

Recent Trends in the Development of Agriculture in Gujarat: Issues and Challenges

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Gujarat has registered double-digit growth of agriculture and allied sectors in 2013-14. The rural cultivator and farm labourer involved in farm sector and is continuously declining in the state. The area under kharif crops has declined about 7070.5 TH in 2015-16 compared to 20105-16 (8505.2 TH) resulted the overall area under cultivation has declined about 12.12 per cent. The cropping pattern of the state indicates that cotton and groundnut have covered about half of the cultivated area and thus area under cash/commercial crops has increased 14.05 per cent point during a decade. As compared to normal rainfall the less rainfall has observed in 17 districts which directly affected the agricultural production and productivity. Net irrigated area increased from 26.07 per cent in 1990-91 to 42.1 per cent in 2009-10 in Gujarat but pulses and oilseed cropped area have very less irrigation facility even today. Due to lack of awareness among the cultivators about insuring so only 13 per cent area of GCA has insured in 2014-15. The growth rate of minimum support prices for some crop has registered over 5 per cent and some crop have over 10 per cent except few crops and thus the farm harvest prices also increased significantly. There are many challenges and issues are facing the Gujarat agriculture.

GROWTH OF AGRICULTURAL IN GUJARAT

Since the beginning of economic reforms in 1991, growth in agricultural GDP has high volatility. It has fluctuated from 4.8 per cent per annum in the 1992-96 to a low of 2.4 per cent during the 2002-06 before rising to 4.1 per cent in the 2007-12 (Govt. of India, 2015-16). The growth of the agriculture and allied sector at the state level differs from that at the national level. At the national level, the GDP from the agriculture and allied sectors grew at the rate of 4.7 per cent in 2013-14 (at constant 2004-05 prices), but the states of Gujarat, Madhya Pradesh and Himachal Pradesh registered double-digit growth during the same period (Govt. of India, 2015-16). As per Census 2011, Gujarat state have about 6.2 per cent of total geographical area with 4.99 per cent of total population of India and 57.4 per cent people (3.47 Cores) of the state live in rural areas (Govt. of India, 2011). Farming and allied activities is to be the main source of income for the majority cultivators and agricultural labourers in this area.

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Table 1
Share of Agriculture and Allied Activities in State GSDP at Constant prices 2004-05

Share of agriculture & allied sector in GSDP	States
30 and above per cent	Arunachal Pradesh
20 to 29 per cent	Andhra Pradesh, Assam, Bihar, Chhattisgarh, Jammu and Kashmir, Madhya Pradesh, Manipur, Nagaland, Punjab, Rajasthan, Tripura, Uttar Pradesh
15 to 19 per cent	Haryana, Himachal Pradesh, Jharkhand, Karnataka, Meghalaya, Mizoram, Odisha, Telangana, West Bengal
Less than 15 per cent	Goa, Gujarat, Kerala, Maharashtra, Sikkim, Uttarakhand, Tamil Nadu

Source: Government of India (2015-16) and CSO

STRUCTURAL TRANSFORMATION AND RATE OF GROWTH IN GUJARAT

With rapid economic growth, the share of primary sector has been decreasing from 43.7 per cent to 14.7 per cent in GSDP during 1964-65 to 2011-12 (Table 2). Gujarat's economy has accelerated its growth during end of the last four decades. The primary sector as an agriculture has grown at over 3 per cent except 1990s decade during 1960-61 to 2010-11.

Table 2
Sector wise Composition of GSDP during Ending of 1964-65 to 2014-51

Sectors	Percentage share to total GSDP for the five years ending				
	1994-95	2000-01	2004-05	2011-12	2014-15*
Primary	29.36	15.89	19.50	14.70	20.90
Secondary	34.82	41.49	36.50	39.30	42.68
Tertiary	35.81	42.66	44.00	46.00	36.48

Note: (*for the year 2011-12 to 213-14 provisional and 2014-15 quick estimates) Source: Govt. of Gujarat, 2015-16 & back, Socio Economic Review, DES, Gandhinagar

EMPLOYMENT IN AGRICULTURE

The share of total farm employment in total population and total workers of the state is displayed in Table 3. This table shows that opportunity in non-farm sector is gradually increased as its share in total population and in total workers has risen in each census year (Bhaiya, 2015). The percentage of rural population and rural workers involved in employment in farm sector has continuously declined after 1971. This table clearly indicated that the share of farm employment in total workers has decreased from 80.35 per cent in 1991 to 73.9 per cent in 2011.

Table 3
Farm and Non-farm Employment in Gujarat (Per cent to total)

Census	Total Farm Employment		Rural Farm Employment	
	Population	Workers	Population	Workers
1991	20.75	59.34	29.36	80.35
2001	21.62	51.34	33.55	71.00
2011*	15.29	45.36	25.30	73.90

Note: *provisional data;
Source: Bhaiya S.R. 2004 and 2015

DRIVERS OF GROWTH IN AGRICULTURE

The agricultural growth in Gujarat reveals that the overall growth in agricultural output and yield of major crops in the state is quite impressive since 2000. The area under paddy, total oilseeds, fruits and vegetables and total non-food grains have increased in the state. The crop pattern of the state has indicating that area under crops increased with fluctuations like maize, wheat, tur, gram, other pulses, total pulses, groundnut, sesamum, rapeseed & mustard, other oilseeds, cotton and fodders (Bhaiya and Parmar, 2015). The increase in value of the agricultural output is concerned, it is noteworthy that the exports and domestic prices of agricultural commodities have increased successively over the years in the state resulting in rise in the value of output (Swain & et al, 2012). About Rs 8315.6 crore was earmarked as budget outlay for agriculture and allied services for 11th FYP as agriculture investment. The total budget outlay for agriculture sector development was Rs. 41286.7 crores which accounts for about 37.2 per cent of total budget outlay for the 11th FYP for the state of Gujarat. The examination of expenditure of this budget outlay during the individual years reveals that the expenditure on these three key drivers of agricultural growth has been over 30 per cent (Govt. of Gujarat, 2015-16).

Season-wise Area under Crops

The area under kharif crops has about 8505.2 TH (thousand hectares) in 2005-06 which has about 7070.5 TH in 2015-16, that means its decreased 16.87 per cent as a resulted the overall area under cultivation has declined about 12.12 per cent during a decade (table 3). Due to enough availability of source of irrigation and good monsoon in the second period, therefore, considerable area under summer seasons has increased about 37.08 per cent in 2015-16 compared to 2005-06. The kharif area has declined in all remaining zones except one and four zones. The maximum that area has decreased in zone five due to dry sub-humid nature and the type of land is medium black and quality of soil is poor drained and saline. And in this zone the paddy and pearl millets are grown. As a resulted the gross cropped area of zones has also declined during a decade (Bhaiya, 2017).

Changiag in Crop Pattern – Zone-wise

The crop and crop groups have its own feathers and it depends upon the natural climate therefore zone wise some crop group has dominated. The area under cereals has been declined except South Gujarat (heavy rain). The farmer's attitude has now become more profit oriented crop selection and generally the growers have given the priority to cash/commercial crops.

The minimum support price of pulses with bonus has announced high last few years so area under pulses gone up. Thus previous agriculture year the bumper production has come and the price of pulses has declined more than the minimum support price so area under pulses indicates that declined. Due to declined area under cereals and pulses the overall area under food grains has also declined. The South Saurashtra, North Saurashtra and North West Zones are the major oilseeds particular groundnut growing zones in Gujarat (table 4).

Table 4
Season wise Area under Crops in 2005-06 and 2015-16 (Area in '000)

Seasons	Agro Climatic Zones Number								Total
	SGHR	SG	MG	NG	BCA	SS	NS	NWZ	
<i>Year 2005-06</i>									
Kharif Total	237.6	535.7	959.3	1444.9	200.3	1544.8	2022.5	1560	8505.2
Rabi Total	86.5	192.9	138.2	478.8	57.6	291.8	306.5	473.4	2025.7
Summer Total	15.7	9.1	19.6	80.3	1.2	53.3	3.7	96.1	279.1
Gross Cropped Area	339.8	737.7	1117.2	2004	259.1	1890	2332.7	2129.4	10810
<i>Year 2015-16</i>									
Kharif Total	272.1	351.7	763.5	1202.7	136.4	1425.6	1750.9	1167.5	7070.5
Rabi Total	84.1	154.9	222.8	710.3	31.2	93.5	113.6	636.8	2047.1
Summer Total	13.5	12.2	18.7	119.1	4.4	34.3	3.1	177.5	382.6
Gross Cropped Area	369.6	518.8	1004.9	2032.2	171.9	1553.4	1867.5	1981.8	9500.2
<i>Percentage change over 2005-06 to 2015-16</i>									
Kharif Total	14.52	-34.35	-20.41	-16.76	-31.90	-7.72	-13.43	-25.16	-16.87
Rabi Total	-2.77	-19.70	61.22	48.35	-45.83	-67.96	-62.94	34.52	1.06
Summer Total	-14.01	34.07	-4.59	48.32	266.67	-35.65	-16.22	84.70	37.08
Gross Cropped Area	8.77	-29.67	-10.05	1.41	-33.65	-17.81	-19.94	-6.93	-12.12

Source: Bhaiya, 2017

Notes: SGHR - South Gujarat (Heavy Rain Area); SG - South Gujarat, MG - Middle Gujarat, NG - North Gujarat, BCA - Bhal & Coastal Area, SS - South Saurashtra, NS - North Saurashtra and NWZ - North West Zone

This Table 5 shows that area under oilseed crops has continuously decreasing phenomenon in these zones due to the productivity level of this crops has not maintained because the pests and disease has highly affected this crops and post harvest management practices has also found very poor. The area under spices and medicinal crops has not noticeable changes has found during the mentioned period. After the development of irrigation facility and the hybrid or Bt seeds of cotton and other cash crops the cropping pattern has toward the non-food rain crops in Gujarat state. The cotton and groundnut crops have covered about half of the cultivated area in Gujarat. The area under cash/commercial crops has increased 28.92 per cent in 2005-16 to 43.97 per cent in 2015-16 (Bhaiya, 2017).

Table 5
Crop Group wise Percentage Change
(Per cent to gross cropped area)

Zone	Cereals		Pulse		Food grains		Oil Seeds		Spices and Medicinal		Commercial Crops	
	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16
SGHR	59.57	63.76	14.74	17.77	74.31	81.53	5.14	1.97	0.23	0.01	19.89	16.43
SG	26.37	25.77	14.61	24.59	40.98	50.36	2.51	0.58	0.02	0.29	53.81	45.88
MG	55.36	56.67	19.90	12.42	75.25	69.09	2.08	0.70	0.34	0.67	21.78	28.98
NG	55.17	48.16	5.94	1.99	61.11	50.15	8.93	5.66	2.35	1.87	25.95	39.16
BCA	38.10	30.96	4.32	4.27	42.42	35.23	10.10	3.11	2.16	0.83	44.82	60.68
SS	16.35	5.84	1.70	1.49	18.04	7.33	53.54	33.96	2.60	0.37	22.61	55.45
NS	12.12	3.96	3.58	1.66	15.70	5.62	49.34	40.42	5.07	2.14	29.20	51.61
NWZ	28.90	19.89	8.00	5.11	36.90	24.99	22.65	17.45	6.16	11.24	33.06	43.47
All	32.00	26.63	7.40	5.49	39.40	32.11	26.88	18.59	3.28	3.33	28.92	43.97

Source: Bhaiya, 2017

Note: Cereals - Paddy, Wheat, Bajari, Maize, Jowar, Ragi and Small Millets; Pulse - Tur, Gram, Moong, Moth, Udad, Other Pulse; Food grains - cereals and pulses; Oil seeds -Groundnut, Seasmum, Rape seed-Mustard; Spices and Medicinal - Chilly, Cumin, Fennel, Garlic, Ginger, Isabgul and Commercial Crops - Cotton, Castor, Guvar , Soybean, Sugarcane, Tobacco.

RAINFALL AND IRRIGATION

The water is the very precious natural resource and the rainfall is the only source of that. The agriculture is mostly depends of availability of rainfall and available water resources. The Gujarat is in the list of deficit states for the rainfall. The Table 6 indicating that out of total districts, about 17 districts is under less rainfall compared to the normal rainfall which has directly affected the agricultural production and yield. Among them Vadodara, Dahod, Panchmahals, Dangs, Bharuch are the have highly deficit of rainfall.

Table 6
Rainfall Distribution of Deficient Districts

District	Actual (mm)	Normal (mm)	Deficit	Per cent	District	Actual (mm)	Normal (mm)	Deficit	Per cent
Daman	1022.2	2316.9	1294.70	-55.88	Tapi	879.8	1484.9	605.10	-40.75
Vadodara	421.4	942.8	521.40	-55.30	Porbandar	399.3	672.7	273.40	-40.64
Dahod	426.8	853.3	426.50	-49.98	Kheda	503.5	811.6	308.10	-37.96
Panchmahals	479.8	912.1	432.30	-47.40	Ahmedabad	400.7	602.6	201.90	-33.50
Dangs	1039.2	1961.7	922.50	-47.03	Surat	884.2	1253.6	369.40	-29.47
Bharuch	437.8	786.2	348.40	-44.31	Valsad	1434.8	1951.3	516.50	26.47
Navsari	1022.8	1803.3	780.50	-43.28	Surendranagar	373	499.8	126.80	-25.37
Anand	452.6	788.9	336.30	-42.63	Junagadh	598.9	787.2	188.30	-23.92
Narmada	650.2	1099.8	449.60	-40.88					

Source: Department of Agriculture, Cooperation & Farmers Welfare.

Net irrigated area in the state increased from 26.07 per cent of net irrigated area in 1990-91 to 42.1 per cent in 2009-10. The proportion of gross irrigated area in gross cropped area rose from 27.37 per cent in 1990-91 to 42.10 per cent in 2009-10 but it has increased after the 2006-07. Even by 1990-91 only about one fourth of the cultivated area of the state is likely to get facilities of irrigation now it near half of the net sown area (Table 7).

Table 7
Irrigated Area in Gujarat during 1990-91 to 2009-10
(Area in hundred ha)

Period	Net irrigated	New Sown Area	Irrigated Area-%	Gross Irrigated	GCA	Irrigated Area-%	Irrigation Intensity	Crop Intensity
1990-91	24376	93502	26.07	29105	106348	27.37	119.40	113.74
2000-01	28060	94896	29.57	33421	104970	31.84	119.11	110.62
2006-07	43360	98010	44.20	56840	121100	46.90	131.10	123.60
2009-10	43360	103020	42.10	49350	111380	44.30	113.80	120.50

Source: Govt. of Gujarat, Annual Season and Crop Reports, Various Issues, Directorate of Agriculture, Krishi Bhavan, Gandhinagar & Govt. of Gujarat, Irrigation in Gujarat, DES, Gandhinagar

The main source of irrigation in Gujarat is wells, most of which are dug wells fitted with diesel pump-sets or electric pump-sets, the canals irrigation facility come next, but the related importance of canals has increased. Due to the development of canal irrigation facility in the state the dependence on tube and dug wells gradually declined last many years. In 2007-08, a canal has provided about 18.4 per cent irrigation in Gujarat. On the other hand, tube and dug wells have provided largely irrigation in the state i.e. about 78.20 per cent (Table 8).

Table 8
Different Sources of Irrigation in Gujarat
(% to Total Irrigated Area)

Period	Canal	Tanks	All Wells	Others	Net Irrigated in '00 ha
1990-91	19.41	1.29	79.18	0.12	24376
2000-01	11.70	0.56	87.45	0.29	28060
2007-08	18.21	1.07	78.20	2.70	43360

Source: Govt. of Gujarat, Annual Season and Crop Reports, Various Issues, Directorate of Agriculture, Krishi Bhavan, Gandhinagar & Govt. of Gujarat, Irrigation in Gujarat, DES, Gandhinagar

The status of crop group wise cultivated and irrigated area In Gujarat for the period of 1990-91 to 2007-08 is presented in table 6 and it is found that about 45.9 per cent cultivated area has been under the irrigation facility in 2007-08. If we look into crop group wise, it has shown that fruit and vegetable crop area have more than 90 per cent irrigated area, but is marginal declined in the last period (Table 9). The pulses and oilseed cropped area have very less irrigation facility therefore the irrigated area has under pulses about 14.1 per cent and oilseed about 28 per cent in 2007-08.

Table 9
Crop Group wise Cultivated and irrigated Area in Gujarat
(Area in '000 ha)

Crop Groups	Cropped Area			Irrigated Area			Per cent			Percentage change 2007-08 over 1990-91
	1990-91	2000-01	2007-08	1990-91	2000-01	2007-08	1990-91	2000-01	2007-08	
Cereals	3798	2975	3694	1040	944	1941	27.40	31.73	52.56	25.16
Pulses	949	742	928	92	61	131	9.75	8.25	14.14	4.39
Food grains	4748	3718	4622	1133	1005	2072	23.87	27.04	44.84	20.97
Fruits & Vegetables	200	272	470	188	260	431	93.81	95.70	91.85	-1.96
Food Crops	5255	4416	5706	1627	1691	3057	30.96	38.30	53.58	22.62
Oilseeds	2818	2860	2965	692	659	830	24.57	23.07	28.00	3.43
Non-Food crops	5379	6080	6504	1283	1650	2556	23.86	27.15	39.30	15.44
GC A	10634	10497	12211	2910	3342	5614	27.37	31.84	45.97	18.60

Sources: Govt. of Gujarat, Annual Season and Crop Reports, Various Issues, Directorate of Agriculture, Krishi Bhavan, Gandhinagar & Govt. of Gujarat, Irrigation in Gujarat, DES, Gandhinagar

ASSURING FARM INSURANCE

In order to protect farmers against such natural risks, including crop failure due to natural calamities, pest and diseases and weather conditions, two major crop insurance schemes, namely National Crop Insurance Program with its three component schemes: Modified National Agricultural Insurance Scheme, Weather Based Crop Insurance Scheme, Coconut Palm Insurance Scheme, and National Agricultural Insurance Schemes are being implemented by the government. However, despite the best efforts of the centre and state governments, low coverage of agricultural insurance remained a continuing concern for the policy makers. Results of the NSSO's 70th round Survey also indicates that only a small segment of agricultural households insured their crops against possible crop loss during the crop period surveyed. This poor coverage was primarily on account of lack of awareness among the cultivators. For example, in case of pulses, 58 per cent of urad cultivators and 49 per cent of moong cultivators were not aware of and were not insuring their pulses crops during the Survey period. The Gross cropped area and area insured is mentioned in Table 10.

Table 10
Insured Area in Gujarat - 2014-15 (area in million hectares)

Particular	Gross Cropped Area	Area Insured	Per cent of Area Insured
Gujarat level	12.6	1.39	11.03
%	6.48	3.07	47.30
All India level	194.4	45.34	23.32

Source: Department of Agriculture, Cooperation and Farmers Welfare

WATER RESOURCE IN GUJARAT

Water resources in Gujarat are concentrated primarily in the southern and central part of the mainland. Saurashtra and Kutch region in the northern mainland and they have limited surface and groundnut resources. A significant percentage of the water in the state is consumed by the agricultural sector for irrigation. The irrigation potential through the surface water is 57.32 lakh ha (55.7% of NSA) while 25.48 lakh ha (24.7% of NSA) through resources can be irrigated. The irrigation potential created has increased from 21.91 lakh ha in 2007-08 to 31.31 lakh ha in 2012-13 (Swain & *et al*, 2012).

The North Gujarat alluvial area has low rainfall but has good topographic conditions of recharge and ideal conditions of aquifers which have rendered the region with rich reservoir. This storage has supported so many of tube-wells for more than 35 years in this region. The coastal Saurashtra enjoyed groundwater regime but the over-drafting of has pushed in saline water resulting in salinity ingress in the region on the one hand. The indiscriminate withdrawal of in the North Gujarat, Kutch and Northern Saurashtra has depleted its water resources badly leading to water mining on a large scale. In the south where the rainfall is high the canal irrigation and the consequent overuse of water has pushed up water logging and salinity in this region (Hirway, 2002).

MINIMUM SUPPORT PRICES AND FARM HARVEST PRICE

The government has announced the every year and the MSP for major kharif and rabi crop in India. The government approved for the increase in the MSPs for all rabi crops of 2017-18. Further, to incentivize cultivation of pulses and oilseeds in the country, government has announced a bonus of Rs. 150 per quintal for gram and Rs 100 per quintal for lentil, rapeseed and mustard and sunflower. This bonus is payable over and above the approved MSP. The details of MSPs and growth rate for the period 2007-08 to 2017-18 are given in table 11. Except few crops' MSP the growth rate has registered above 5 per cent during mentioned period. The groundnut, juwar, urad, moong, sugarcane, ragi, tur, nagar seed, jute and seasmum are registered their growth rate about 10 per cent during 2007-08 to 2016-17/2017-18.

Table 11
Crop wise MSP for Last 10 Year and Growth Rate (per Quintal/Rs.)

Crop	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	Growth Rate (%)
Paddy - Comman	580	850	950	1000	1080	1250	1310	1360	1410	1470	--	9.75
Paddy - A Grade	610	880	980	1030	1110	1280	1345	1400	1450	1510	--	9.49
Juwar - Hybird	600	840	840	880	980	1500	1500	1530	1570	1625	--	10.48
Juwar - Maldani	620	860	860	900	1000	1520	1520	1550	1590	1650	--	10.28
Bajra	600	840	840	880	980	1175	1250	1250	1275	1330	--	8.29
Matze	620	840	840	880	980	1175	1310	1310	1325	1365	--	8.21
Ragi	600	915	915	965	1050	1500	1500	1550	1650	1725	--	11.14
Tur	1550	2000	2300	3000	3200	3850	4300	4350	4425	4625	--	11.55
Moong	1700	2520	2760	3170	3500	4400	4500	4600	4650	4800	--	10.94
Urad	1700	2520	2520	2900	3300	4300	4300	4350	4425	4575	--	10.41

Crop	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	Growth Rate (%)
Cotton SS	1800	2500	2500	2500	2800	3600	3700	3750	3800	3860	--	7.93
Cotton LS	2030	3000	3000	3000	3300	3900	4000	4050	4100	4160	--	7.44
Groundnut	1550	2100	2100	2300	2700	3700	4000	4000	4030	4120	--	10.27
Sunflower	1510	2215	2215	2350	2800	3700	3700	3750	3800	3700	4100	9.51
Soyabean	1050	1390	1390	1440	1690	2240	2560	2560	2600	2675	--	9.80
Seasmum	1580	2750	2850	2900	3400	4200	4500	4600	4700	4800	--	11.75
Nagar seed	1240	2405	2405	2450	2900	3500	3500	3600	3650	3725	--	11.63
Wheat	1000	1080	1100	1120	1285	1350	1400	1450	1525	1625	1735	5.14
Barley	650	680	750	780	980	980	1100	1150	1225	1325	1410	7.29
Gram	1600	1730	1760	2100	2800	3000	3100	3175	3425	4000	4400	9.63
Lentil	1700	1870	1870	2250	2800	2900	2950	3075	3325	3950	4250	8.69
R & Mustard	1800	1830	1830	1850	2500	3000	3050	3100	3350	3700	4000	7.53
Copara Miling	3620	3660	4450	4450	4525	5100	5250	5250	5550	6500	--	6.03
Copara whole	3870	3910	4700	4700	4775	5350	5500	5500	5830	6240	--	4.89
Jute	1055	1250	1375	1575	1675	2200	2300	2400	2700	3200	--	11.74
Sugarcane	81.18	81.18	129.84	139.12	145	170	210	220	230	230	--	10.98

Source: Department of Agriculture, Cooperation and Farmers Welfare

FARM HARVEST PRICE

The comparisons of FHPs and MSPs for the period 2012-13 to 2016-17 are given in Table 12. The table clearly indicating that the FHPs has always some extent higher than the MSPs for about 15 crops in Gujarat except few crops as bajra, cotton LS, gram and sugarcane.

Table 12
Crop wise Farm Harvest Price in Gujarat (per Quintal/Rs.)

Crop	Farm harvest prices (FHPs)					FHPs - MSPs				
	2012-13	2013-14	2014-15	2015-16	2016-17	2012-13	2013-14	2014-15	2015-16	2016-17
Bajra	1190	1244	1220	-	-	15	-6	-30	-	-
Cotton LS	4749	4288	4005	-	-	849	288	-45	-	-
Cotton SS	3809	3913	3925	-	-	209	213	175	-	-
Gram	3242	3100	3100	3950	4269	242	0	-75	525	269
Groundnut	3802	4200	4125	-	-	102	200	125	-	-
Juwar	2825	2825	2517	-	-	1325	1325	987	-	-
Maize	1500	1416	1392	-	-	325	106	82	-	-
Moong	6827	7116	7226	-	-	2427	2616	2626	-	-
Paddy	1393	1371	1390	-	-	143	61	30	-	-
R & Mustard	3214	3050	3820	3757	3349	214	0	720	407	-351
Seasmum	10265	7187	6990	-	-	6065	2687	2390	-	-
Sugarcane	170	210	296	258	226	0	0	76	28	-4
Tur	4657	5838	7619	-	-	807	1538	3269	-	-
Urad	5563	8777	9060	-	-	1263	4477	4710	-	-
Wheat	1729	1714	1775	1806	1843	379	314	325	281	218

Source: Department of Agriculture, Cooperation and Farmers Welfare, Govt. of Gujarat

AGRICULTURE PRODUCTION

Gujarat is the dominant producer of tobacco, cotton, castor and groundnuts in India. Other major crops produced in state are rice, wheat, jowar, bajra, maize, pigeon pea and gram. Castor, Groundnut and Mustard are the important oilseed crops of the state. The state has noticeable achievement in production and productivity in cotton, castor and groundnut and other major crops. Cotton is an important cash crop of the state which covers 27.19 lakh ha and the production 91.15 lakh bales during 2015-16 (yield 3352 kg/ha) which is estimated about one third production of the country. State has about 30 per cent share in country for production of Groundnut with 19.25 lakh MT production through area coverage of 13.55 lakh ha in 2015-16 (Table 13).

Table 13
Area and Production of Rabi Crops in Gujarat
(Area '00, Prod '00 MT, Yield ha/kg)

Crop	2013-14			2014-15*			2015-16*			2016-17*		
	Area	Prod	Yield	Area	Prod	Yield	Area	Prod	Yield	Area	Prod	Yield
Paddy	7570	1543	2038	7550	2129	2820	7290	1567	2150	-	-	-
Bajra	3710	503	1356	1820	207	1137	1440	228	1583	-	-	-
Juwar	740	107	1446	1440	202	1403	770	113	1468	-	-	-
Maize	3330	422	1267	3010	469	1558	2980	395	1326	-	-	-
Tur	2100	2090	995	2140	235	1098	2270	237	1044	-	-	-
Moong	1280	570	445	830	56	675	1040	52	500	-	-	-
Urad	890	540	606	670	46	687	630	37	587	-	-	-
Groundnut	1748	525	3003	1346	2918	2168	1355	1925	1421	-	-	-
Sesamum	1100	570	5182	1340	79	590	1530	61	399	-	-	-
Cotton	25190	10088	4005	27730	9624	3471	27190	9115	3352	-	-	-
Wheat	1024	294	2871	11464	3177	2771	8510	2484	2919	9760	2879	2950
Gram	136	13	956	1699	167	983	1150	153	1330	1690	208	1231
R & M	-	-	-	1843	258	1400	1900	306	1611	2000	347	1735
Sugarcane	-	-	-	2035	14020	68894	1570	11120	70828	1670	11760	70419

Notes: * Forecast data, Govt. Gujarat, Cotton production in 170 kg per Bales

Source: The mentioned data has collected from the Directorate of Agriculture and Farmers Welfare, GoG, Gandhinagar.

LAND HOLDING STATUS

Increasing fragmentation of land holdings is a continuing cause for concern. Around 85 per cent of the operational holdings in the country are marginal ($1 > \text{ha}$) and small ($2 > \text{ha}$). Between 2000-01 and 2010-11, the number of marginal holdings increased about 23 per cent (from 75.41 million to 92.83 million) and number of small holdings increased 9 per cent (from 22.70 million to 24.78 million). Even the large holdings dropped by 11 per cent and large holdings by almost 11 per cent. In terms of the proportion of operational area under different sized holdings, small and marginal holdings in 2010-11 accounted for 44.6 per

cent of the area, while 10.6 per cent area by the large holdings. This is indicative of the significant fragmentation of operational holdings in India. Big holders are getting converted frequently into small and marginal holdings. It is estimated that the average size of land holding, which at present is 1.15 hectare (Agriculture Census 2010-11). In Gujarat, out of total geographical area (196 lakh ha), 99.66 lakh ha are under net cultivable area which is 50 per cent of the same. Total gross cropped area is about 122.11 lakh ha in Gujarat. Total gross irrigated area is 56.14 lakh ha which is accounted for 45.97 per cent of total crop area. Total operational land holders in the state are 48.86 lakh, who possess the cultivable land with an average of 2.03 ha per land holders. Out of total land holders, 37.16 per cent marginal, 29.25 per cent small, 22.10 per cent semi-medium, 10.49 per cent medium farmers and only 1.00 per cent large farmers. The average size of operational holdings was 2.2 hectares. The average size of land holdings in the case of marginal and small farmers was just 0.50 hectares and 1.46 hectares respectively in Gujarat (Agriculture Census, 2010-11).

WEATHER AND CLIMATE

Consistent warming trends and more frequent and intense extreme weather events are being observed across India in the recent years. Several areas have been identified as risk prone due to impact of climate change like coastal areas, Indo-Gangetic plains and the drought and flood prone regions of the country. Besides production from crops and livestock, fresh water and marine ecosystem is also likely to be affected due to warming of sea surface temperatures. Such climatic fluctuations could adversely affect agricultural sustainability resulting in unforeseen situational shortages which could also impact other economic sectors. 2.73 Agriculture is an important source of Green House Gas emissions and 17.6 per cent of the annual emissions were from agriculture in India during 2007. The major sources of emission in agriculture sector are enteric fermentation (63.4%), rice cultivation (20.9%), agricultural soils (13.0%), manure management (2.4%) and on-field burning of crop residues (2.0%).

The Gujarat has a tropical climate as sub-humid, arid and semi-arid, are spread over different regions of the state. Out of total area of the state, 58.6 per cent fall under arid and semi-arid climatic zone. The arid zone contributes 24.94 per cent, while the semi-arid zone forms 33.66 per cent of the total area of the state. The rainfall pattern in Gujarat reveals that the average annual rainfall over different parts of the state varies widely from 300 mm in the Western half of Kutch to 2100 mm in the Southern part of Valsad district and the Dangs. The average rainfall for the state during 2008-2015 was 822 mm compared to the all-India average of 1100 mm. About 95 per cent of the total annual rainfall is received during three months: July, August and September. Rainfall in the large parts of Gujarat is not only inadequate but also varies widely from year to year (Swian and *et al* 2012, GoG, 2015-16).

AGRICULTURAL CHALLENGES AND ISSUES IN GUJARAT

Pressure of Population on Land

Increased pressure of population on land, increased fragmentation and non-agricultural land has resulted in fall in average operational holding from 2.93 ha in 1990-91, 2.62 ha in

1995-96 and 2.20 ha in 2005-06 in Gujarat. However, marginal and small holders are less number 52.90 per cent share in total holder with 26.8 per cent share in total operated area.

Constrain of Fertilizer Use

The farm yard manure, chemical fertilizer and macro nutrients are an important input for crop growth and increasing production and yield. The overall consumption of NPK has increased from 16.23 lakh tonnes in 2007-08 to 19.39 lakh tonnes in 2010-11 (19.47% rose). Thus, NPK consumption per hectare of GCA has also increased by 16.5 per cent, from 134 kg in 2007-08 to 156 kg in 2009-10 and the NPK ratio is 6.4:2.7:0.9 for the year 2010-11.

But It is observed that a poor rainfall situation and consistent draughts, less irrigation or protective irrigation facility have affected the use of fertilizers in Gujarat which adversely affect the yield and production level.

Constrain related to Irrigation

Although, natural factors and forces are relatively less favorable in Gujarat. A comparison with the all India position shows that Gujarat is relatively poor in respect of both ground water and surface water resources. The water resources of Gujarat even after considering allocated share from the inter-state rivers are hardly 2 per cent of the country's water resources. The irrigation potential created has increased from 21.91 lakh hectares in 2007-08 to 31.31 lakh hectares in 2011-12. Similarly, the utilization of irrigation potential created has increased from 16.99 lakh hectares in 2007-08 to 23.2 lakh hectares in 2011-12. On the other hand, the irrigation potential created through ground water has declined sharply from 20.35 lakh hectares in 2007-08 to 0.87 lakh hectares in 2011-12 resulting in overutilization by 137.9 per cent (GoG, 2012)

Soil Constrains

Soil salinity is one of the major constraints in development of agriculture in Gujarat. This is aggravated by increase in ingress of salinity in different parts of state. There is salinity ingress due to heavy withdrawal of groundwater and little recharge. This is happening in Banaskantha, Ahmedabad, Gandhinagar, Sabarkantha and Mehsana. Salinity is in coastal areas due to underground faults in seacoast. This is affecting Bhavnagar, Junagadh, Amreli and Kutch. There are areas along the periphery of little and great Rann of Kutch, particularly of Banaskantha and Surendranagar districts, which are affected by the advancement of Rann. New problem areas are due to water logging in irrigated areas. This is in command areas of Mahi Shetrunj and Ukai. Affected districts are Surat, Bharuch, Panchmahals, and Kheda.

Poor Position of Rainfall

In Gujarat overall position of rainfall is relatively poor. Net cultivated area are covered under 1150 mm and above at 8 per cent, under 750 to 1150 mm at 25 per cent and under below 750 mm at about 67 per cent in Gujarat. Even in good years, there is a gap between two spells of rainfall, sometimes exceeding one month or there is delayed rainfall or missing the last round of rains in September. The recurrent drought happens at least thrice in a

decade. Sometimes there are two recurring droughts. Many times, two-thirds of the state gets affected.

High Arid and Semi-arid Area

The proportion of arid (19.61%) and semi arid (9.46%) area in total net sown area is high.

Drought Prone District

About 29 per cent drought prone area is in total area and it covered about 18 per cent population in total population of the state.

Salinity and Water Logging

Area adversely influenced by salinity and water logging constituted 21.80 and 16.52 per cent of irrigation utilization respectively in Gujarat, while the corresponding figures were 9.37 per cent and 9.67 per cent of irrigation utilization respectively at the nation level.

Research Constrains

Gradually we are entering in the e-techno world and so many well developed equipments and machineries, seeds, supplementary micro nutrients, pesticides etc. however, we have facing such kind of research constrains as (i) lake of suitable drought resistant, short duration and high yielding varieties of cereals, pulses and cash crops; (ii) limited expertise available for research in agro-forestry, horticulture-floriculture and fodder crops; (iii) limited knowledge and literature available for post-harvest management activates for the corps; (iv) limited research facility in biotechnology; (v) little information on cropping system based agriculture for various agro-climatic conditions; (vi) very few research in organic farming; (vii) The research on efficient use of water saving devices like sprinklers, drip irrigation are lacking; (viii) stagnant the crop pattern in some agro climatic zones and its part. Recently, in cotton crop the pink larva have been attracting last couple of year and destroyed the kapas about more than 50 per cent production thus this pest not controlled by the any afford.

Remunerative Prices

It is observed that a majority of small and marginal farmers don't get remunerative prices because of constraints in marketing channels and infrastructures resulting in lower value of their output. Farmers are unable to get minimum support price because of monopolistic behaviour of the informal buyers/ traders. Even during last two years the tur production gone up bumper but farmers have neither getting the remunerative price nor minimum support price in the state.

SUMMARY AND CONCLUSION

Gujarat, Madhya Pradesh and Himachal Pradesh registered double-digit growth of agriculture and allied sectors in 2013-14. The rural worker involved in employment in farm sector

is continuously declining in the state. The area under kharif crops has about 8505.2 TH (thousand hectares) in 2005-06 which has about 7070.5 TH in 2015-16, that means its decreased 16.87 per cent as a result the overall area under cultivation has declined about 12.12 per cent during a decade. The South Saurashtra, North Saurashtra and North West Zones are the major oilseeds particular groundnut growing zones in Gujarat. The cotton and groundnut crops have covered about half of the cultivated area in Gujarat. The area under cash/commercial crops has increased 28.92 per cent in 2005-16 to 43.97 per cent in 2015-16. About 17 districts is under less rainfall compared to the normal rainfall which has directly affected the agricultural production and yield. Net irrigated area in the state increased from 26.07 per cent of net irrigated area in 1990-91 to 42.1 per cent in 2009-10. But pulses and oilseed cropped area have very less irrigation facility. This poor coverage was primarily on account of lack of awareness among the cultivators about insuring so only 13 per cent area of GCA has insured in 2014-15. Except few crops' MSP, remaining has registered above 5 per cent growth rate during decade as a result the FHP also significantly increased. During 2000-01 to 2010-11, the number of marginal and small holdings increased about 23 per cent and 9 per cent respectively. There are many challenges and issues are facing the Gujarat agriculture as high pressure of population on land, poor and diorite the soil quality, over use of fertilizers and less use organic/manure and less protective irrigation facilities over withdrawal of groundwater, poor and erotic rainfall, high arid and semi-arid area, drought prone districts, salinity and water logging issues, research and techno base constraints, remunerative prices marketing problems etc.

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