ha of rainfed area through water conservation technologies and practices. Up to 2010, nearly 1.01 lakh small water harvesting structures had been completed under the watershed development programmes. These are in the nature of check dams, *bori-bunds* and farm ponds/tanks. More intensive extension efforts are needed to popularize water saving technologies such as drip and sprinkler irrigation systems for sustainable use of groundwater.

The ultimate irrigation potential through surface sources is assessed at 3.9 million ha, of which 1.8 million ha is through major and medium schemes. Sardar Sarovar Project (SSP) has a cultivable command area of 1.7 million ha. Minor irrigation has the potential to cover 0.4 million ha. Up to 2008, gravity flow irrigation from SSP had reached 72,000 ha. However, additional 215,000 ha are being irrigated by lifting SSP water and transporting it by pipelines. Thus, even though the Narmada Canal has not delivered water to fields in the entire command, the completed network has enabled the farmers to tap water from the system. The gross irrigated area through this could be in the range of 2.4 – 3.3 lakh ha. Further, Narmada water has replenished aquifers in North and Central Gujarat. Overall, the harnessed groundwater potential is around 2.04 million ha. Of ultimate irrigation potential by surface and ground water (excluding SSP), nearly 81 per cent has already been harnessed. Low soil moisture content, very high potential evapo-transpiration and aridity pose several limits to the choice of crops in Gujarat.

The dependence of economy on agriculture is rapidly declining and the process has hastened after 1998-99. Contribution of yield as a component of output growth has picked up in post-liberalization phase for most of the crops. Liberalization has boosted the process of agricultural commercialization. This was possibly aided by enhanced availability of water due to SSP and some proactive Government initiatives such as subsidized electricity, extension services, soil health

**Table 2. Per cent annual compound growth rate in crop sector of Gujarat**

Particulars	TE 1972-73 to TE 1982-83	TE 1982-83 to TE 1992-93	TE 1992-93 to TE 2002-03	TE 1999-00 to TE 2009-10
Value of output	3.64	-2.12	-0.37	8.05
Land productivity	3.67	-0.15	0.14	7.54

Source: Crop & Season Reports, Department of Agriculture, GoG (Various years)

cards, mass based groundwater recharge through small water harvesting structures and spread of micro-irrigation.

### Recent Trends in Agricultural Production

The period after 1999-2000 saw a turn-around in Gujarat, as far as agricultural growth is concerned. Between 1999-2000 and 2008-09, Gujarat agriculture (including dairying) grew at a statistically significant rate of 10 per cent. Further, its contribution to state NSDP after 2004-05 has stabilized at 17-19 per cent. The correlation coefficient of growth in NSDP from agriculture and total NSDP was 0.48 in 1980s, which increased to 0.52 during 1993-94 to 2004-05, and further to 0.85 (not significant) during 2005-06 and 2007-08. Thus, despite long-term declining share of agriculture sector in the state and severe output and income fluctuations, the period of 2000s was one of high growth. Relationship between the behaviour of agriculture sector and that of NSDP has strengthened in recent times. Gujarat economy has responded favourably to the process of liberalization and agriculture has also benefited from this. Table 2 depicts the growth of aggregate output and land productivity for the major crops<sup>2</sup> in Gujarat.

Crop sector output in the period TE 1982-83 to TE 1992-93 was declining at – 2.12 per cent from 3.64

per cent recorded in TE 1972-73 to TE 1982-83, i.e., the phase coinciding with green revolution. With onset of liberalization (after TE 1992-93) decline in output growth continued. The output growth during TE 1999-2000 and TE 2009-10, however, shows that early-2000s witnessed a significant trend break. Output after TE 1999-2000 has recorded unprecedented growth at 8.05 per cent, leading to growth in land productivity at 7.54 per cent from 0.14 per cent recorded in 1990s. Thus, early-2000s period can be considered a watershed after which output has recorded tremendous increase, making Gujarat the foremost state in India in terms of growth in value of agricultural output.

In the 2000s decade, wheat and high-value crops, such as cotton, spices, fruits and vegetables were responsible for the rise in output. Even though the foodgrain area declined, the increase in its output was quite high. The growth of non-foodgrain was, however, higher at 8 per cent than of foodgrains (6%); an indication of increasingly commercialized and diversified nature of Gujarat's agriculture. The changes taking place in physical output for major crops are shown in Table 3.

The growth rates in area, production and yield of crops during the 2000s are presented in Table 4. Among the major food crops, the yield growth of *bajra* (at 2.3%) between 2001 and 2010 could not offset the declining acreage under it. The process of replacement of *bajra* by other crops gained momentum after 2000-01 (-4.53%) and is responsible for the entire fall in its output (at -2.3%). *Jowar* also recorded a decline in area growth (-0.53%). However, improvement in productivity at 3.5 per cent per annum led to a modest growth in its production at 2.4 per cent per annum. The production of *jowar* has also shown an upward trend despite productivity registering a slowdown after 2000.

Area under wheat has shown a statistically significant and phenomenal growth rate (10.7%) after

<sup>2</sup> The value of output and land productivity were estimated (using TE 1992-93 prices) up to TE 2002-03 in an earlier study (Mehta, 2006). The crops considered in the analysis were: cereals, arhar, groundnut, mustard, sugarcane and cotton. For more recent periods, i.e. TE 1999-2000 and TE 2009-2010, the computations were carried out again. However, the crops included were major cereals (rice, wheat, ragi, jowar, bajra, maize), pulses (arhar, gram, mung, urad), oil-seeds (groundnut, castor, rapeseed and mustard, sesame), guar, potato, tobacco, sugarcane, cotton, spices and major fruits (mango, sapota, banana). Nevertheless, trends in output and land productivity can be discerned.

**Table 3. Yield levels for major crops**

Crop/ Group	(kg/ha)				
	TE 1982-83	TE 1992-93	TE 2002-03	TE 2004-05	TE 2009-10
Rice	1335	1332	1207	1483	1863
Wheat	2316	2119	2223	2424	2689
Jowar	566	597	733	876	1155
Bajara	1194	891	1047	1170	1339
Maize	1397	1193	1485	1436	1259
Arhar	719	780	510	651	1001
Groundnut	817	586	778	1111	1378
Sugarcane	7422	8337	7056	7151	7069
Cotton	205	239	1521	317	

Source: Crop & Season Reports, Department of Agriculture, GoG (Various years)

**Table 4. Growth rates of area, production and yield of major crops in Gujarat: 2000-01 to 2010-11**

Crop	Area	Production	Yield
Rice	1.95	6.25*	4.64**
Bajra	-4.53**	-2.33	2.26
Jowar	-0.53	2.39	3.53
Wheat	10.73*	12.53*	2.37
Maize	-0.59	-3.00	-2.08
All cereals	1.73	5.85*	4.39**
Arhar	-2.90	5.52*	7.76*
Gram	-10.9*	-8.10*	3.70**
All pulses	1.62	7.26*	6.08*
Foodgrains	1.92	6.21*	4.67**
Groundnut	-0.30	2.48	3.04
Sesamum	5.00**	3.06	-1.81
Castor	1.18	5.83*	4.21**
All oilseeds	-0.63	4.05**	4.81**
Cotton	5.26*	15.39*	11.42*
Sugarcane	-0.30	0.46	0.73
Potato	6.00*	5.56*	-0.40
Tobacco	2.44	1.20	-1.16
Spices @	12.07*	19.29*	9.68*
Fruits & vegetables@	7.19*	10.91*	4.00**

Notes: \* Significant at 5 per cent; \*\* Significant at 10 per cent; @ Growth rates for 2000-01 to 2009-10

Source: Crop & Season Reports, Department of Agriculture, GoG (Various years)

2000-01 and production has recorded an increase of 12.5 per cent per year. Yield levels have also improved significantly after 2000-01 (at 2.4% per annum) contributing to the unprecedented rise in its output.

Production of pulses during 2000-01 to 2010-11 has increased at the annual rate of 7.3 per cent (statistically significant). While the growth rate of area was modest at 1.6 per cent, its productivity showed a considerable breakthrough rising at 6 per cent. Among other food crops, potato, fruits & vegetables and spices (mainly chilly) have registered fairly high growth rates. The annual growth rates for spices from 1990-91 onwards were modest. After 2000-01, the growth rate for spices was as high as 19.3 per cent. While the growth rate for area under spices was 12.1 per cent, its productivity also grew at 9.7 per cent. State contributes 14-20 per cent share in major fruits and vegetables. Gujarat has recorded unprecedented growth in output of fruits and vegetables at 11 per cent, along with spices, contributed by very high growth in area (7.2%) and productivity (4%). The efforts of the Government to promote horticulture are bearing fruit. A few districts like Valsad are specializing in horticultural crops such as mango, sapota and cashew. With a view to double horticultural production and for simultaneous development of post-harvest infrastructure and marketing facilities, Gujarat State Horticultural Mission is being implemented in 15 potential districts.

Output of potato has nearly doubled in the post-liberalization phase. Area growth (6%) is mainly responsible for this. Sugarcane cultivation has largely been confined to the irrigated districts of Vadodara,

Bharuch, Valsad, Kheda and Surat and these districts had recorded high output growth in the decade of 1980s. However, its cultivation is proving to be unsustainable, as can be seen from stagnation in yield and decline in area under the crop. Waterlogging and salinity, afflicting the canal-irrigated tracts where sugarcane is cultivated, are adversely affecting the yield of this crop.

Gujarat is a major groundnut-producing state; its average contribution to the total production in the country is 37 per cent. In the post-liberalization phase, even though groundnut acreage is facing stagnation or replacement by other crops, its yield performance is better owing to several years of good rainfall that facilitates early sowing. After 2000-01, area under sesame has recorded a huge growth at 5 per cent, which was not so earlier. Large area shifts under this crop (replacing coarse cereals) are somewhat undermined by the productivity decline, and the output growth is a modest 3 per cent annually. In contrast, while area under castor has remained more or less the same, the statistically significant growth in its output at nearly 5.8 per cent has attributed largely to improvements in productivity at 4.2 per cent. Overall, the output of oilseeds in Gujarat is growing at a high rate of 4.1 per cent almost entirely driven by the productivity growth (4.8%). Oilseeds apart from technological inputs, require effective measures for the post-harvest processing activities.

Cotton is currently the single most important non-food crop of Gujarat. There has been a marked improvement in cotton production in post-liberalization phase. After 2000-01, area under cotton increased at the rate of 5.3 per cent and its productivity grew at 11.4 per cent. During the period, this was the highest achievement for any crop in Gujarat. During the period 2000-01 to 2010-11, growths in area and productivity have combined to cause production growth rate of 15.4 per cent. The single most important factor driving this growth is the widespread adoption of Bt cotton. Measures such as water harvesting through checkdams and water availability from the Narmada project and other irrigation projects pursued by the state, have aided the shift towards cotton quite significantly. Further, a strong local marketing system comprising agri-businesses and cooperatives, has helped to deliver inputs and handle marketing of the output efficiently. A noteworthy fact is that benefits from Bt cotton in

terms of yields have been scale-neutral. Bt cotton yields have been reported to be similar across different farm categories. The yield increases for Bt cotton are found to be 35 per cent higher than of traditional high-yielding varieties. Even after foregoing the higher cost of cultivation for Bt cotton due to higher seed cost, net profit is reported to increase by 75 per cent with adoption of Bt cotton. This explains the success of Bt cotton in Gujarat (Gandhi and Namboodiri, 2007; 2010).

Tobacco is a minor crop in the Gujarat economy (claiming less than one per cent of gross cropped area), but is an important crop for the districts of Central Gujarat. The share of Gujarat in India's tobacco production was about 16 per cent in 2007-08 and 11 per cent in 2008-09. After 2000-01, the area grew at 2.4 per cent, though at a declining productivity (-1.2%) to cause output growth at 1.2 per cent. The average productivity of tobacco is decreasing steadily.

The growth performance for major crops reveals that the post-liberalization phase was marked by improvements in yield levels for all the major food crops, groundnut and cotton. Foodgrains as a category recorded a decline in acreage up to 2000-01. Between 2001 and 2010, the share of foodgrain area in gross cropped area stabilised at around 34 per cent. While *bajra*, *jowar* and maize recorded a decline in acreage growth, wheat area expanded very rapidly (estimated to be 10.7% annually) that arrested the falling importance of foodgrains in the agricultural economy of the state. Commercialization process and crop diversification towards non-food crops (cotton, spices, horticulture) are positive developments. Castor and sesame besides groundnut are the other commercial crops that are amenable to processing and have expanding domestic and global demand.

### Issues in Gujarat Agriculture

There are certain problem areas in Gujarat agriculture that may be reviewed in the light of the recent record of achievements. Take the case of pulses which are an important component of diet in the state and a principal source of protein. On an average, area under pulses in Gujarat comprises 4 per cent of the total area in the country. Gujarat produced on an average 6 lakh tonnes of pulses during the period 2008-09 to 2010-11. Area under pulses has been around 7-8 lakh ha and area expansion has been far from

satisfactory. Further, only 12.3 per cent of area under pulses is irrigated. Heartening feature is that the average productivity of pulses in Gujarat (775 kg/ha) is far above the national average (659 kg/ha). Yield expansion has accelerated notably after 2000-01 and is responsible for a considerable rise in production of pulses. The gross value of gram has grown at 14.4 per cent, arhar on the other hand, has shown a strong decline in output value. The task of sustaining high growth in pulses would be difficult without area expansion and irrigation. Systematic efforts are required for increasing both area under pulses and stabilizing productivity at a higher level.

Of the ultimate irrigation potential of around 65 lakh ha through surface and groundwater resources, total irrigation potential of surface water created up to 2010 is nearly 49 per cent. Nearly 76 per cent of the irrigation potential created is being utilized in the state (GoG, 2011). The SSP will provide annual irrigation benefits in about 18.45 lakh hectares. However, the distribution network for this is considerably underdeveloped. Distribution system for only 3.48 lakh ha or 19 per cent of command area is completed. The command areas of some major irrigation projects in Gujarat are facing problems of waterlogging and salinity. Efforts are needed for evolving a more efficient system of water management.

The other issue of importance is that nearly 58 per cent of the cultivated area in Gujarat is still rainfed. Hence, evolving dry farming technologies should receive much higher priority in all future efforts. Further need is to disseminate available dryland technologies to resource-poor farmers in the rainfed regions. Besides promoting dryland technologies, emphasis on technology-based agricultural growth is needed, facilitated by increasing expenditure and credit-flow to remove pro-irrigation bias. Watershed development for raising yields of largely rainfed crops to cover oilseeds, pulses, fruits and vegetables, would yield promising results. This would contribute to another green revolution.

Institutional support to agriculture is rather weak in the state. Despite a well-functioning cooperative structure, it has not succeeded in ensuring adequate supply of credit for weaker sections of the society. Of the total advances made by credit institutions in the state as of March 2011 (₹1,87,803 crore), only 7.5 per cent have gone to the weaker sections (₹11,605 crore).

Advances for agricultural purposes comprise 20.2 per cent of the total advances. It needs to be noted that district-wise distribution of Kisan Credit Cards (KCC) is rather skewed and districts like Kheda, Ahmedabad, Surat and Bharuch have a very low ratio of KCC per thousand operational holdings. Overall for Gujarat, 508 KCC per 1000 holdings have been reported, showing considerable mismatch in outreach (State Level Bankers' Committee, 2011). Concerted efforts are also needed for ensuring success of new experiments, such as, farmers' clubs.

## Conclusions

Crop output in Gujarat after 2000-01 has shown a trend break; performance, however, has varied. Foodgrains area has plateaued but its output in terms of value has increased considerably on account of spurt in growth of wheat. Rice production has also consolidated, both in terms of physical output and gross value. Amongst non-foodgrains, noteworthy contributions to gross value and output have been made by cotton, spices and fruits & vegetables. Technological advancements in terms of adoption of higher-yielding varieties of food crops and Bt cotton have caused high yield enhancement. Moreover, during this period contribution of yield to total output has been quite remarkable. Yet, factors responsible for fluctuations in output of these crops need a careful attention. Technological advancement needs to encompass a wider range of crops as it is crucial for output growth. Growth of real income in the agricultural sector appears to have caused buoyancy in the farm sector and prosperity amongst rural households is providing wider markets for industry and service sectors, leading to high overall income acceleration.

The production technology seems to be the major key to improve the prospects of agriculture in the state. Research should be encouraged for evolving suitable production technologies to push up the prevailing technological frontiers. Investments in this direction may be envisaged, particularly for the rainfed regions with scarce water resources, and for regions where there is possibility of water harvesting.

Also, the problem of agricultural development in Gujarat has to be considered in the wider perspective of integrated rural development. Agricultural development has to be integrated with the overall economic growth and generation of livelihood

opportunities in the rural sector. A diversified and high-value agriculture is the pre-requisite for high growth of non-farm sector as it opens possibilities for value addition and strengthens backward and forward linkages with non-agricultural sectors, leading to livelihood opportunities for the indigent.

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Received: November 2011; Accepted: April 2012

**Appendix I**

Percentage share and annual compound growth rate of output value across  
districts of Gujarat: TE 2001-02 to TE 2009-10

District	Total foodgrains		All crops	
	% share	CARG	% share	CARG
Ahmedabad	6.36	8.99	3.99	4.62
Banaskantha	7.88	2.76	6.53	4.35
Bharuch	5.20	1.46	7.10	3.45
Dang	0.72	14.49	0.17	17.68
Gandhinagar	1.58	13.48	0.66	21.38
Kheda	14.06	5.64	7.34	3.81
Mehsana	9.35	5.18	6.21	1.00
Panchmahal	7.43	4.10	1.66	17.54
Sabarkantha	7.79	3.08	5.03	4.39
Surat	10.00	0.32	11.15	2.10
Baroda	7.03	-2.04	6.43	4.47
Valsad	5.23	2.24	4.63	2.79
Amreli	1.73	7.92	4.09	13.78
Bhavnagar	2.36	9.39	4.69	16.73
Jamnagar	1.45	14.00	3.86	17.80
Junagadh	4.40	18.88	10.33	7.28
Kutch	2.95	7.72	3.68	8.84
Rajkot	1.81	19.47	5.98	15.91
Surendranagar	2.67	5.04	6.46	9.34
Gujarat	100	6.03	100	8.05