

**STATE AGRICULTURE PLAN (SAP)
AND
STATE INFRASTRUCTURE
DEVELOPMENT PLAN
(SIDP)
12th FYP, GUJARAT**

**Department of Agriculture and Co-operation
Government of Gujarat
Gandhinagar**

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LIST OF ABBEVIATIONS

Sr No	Abbreviated Form	Full Form
1.	AAS	Atomic Absorption Spectrophotometer
2.	AAU	Anand Agriculture University
3.	A.H.	Animal Husbandry
4.	AES	Agro Ecological Situation
5.	AES	Advanced Encryption Standard
6.	AFIS	Advance Fibre Information System
7.	AGMARK net	Agricultural Marketing Network
8.	AgriI	Agricultural
9.	AI	Artificial Insemination
10.	AICCP	All India Coordinated Cotton Improvement Project
11.	AICPMIP	All India Coordinated Millet Improvement Project
12.	AICRP	All India Coordinated Research Projects
13.	AMCs	Automated Milk Collection Centres
14.	APEDA	Agricultural Produce Export Development Authority
15.	APMC	Agricultural Produce Marketing Committee
16.	AS	Ammonium Sulphate
17.	ATMA	Agriculture Technology Management Agency
18.	AWS	Automatic Weather Stations
19.	BCL	Bio Control Laboratory
20.	BISAG	<i>Bhaskaracharya</i> Institute for Space Application and Geo-Informatics
21.	BLB	Bacterial Leaf Blight
22.	BOD	Biological Oxygen Demand
23.	CA	Controlled Atmosphere
24.	CARI	Central Avian Research Institute
25.	CBG	Compressed Bio Gas
26.	C-DAPs	Comprehensive District Agriculture Plan
27.	CIFA	Central Institute of Freshwater Aquaculture
28.	CIFRI	Central Inland Fisheries Research Institute
29.	CIFT	Central Institute of Fisheries Technology
30.	CRS	Community Radio Station
31.	CWC	Central Warehousing Corporation
32.	DAG	Director of Agriculture
33.	DAO	District Agriculture Officer
34.	DAP	District Agriculture Plan
35.	DAP	Di-Ammonium Phosphate
36.	DDA	District Development Agency
37.	DHO	District Health Officer
38.	DNA	Deoxyribo Nucleic Acid
39.	DOA	Directorate of Agriculture
40.	DRDA	District Rural Development Agency
41.	DSM	Demand Side Management
42.	EC	Effective Concentration, Electrical Conductivity

Sr No	Abbreviated Form	Full Form
43.	EEI	Extension Education Institute
44.	EEZ	Exclusive Economic Zone
45.	ELISA	Enzyme-Linked Immunosorbent Assay
46.	Ext.	Extension
47.	FAI	Fertilizer Association of India
48.	FAOSTATE	Food And Agriculture Organization Statistical Databases
49.	FCO	Fertilizers Control Order
50.	Fe	Iron
51.	FFDA	Fish Farmer Development Agency
52.	FFS	Farmers Field School
53.	FG	Farmers Group
54.	FGR	Forest Genetic Resources
55.	FIAC	Farm Information Advisory Centre
56.	FIG	Farmer Interest Group
57.	FLDs	Front Line Demonstration
58.	FRA	Forest Right Act, Farmers Right Act
59.	FRP	Fibre glass Reinforced Plastic
60.	FTC	Farmers Training Centres
61.	FY	Five Years
62.	FYM	Farm Yard Manure
63.	FYP	Five Year Plan
64.	GAU	Gujarat Agricultural University
65.	GDP	Gross Domestic Product
66.	GEDA	Gujarat Energy Development Agency
67.	GFDP	Gujarat Forestry Development Project
68.	GGRC	Gujarat Green Revolution Company
69.	GHG	Green House Gas
70.	GI	Geographical Indication
71.	GIR	Geographical Indication Registration
72.	GIS	Geographical Indication system
73.	GIS	Geographic Information Systems
74.	GM cotton	Genetically Modified Cotton
75.	GM crops	Genetically Modified Crops
76.	GMS Cotton	Grams per Square Meter cotton
77.	GoG	Government of Gujarat
78.	GPS	Global Positioning System
79.	GSDP	Gujarat State Domestic Product
80.	GSWAN	Gujarat State Wide Area Network
81.	GSWDC	Gujarat State Wool Development Corporation
82.	GVC	Gujarat Veterinary Council
83.	HACCP	Hazard Analysis and Critical Control Print
84.	HDP	High Density Planting
85.	HDPS	High Density Planting System
86.	HPS	Hydraulic Power System
87.	HVI	High Volume Instrument
88.	HYV	High Yielding Variety

Sr No	Abbreviated Form	Full Form
89.	ICAR	Indian Council of Agriculture Research
90.	ICM	Institute Of Commercial Management
91.	BL	Blast
92.	BPH	Brown Plant Hopper
93.	GLH	Grassy Leaf Hopper
94.	GM	Gall Midge
95.	ICM	Integrated Crop Management
96.	ICT	Information Communication Technology
97.	IDM	Integrated Disease Management
98.	IFTC	Inland Fisheries Training Cum Demonstration Centre
99.	IMC	Indian Major Carp
100.	IMD	Indian Meteorological Department
101.	INM	Integrated Nutrient Management
102.	INRM	Integrated Natural Resources Management
103.	IPCC	Intergovernmental Panel on Climate Change
104.	IPDM	Integrated Pest And Disease Management
105.	IPM	Integrated Pest Management
106.	IRM	Integrated Resource Management
107.	ISFR	India State of Forest Report
108.	IWM	Integrated Weed Management
109.	IWM	Integrated Water Management
110.	JAU	Junagadh Agricultural University
111.	KVK	Krishi Vigyan Kendra
112.	LAN	Local Area Network
113.	LBF	Liquid Bio Fertilizer
114.	LCD	Liquid Crystal Display
115.	LED	Light-Emitting Diode
116.	LF	Leaf Folder
117.	LOI	Letter of Intent
118.	MA	Modified Atmosphere
119.	MAN	Metropolitan Area Network
120.	MIS	Micro Irrigation System
121.	Misc.	Miscellaneous
122.	MMRS	Multi-Mode Receiver System
123.	MoP	Murate of Potash
124.	MPEDA	Marine Products Export Development Authority
125.	MSP	Minimum Support Price
126.	MU	Mega Units
127.	N. A. U.	Navasari Agricultural University
128.	N:P:K	Nitrogen: Phosphorus: Potash
129.	NA	Not Available
130.	NABARD	National Bank for Agriculture and Rural Development
131.	NADEP	N.D. Pandharipande (also popularly known as “Nadepkaka”)
132.	NDC	National Development Council
133.	NFSM	National Food Security Mission
134.	NGOs	Non Government Organizations

Sr No	Abbreviated Form	Full Form
135.	NRM	Natural Resources Management
136.	NUE	Nitrogen Fertilizer Use Efficiency
137.	PCR	Polymerase Chain Reaction
138.	PERI	Poultry Extension and Research Institute
139.	PHCL	Plant Health Clinical Laboratory
140.	PHM	Post Harvest Management
141.	PL	Post Larvae
142.	POL	Petroleum, Oil and Lubrication
143.	PPP	Public Private Partnership
144.	PPV &FR	Protection of Plant Varieties and Farmers Rights
145.	PRI	Primary Rate Interface
146.	PRL	Pesticide Residue Laboratory
147.	Prod.	Production
148.	PSB	Phosphorus Solubilizing Bacteria
149.	QTL	Quantitative Trait Loci
150.	R&D	Research And Development
151.	RCTs	Resource Conservation Technologies
152.	RES	Renewable Energy Sources
153.	RKVY	<i>Rastriya Krishi Vikas Yojana</i>
154.	RTV	Rice Tungro Virus
155.	S.C.	Schedule Caste
156.	S.T.	Schedule Tribe
157.	SAP	State Agriculture Plan
158.	SAUs	State Agriculture Universities
159.	SB	Stem Borer
160.	SDAU	Sardarkrushinagar Dantiwada Agricultural University
161.	SHGs	Self Help Groups
162.	SIDP	State Infrastructure Plan
163.	SIRA	Sawant's Integrated Rice Agro Technology
164.	SLSC	State Level Steering Committee
165.	SMD	Sterility Mosaic Disease
166.	SPV	Solar Photovoltaic
167.	SRI	System of Rice Intensification
168.	SRR	Seed Replacement Ratio
169.	SSNM	Soil Solarization Nutrient Management
170.	SSP	Single Super Phosphate
171.	STLs	Soil Testing Laboratories
172.	SWC	State Warehousing Corporation
173.	SWC	Soil and Water Conservation
174.	SWOT	Strength, Weakness, Opportunity, Threat
175.	T & V	Training and Visit
176.	TDO	Taluka Development Officer
177.	TOF	Green Forest Cover
178.	TSI	Technical Support Institute
179.	TSP	Triple Super Phosphate
180.	TUF	Textile Up-Gradation Fund

Sr No	Abbreviated Form	Full Form
181.	TV	Television
182.	UV	Ultra Violet
183.	VAM	Vascular Arbuscular Mycorrhizal fungi
184.	VHT	Vapor Heat Treatment
185.	VLAW	Village Level Agriculture Worker
186.	WAN	Wide Area Network
187.	WBPH	White- Backed Plant Hopper
188.	WHO	World Health Organization
189.	WHS	Water Harvesting Structure
190.	WM	Water Management
191.	WTO	World Trade Organization
192.	WUA	Water User Association
193.	WUE	Water Use Efficiency
194.	YMV	Yellow Mosaic Virus
195.	Y	Yield
196.	Zn	Zinc

List of Measurement Units

Sl. No.	Symbol	Full Form of Unit
1.	@	At the rate
2.	A	Area
3.	C	Degree in Celsius
4.	cfu	Colony forming units
5.	cm.	Centimetre
6.	ha	Hectare
7.	kg	Kilogram
8.	Kg/ha	Kilogram/hectare
9.	m.m ³	Metre/cubic metre
10.	Mha	Million hectare
11.	MW	Mega Watt
12.	Nos.	Numbers
13.	Nos/ha	Numbers/ hectare
14.	Lit/kg	Litres/kilogram
15.	m.m ³	Milliliter/cubic metre (volume)
16.	q/ha or Q/ha	Quintal/hectare
17.	Qtls.	Quintals
18.	Sq km	Square kilometre
19.	sq. m.	Square metre
20.	T	Tonne
21.	M ²	Square metre
22.	T/ha	Tonne/hectare
23.	Y, Yld.	Yield
24.	G, g	Gram
25.	hp	Horse power
26.	KVA	Kilo Volt Ampere
27.	KW	Kilowatt
28.	Kwh/m ²	Kilo watt.hours/squaremetre
29.	M ³	Cubic metre
30.	MW	Mega Watt
31.	No.	Numbers

STATE AGRICULTURE PLAN EXECUTIVE SUMMARY

Seventy per cent of Gujarat State's population is either wholly or significantly dependent for their livelihoods on agriculture, horticulture, animal husbandry or fisheries. The Gujarat Government envisages agriculture promotion through focused agricultural research and dissemination of useful scientific knowledge at the farmers' door steps through technological interventions. Government of Gujarat rightly took several initiatives in the past to achieve the current agricultural growth rate of about 11% and thus has become the growth-engine for agricultural development in India, when the country's growth rate is less than 3%. Agricultural income of the state farmer has risen from ₹ 9000 to ₹ 80,000 crore in last 10 years. As per the agenda - VII of the 5th meeting of Gujarat State Level Steering Committee (SLSC) held on May 26, 2011, it was directed to prepare the Comprehensive District Agriculture Plans (XII five year plan) by the Agricultural Universities for all the districts under their jurisdiction. These plans present the vision for agriculture and allied sectors.

As per 12th FYP guide lines of RKVY, SAP and SIDP need to be prepared, for which, SLSC decided that SAP and SIDP should also be prepared by SAUs and the Vice Chancellor of Anand Agricultural University, Anand will act as a Nodal Officer. The points considered in preparation of State Agriculture Plan and State Infrastructure Development Plan are discussed here.

Major Agricultural Issues and Areas of Focus:

The major part of the Gujarat falls under varying climatic as well as soil conditions and has been divided into eight agro-climatic zones. The major issues and areas to be focused in the plan are:

- i. Integrated development of crop varieties and cultivation practices for major cereals, food, cash, fruits, vegetables and spices crops.
- ii. Enhancement of soil health, integrated nutrient management, use of organic and bio-fertilizers and integrated pest management.
- iii. Initiatives like integrated watershed management, drainage, rainwater conservation, ground water recharge, use of MIS should be focused to alleviate the problems like inland salinity and alkalinity, seawater ingress and climatic aberrations.
- iv. Development of mechanization by introducing improved tractors, machines, implements, equipments and tools. Increasing use of renewable energy i.e. solar, wind and bio energy in agriculture.
- v. Enhancement of horticultural production, high density cultivation and popularization of micro-irrigation systems. Food processing and value addition of produce; cold storage, handling, packaging, transportation and marketing of perishable produce (fruits and vegetables).
- vi. Good local breeds of cattle (*Gir* and *Kankrej*) and Buffaloes (*Jaffrabadi*, *Surati* and *Mehsani*) are reared, but needs breed establishment. Proper clinical care of animals, increased fodder production and feed management for increasing milk production.
- vii. Modernization of marine fish processing units and quality control as per HACCP norms for accelerating export at sea ports. Development of cage culture of commercial marine fauna. Development of inland fisheries by utilizing salt affected land and water by introducing diversified fish and shrimp fauna.

- viii. Strengthening of market infrastructure and marketing development.
- ix. Strengthening of infrastructure to promote extension services for farmers.
- x. Innovative schemes.

Methodology Adopted for Preparation of Comprehensive District Agriculture Plans:

The C-DAPs were prepared adopting participatory appraisal mode. All four SAUs of Gujarat were identified as Technical Support Institutes (TSI) for their working area. The TSI, under the guidance of respective Director of Research and Director of Extension Education, provided all necessary technical help to planning units and support groups for preparation of these C-Daps through participatory bottom-up process. The TSI trained the Planning Units/ Groups in designing formats for data collection, guided in data collection, analysis and conducted regular workshops for plan preparation. In coordination with Scientists/ Professors from SAUs and officials from Department of Agriculture, Horticulture, Animal Husbandry and Fisheries, District Panchayat, DRDA, BISAG, NABARD, ATMA, GVCL, Dept. of Disaster Management, Department of Irrigation etc, the task was fulfilled. The Taluka wise information was collected.

Formulation of District Planning Unit:

To facilitate the involvement of local representatives in the preparation of plans, planning units in each district were formulated. The composition of the district planning units was as given below:

- a) Director of Research & Dean PG studies, Associate Directors of Research, Director of Extension Education, Associate Director of Extension Education, Deans of various Colleges and scientists of related discipline.
- b) Coordinating staff from Directorate of Research and Directorate Extension Education.
- c) Officials of Line Departments from Agriculture, Horticulture, Animal Husbandry, Fisheries, District Panchayat and DRDA.

Meetings with stakeholders for proposed design, trials, front line demonstration (FLDs) and other activities in a farming system approach were discussed. The group identified the farmers' needs and constraints and subsequent changes proposed in management practices. The time frame of various activities and expected outcomes of five year plans were incorporated.

An indicative outline for the preparation of C-DAP:

- 1: A brief introduction to the District, its location, features, etc.
- 2: Main points of SWOT analysis of the District
- 3: Areas/ Sectors which need to be addressed in the district
- 4: Various on- going programs in the district- a brief contextual gist
- 5: The District Plan at a Glance.

Methodology Adopted for Preparation of State Agriculture Plan:

In this regard, a meeting was convened at AAU, Anand in September, 2014, inviting Officers from Gujarat State line Departments of Agriculture, Horticulture, Animal Husbandry, Fisheries, SAUs and *Kamdhenu* University. Looking to the requirement of various components of SAP and SIDP, total 34 committees were formed with a Convener from one SAU, Co-Convener from Line Departments of Gujarat state and two members from other SAUs. They were instructed to follow latest guidelines of RKVY for compilation of C-DAPs for their respective discipline. Few topics of common issues and infrastructure development were also identified for inclusion in SAP and SIDP. The necessary input provided by these committees were compiled and edited in various chapters which are summarized here.

Agricultural Scenario of Gujarat State:

Gujarat has geographical area of 19.6 Mha, out of which, 55.10 % is under agriculture land i.e.10.8 Mha. The major crops grown in the state are wheat, bajra, paddy, maize, groundnut, mustard, sesame, pigeon pea, green gram, gram, cotton and sugarcane. Bajra, paddy, maize, groundnut, castor, cotton, tobacco and pulses are the main *kharif* crops and wheat, mustard and rapeseeds are the main *rabi* crops grown in the state. The state has a wide range of cropping systems viz. Cotton-Wheat-Bajra, Mung-Wheat-Bajra, Cotton-Wheat-Mung, Cotton-Wheat, Groundnut- Wheat, Paddy-Wheat-Bajra, Paddy-Wheat etc.

Gujarat is the largest producer of castor, fennel, tobacco and *isabgul(psyllium)*, whereas it is second largest producer of sesame seeds, cotton and groundnut in the country. Gujarat has highest productivity in mustard, castor and cotton also has second highest productivity in groundnut and bajra, and third highest productivity in gram and guar in the country. Horticultural Crops are grown in about 14.04 lakh ha. The major Crops are mango, banana, sapota, lime, guava, tomato, potato, onion, cumin, garlic, *isabgul* and fennel. In the country, Gujarat has highest productivity in guava, potato, onion, cumin and fennel and third highest productivity in banana and *isabgul*. In 2001, Gujarat produced 23 lakh bales of cotton, but today the figure stands at 123 lakh bales (one bale equals to 170 kg).

Cereals Crops:

Cereals are grown on one third of cultivated land of Gujarat. Rice occupies about 7 to 8% of the gross cropped area of the state and accounts for around 14% of the total food grain production. It is grown on an average about 7.25 to 7.75 lakh hectares of land comprising nearly 55 to 60% of low land (Transplanted) and 40 to 45% of Upland (Drilled) rice.

Wheat is grown on 0.9 – 1.6 Mha that comprises 23 % of the land used for cereals. The average wheat production and productivity in Gujarat was 38.12 lakh T (2009-10 to 2011-12) and 29.96 q/ha respectively. The state has nearly 45.90 % of the area under irrigation, though the irrigated wheat comprises 94 % of the total area.

Pearl millet is a drought tolerant and thermo resilient cereal grown in the state. It is valued for both, its grain and stover due to high protein content, balanced amino acid profile, and high levels of iron, zinc and insoluble dietary fibre. In Gujarat, *Bajra* is grown in 19 out of 26 districts covering an area of 3.34 lakh ha in *kharif* with an average productivity 1035 kg/ha and around 2.85 lakh ha area under summer cultivation with an average productivity of 2545 kg/ha. Area during summer cultivation is increasing gradually due to short period of time window available to farmer after *rabi* crops, increased demand for fodder and congenial climatic condition.

Maize is a staple food and fodder of tribal people of eastern region of Gujarat and emerging as a raw material for maize based industries, viz. starch, protein, oil, ethanol (bio-fuel), poultry and animal feed including specialty corns (quality protein maize, sweet corn, popcorn and baby corn). Maize accounts for a little more than half of the production of coarse cereals. It ranks third after rice and wheat across the world and India in production.

Sorghum is another important food and fodder crop of dry land agriculture and ranks third in area and production after rice and wheat in India. The crop accounts for nearly 52% of the area and 63% of production under millets with an area of 15.8 M ha and a production of 11.85 T.

Other Crops like small millets comprising the small seeded cereal crops namely Finger millet, Little millet, Kodo millet, Foxtail millet, Banti and Cheena are grown in hilly areas of Gujarat. These small millets are the staple food especially of the tribals in Gujarat.

Oilseed Crops:

Gujarat plays a prominent role in oilseed production in India. Oilseeds are important next to food grains in terms of area, production and value in the state. These eight districts altogether account for

about 92.88 % of total area and 91.61% of production of groundnut in Gujarat. In Gujarat, groundnut is cultivated mainly in *kharif* season (rain-fed conditions) with low inputs and if available, with protective irrigations. In *kharif*, the pressure of diseases, insect-pests and weeds are high.

Sesame productivity in Gujarat (4.00 q/ha) is close to the productivity at national level (3.80 q/ha). One of the reasons for attributing to low productivity includes rain fed cultivation with the low resource input efficiency.

Soybean is a dual purpose crop for protein and oil. It is a draught tolerant, short duration, rain fed crop and is frequently cultivated as an inter-crop with major crops of the region. The area under soybean in the year 2011-12 was 0.42 lakh ha accounting total production of 0.33 lakh T.

Castor is an important industrial non - edible oilseed crop of arid and semi-arid regions. Gujarat is leading state in castor production in the country with 0.8 M ha cultivated area, which is about 60 % of total castor area of India and total production of 1.7 T, which is about 80 % of total castor production of India. India is a leading exporting country of castor oil and its derivatives of worth more than Rs. 4000 crore. The castor growing area in Gujarat is increasing day by day.

Mustard is an important edible oilseeds crop of arid and semi-arid regions. It is grown extensively in rain fed as well as in irrigated conditions. In Gujarat, mustard is grown in 2.14 lakh ha with 0.32 MT of total crop production. North Gujarat is the main mustard producing area. This crop accounts for 22.7 % of total oilseed production and 19.2 % of total cropped area in the country.

Pulse Crops:

Pulses not only provide nutritional security but also improve the soil health. India is the largest producer, consumer and importer of pulses. Different pulse crops are grown in the state with a total area of 0.9 Mha and are cultivated in all three seasons. Pulses cultivation is not distributed uniformly in the state. Pigeonpea is cultivated in south and middle Gujarat, Mungbean, Urdbean and Mothbean are predominant in North Gujarat and Gram is distributed throughout the state. Cowpea and Mungbean are grown in summer season in middle and north Gujarat. As far as pulses production is concerned, Gujarat occupies seventh position in India.

Cash Crops:

Gujarat has glorious past and glittering present ahead of all the states on the national map of cotton production and /or productivity. Cotton is cultivated in all the districts of the state except Valsad, and Dang. Nearly 33 % cropped area of the state is occupied by cotton, which played pivotal role in economy of the state providing employment to rural people. Increasing area of Bt hybrid cotton year by year reaching to the record of 30 lakh ha in 2014-15 might be due to (a) low cost of cultivation, (b) resilient to pest and diseases and (c) high revenue.

Sugarcane is an important cash crop in India having economical, political and sociological significance. It is a major source of food, fuel, fodder and fiber. Sugar industry is the second largest agro industry next to textiles. Sugarcane is a tropical crop and is cultivated in 0.18 Mha, producing 13.3 T of cane at approximately 71 T/ha in Gujarat.

Integrated Pest and Disease Management (IPDM):

Integrated Pest and Disease Management (IPDM) programs allow growers to monitor pests and diseases to ensure crop health. This requires long-term strategies for the minimization of pest and disease occurrence preferably by enhancing natural control mechanisms for growing a “healthy crop”. Specific measures include the use of disease- and pest-resistant crops, rotation of

crops, including those with pasture, to provide disease breaks for susceptible crops, apply non-chemical control practices (thermic, mechanical) as applicable and as last resort, the tactical use of agrochemicals to control weeds, pests and diseases.

Soil Health:

Soil health needs to be assessed at regular intervals so as to ensure that farmers apply the required nutrients while taking advantages of the nutrients already present in the soil. Soil is a living and life-giving natural resource. A Soil Health Card displays soil health indicators and associated descriptive terms. In this direction, Gujarat is the first state in the country to issue Soil Health Cards to the farmers for increasing the resource use efficiency and for sustaining agriculture productivity. Till now, the soils of 42 lakh farmers have been tested and 31 lakh soil health cards have been distributed, which is a record in itself.

Bio-fertilizers:

Bio-fertilizers are microbial inoculants containing live or latent cells of useful strains of microorganisms. They are used for enhancing productivity of the soil. They fix atmospheric nitrogen and solubilise/mobilize phosphorus and potash. Also, they stimulate plant growth through synthesis of plant growth promoting substances and/or antibiotics. This highly efficient and low cost technology of bio-fertilizer application has an important role to play in increasing agricultural production.

Organic Farming:

Gujarat is bestowed with lot of potential to produce all varieties of organic products due to its diverse agro-climatic regions. In several parts of the state, the inherited tradition of organic farming is an added advantage. This holds promise to fetch the premium price to the organic producers by tapping steadily growing domestic and international markets of organic produce.

Horticulture Crops:

Horticultural crops contribute to about 20% to total Agricultural economy of the State. The major vegetables grown in Gujarat are onion, potato, brinjal, tomato, okra and cucurbits. The State also produces spices viz. cumin, fennel and garlic. The productivity of onion, tomato, banana, potato and pomegranate in the state is leading at national level. The state also introduced new horticulture crops like cashew nut, pamaroza, sweet orange and medicinal crops.

The major fruit crops grown in Gujarat are banana, mango, citrus and sapota (*Chiku*). The area and production of fruit crops has increased, however, the productivity needs improvement. At present, Gujarat contributes 23.11% papaya, 20.22% sapota and 13.36 % banana production of India with second rank in banana and third in pomegranate productivity. Nearly 19.50 % cropped area of the state is covered by the fruit crops. Availability of flowers increased significantly in the cities, as indicated by number of florists and export of cut and dried flowers. The area under cultivation of flowers is very less as compared to other horticultural crops. The major flower crops grown near the city area are rose, marigold, mogra and lilly. Flowers like carnation, gerbera and rose for cut flowers are also cultivated by using hi-tech greenhouse technology in some of the districts.

Spices:

On an average, seed spices are grown on 4.2 lakh ha of land. Gujarat is the leading state for producing cumin and fennel. The share of Gujarat for cumin and fennel is 63 and 73 per cent in area and 73 and 92 per cent in production. Gujarat ranks first at National and International levels in average productivity. The state has also wide range of cropping systems viz. Jowar/Bajra-seed spices, Mung-cumin/fennel, Sesamum-seed spices etc.

Soil and Water Management:

Growing world population and increasing standard of living are placing tremendous pressure on soil and water resources and necessitated for judicious utilization and management of these resources without adverse environmental consequences. Soil degradation and water quality deteriorated due to overexploitation of these natural resources, coastal land inundation from sea tidal water and falling water table enriched with salinity of ground water and soil. Hydro-climatic extremes, low irrigation efficiencies, low water productivity added another dimension to low productivity in irrigated and rain fed agriculture. Necessary low cost, eco-friendly technological soil and water interventions are necessary for sustaining productivity of water and soil.

Gujarat Government has created history in water conservation by constructing more than 3.5 lakh check dams, *boribundhs* and *khettalavadies* (farm ponds). The water conservation work was carried out by various state Govt. departments in cooperation with NGOs and the private sector during last 10 years, which has brought up the ground water level throughout the state and increased the agriculture income by four folds. On behalf of Government of Gujarat, GGRC as an implementing agency aims to promote Micro Irrigation System (MIS) to bring 2nd green revolution. MIS saves water and energy, besides multiple benefits to improve agricultural productivity and farmer's prosperity at large. Till date, more than 35 lakh ha area is brought under MIS in the state.

Farm Mechanization:

Farm mechanization has been helpful in improving productivity of different crops, time saving, reducing drudgery, timely farm operations, resource conservation and protection from natural calamities. Use of crop harvesting machines ensures early completion of harvesting and threshing works which avoids the untimely rainfall and storms hazards particularly in wheat. Seed grader, laser leveler, bed planter, etc needs large scale adoption. There is a need to create more awareness among farmers for proper use of tractors/ farm machineries for higher efficiency, saving human and energy resources etc.

Animal Husbandry:

The livestock sector, especially dairy farming, regarded as power house of growth, is most vibrant in Gujarat. It plays pivotal role in rural livelihood, nutritional security and national economy by contributing significantly to agricultural gross domestic product. Cattle and buffaloes contribute to food and nutritional security through milk, provide draught animal power, manure for crop production and various raw materials for several industries. The status and progress in dairy husbandry sector has been directly or indirectly affected by a number of factors viz., breeding and health coverage programs, various inputs, infrastructure facility and change in demand and price of livestock products.

Gujarat ranks 10th and 12th in egg and poultry meat production respectively in the country. In view of modernization, ever changing life style and demand of quality protein resources, there is tremendous scope for development of poultry farming in the State through improvement in production, infrastructure, better inputs and services, training to youth and women and organized marketing networks.

The small ruminants provide livelihood opportunities for marginalized section of society hence emphasis is placed on capacity building of these stakeholders for scientific sheep and goat rearing. Gujarat is privileged to possess five recognized breeds of goat and one recognized breed of sheep.

The contribution of milk alone is higher than the major agricultural crops like paddy, wheat and sugarcane. Nonetheless, contribution of gross value output from livestock to agriculture

and livestock sector improved consistently from 15% in 1981-82 to 23% in 2011-12. Total 42.66 lakh families keep livestock as primary or secondary source of income and contribution of gross value output from livestock to Total GSDP was estimated to ₹ 30.24 crore. In Gujarat, livestock sector has achieved remarkable milestone of over 103 lakh T annual milk production in the year 2012-13. Collective efforts of Government organizations, Non-Government organizations and the farmers have resulted into sustainable and steady growth of livestock sector and the consumption of livestock products is growing faster than the cereals.

Gujarat state has diversity of more than 18 domestic animal breeds. Milk production in Gujarat grew at a higher rate than that of a nation and hence the contribution of state in national production increased from 6.5% to 7.5% during last 15 years. The demand for milk and milk products is expected to grow rapidly with the rise in per capita income both in Gujarat as well as in India. The livestock sector plays important role in rural economy through employment to uneducated youth and woman and income generation amongst landless laboureres and marginal farmers especially in semiarid districts of north Gujarat.

Fisheries:

Gujarat is endowed with a wide range of marine and inland aquatic resources. Gujarat occupies first position in production of marine fish (0.71 T/year) with a share of 24 % in total production of the country. Value of fish production is ₹ 1200 crore per annum and export worth ₹ 390 crore. In inland fisheries, catla, rohu, mrigal are the major fish varieties. The state has a long coastline extending to 1600 km, a continental shelf area of 0.18 million km², Exclusive Economic Zone (EEZ) of 0.214 million km², rivers and tributaries extending to 3865 km, reservoirs of 0.286 million ha, ponds and tanks of 0.071 million ha and brackish water area of 0.376 million ha. Gujarat occupies 32% of the continental shelf area and 10% of the total EEZ of India. Inland fish production is 8-10 % of total fish production of the state.

Forestry:

Trees play a vital role in improving air, water quality and provide variety of ecological, environmental and social benefits. Gujarat has got second rank for maximum tree cover area (8,358 sq km) after Maharashtra (9,142 sq km). Enhancing forest and tree cover results in mitigating the climate change by absorbing CO₂ from the atmosphere and turning into biomass.

Extension and ICT Initiatives:

Information and Communication Technology (ICT) accelerates sustainable agricultural development and enhances productivity. Promoting Agricultural Information Systems programs like *Krushimahotsav*, trainings, demonstrations, exhibitions etc enhance the dissemination of agricultural research information at grass root level.

The then, Hon'ble Chief Minister of Gujarat, Shri NarendraModi had initiated a mega event *Krushimahotasav* for dissemination of agricultural and allied field technologies to the farmers in Gujarat. In a month long *Krushimahotasav*, the government officials, agro-scientists and experts from SAUs are visiting all the villages of the state with informative *Krushirath* to give scientific information about farming practices to the farmers. During *Krushimahotsav*, intensive animal vaccination and animal health camps programs are held every year across all the villages.

Energy Use:

In Gujarat, under '*Jyoti Gram Yojna*', villages are getting round the clock uninterrupted electricity supply that covers 18,065 villages and 9,680 suburbs. The farmers are getting 8 hours per day assured 3 phase power supply for irrigation. Gujarat's advancement in the field of solar energy is also encouraging; the state has dedicated 600 MW of solar energy to the national grid,

while the rest of the country is producing only 120 MW of solar energy. The solar park set up at *Charanaka* village will be the Asia's largest and innovative canal-top solar power project, which will save about one crore litres of water per kilometre from evaporation annually and would save 16 % of electricity and land for farmers.

Marketing:

The State has strong cooperative credit & marketing structure, along with 213 cold storages having 9.50 lakh tonne storage capacities. About 42 Fruit and Vegetable Co-operative Marketing Societies and 197 Agriculture Produce Market Committees (APMCs) deal with selling and buying of horticulture produce in the State. The State of Gujarat has strength in agro based industry in terms of natural resources, established industrial base, skilled labour force, enterprising farmers, network of market yards and other requisite infrastructure like airport, seaport and extensive road & railway network.

Post Harvest Management and Value Addition of Horticulture Crops:

Horticulture accounts for more than 25 per cent of the agricultural GDP. In the production of fruits and vegetables India has attained global supremacy, occupying the first and second positions, respectively. According to recent estimate, horticultural Crops occupy 10% gross cropped area (17.95 Mha) with a production of about 214.73 million T. Fruit's production is 79.97 million T from an area of 9.5 Mha while that of vegetable's production is 129.1 million T from an area of 7.9 Mha. Despite a huge production of horticultural commodities, only about 2.4 % is utilized for processing purpose which resulting huge post harvest losses of 20-30 % amounting more than Rs 65000 crore. The major cause of post harvest loss is availability of poor infrastructure for post harvest management (PHM) and processing of commodities. These losses can only be minimized by proper handling, marketing and processing of the agricultural commodities. There is an urgent need to address these issues for loss prevention and value addition.

Animal Health:

The provision of veterinary services is a key component to the success of farm operation. There is a direct correlation between quality livestock production and veterinary medical services to animals. An advice to the animal keepers on proper herd health management practices such as proper de-worming, vaccination, nutrition, environmental sanitation, disease prevention and control and treatment of animal illnesses are very critical issues.

Agricultural Scenario of Gujarat State:

The Gujarat state is located between latitude 20.1⁰ N and 24.7⁰ N and longitude 68.4⁰ E and 74.4⁰ E. The tropic of cancer passes through Gujarat state. The state has geographical area of 19,60,924 sq. km. accounting for 6.19% of total geographical area of India with costal line of 1600 km. Gujarat shares borders with the state of Rajasthan to the north, Madhya Pradesh to the east, Maharashtra, Union territories of Diu, Daman, Dadra and Nagar Haveli to the south and international border with Pakistan to the north-west. The state is bounded to southwest by the Arabian Sea with Gulf of Khambhat and Kachchh.

Gujarat is divided into three physiographical regions **(1) Mainland Gujarat:** The main land plains extend from the *Rann* of Kachchh and the Aravali hills in north to Damangangar river in south. **(2) Kathiawar peninsular:** Covers irregular highland regions with central elevated core part. The slopes dissected by rivers flowing in all directions. The principal regions are *Shetrunji*, *Bhadarand Aji*. **(3) Kachchh region:** It is mainly *Rann* area. Gujarat is divided into eight Agro climatic zones. In North Gujarat weather is marked by a dry and arid climate; whereas in the south, one can find a moist weather owing to the Arabian Sea and the Gulf of Cambay.

Normally, the Gujarat weather is divided into four major seasons:

- Winter season (December - February)
- Summer season (March - May)
- Monsoon season (June - September), and
- Post monsoon season (October-November)

Winters in Gujarat are mild, pleasant and dry. The day temperature in winter is around 28.3 C and at night is 11.6 C. Summers are extremely hot, with the day time temperature being 46.1 C, and the night temperature being 32.2 C. In Gujarat, monsoon is generally hot and utterly humid. The temperature at day is 37.7 C but at night it falls down to 26.6 C. Sometimes severe flood also occurs in some parts of the region during monsoon. Rainfall in Gujarat varies from place to place the average rainfall varies from 33 to 152 centimeters. The northern region receives a rainfall ranging from 51 to 102 centimeters; whereas the southern region receives 76 to 152 centimeters of rainfall. Rainfall in the southern regions of Saurashtra and the Gulf of Cambay is low compared to the other parts of Gujarat. The hot arid region around the *Rann* of Kachchh faces an acute scarcity of water, due to frequent low rainfall in these areas.

District-wise Annual Average Rainfall (mm), rainy days, maximum and minimum temperatures of Gujarat are shown by maps. Based on soil characterization and rainfall, eight agro climatic zones in Gujarat have been identified:

- Zone- I South Gujarat (Heavy Rainfall Area)
- Zone-II South Gujarat
- Zone-III Middle Gujarat
- Zone-IV North Gujarat
- Zone-V North West Zone
- Zone-VI North Saurashtra
- Zone-VII South Saurashtra
- Zone-VIII Bhal and Costal area

As per Census, 2011 the population of India was 121.06 crore (62.31 crore males and 58.74 crore females). The population of Gujarat was 6.04 crore (3.15crore males and 2.89 crore females) comprising rural population of 3.47 crore and urban population of 2.57 crore. Gujarat accounts for 4.99 % of the population of India. The literacy rate is 78.0 %. In rural areas the literacy rate is 71.7 % and in urban areas it is 86.3%. The male literacy rate is 85.8 % (Rural 81.6 %, Urban 91.0 %) which is higher than the female literacy rate of 69.7 % (Rural 61.4 %, Urban 81.0 %). Similar data for SC and ST are also presented.

Total geographical area of the state is about 196.24 lakh ha and reported area of the state is 188.12 lakh ha which comprises of forest area, non-agriculture, net area sown, cultivable waste land, barren land, permanent pasture, land under misc. trees and crops, current fallow and other fallow. District-wise land utilization is also reported. Irrigated, Un-irrigated Land Water Resources of Gujarat are shown by map. Soil fertility indices in terms of availability of Nitrogen, phosphorous, potassium, copper, iron, zinc and manganese in different parts of Gujarat are shown by different maps.

Season and crop-wise area, production and yield of food and non-food crops for the Year 2008-09 to 2010-11 and average of three years are reported. District-wise average area, production and productivity of fruit and flower Crops for the year 2008 to 2011 are given.

The state is possessing 79.77 lakh cattle and 87.74 lakh buffalo .These bovine have produced over 103 lakh tonne annual milk production in the year 2012-13. Per-animal productivity

of indigenous cows, crossbred cows and buffaloes during the year 2012-13 is estimated to be 3.9, 8.8 and 4.8 kg per day, respectively. Gujarat has total livestock of 199.39 lakh with a cattle population of 67.49 lakh. It has 72.36 lakh poultry. In dairy sector, Gujarat has 12 District Milk Producers' Unions, 10,725 Milk Cooperative Societies, 20.84 lakh members of milk cooperatives. District-wise population as per Livestock census of 2003 and 2007 for milch animals and poultry are given. District-wise current population of cows and buffalo with total milk production is reported. In last decade, Gujarat's milk production has risen by 68 per cent and reached to 150 lakh litres/day. Animal Husbandry has been making significant contribution to State's Agriculture GDP amounting to 23.5 per cent of share of Gujarat and has very well developed dairy sector.

District-wise and Category-wise as per type of fish Inland and Marine Fish Production for 2008-09 to 2012-13 are given. Item-wise/Species-wise Foreign Export of total quantity and value of fish and fish products from Gujarat (2008-09 to 2012-13) are also reported. The state has 23 wildlife sanctuaries and 4 National Parks covering about 9.05 % of the total geographical area of the State.

SWOT Analysis:

A SWOT analysis is the first step in strategic planning. This is a modern structural planning management method/technique/base to analyze the Strength, Weaknesses, Opportunities and Threats of any business sector in order to make the venture more productive and efficient. The SWOT analysis has been attempted first for the state economy, as a whole and then for the agriculture sector as well as allied sectors like horticulture, agriculture engineering, agricultural marketing, animal husbandry, dairying, fisheries etc.. Overall SWOT analysis is summarized here from chapter 3.

Strength: The major strength of the State are:

- Varied agro-climatic zones with different varieties of soil and crops
- Predominance of non-food, high value crops like *cotton, castor, tobacco, Isabgol, cumin, fennel, mango groundnut, banana*
- The productivity of castor in state is highest in world.
- Leading state for groundnut area, production and productivity
- Well established forestry department and agriculture department with field staff up to taluka and village level
- Well established research and extension network
- Enthusiastic and highly entrepreneurial farmers
- Longest sea coastline
- Well-developed infrastructure
- Higher yield potential and productivity of mustard
- Congenial single window agro industries policy
- Well-developed co-operatives
- Dominance in milk sector
- Well established research and extension network
- Good governance + original initiatives
- Relatively strong marketing network
- Recent attention to post harvest management

- The State is endowed with favorable agro climate and abundance of natural resources for diversified agriculture production
- Highly productive soils with predominance of fertile alluviums which are responsive to different inputs and management practices.
- Well-developed irrigation infrastructure facilitating higher cropping intensity potential for further development especially of ground water resources.
- The technologies of crop production are also constantly changing due to research and development activities of the SAUs in the state. Constantly changing technologies are the essentials for agricultural development.
- Well-developed agro-based cotton and sugar-industries added Strength: for the rapid growth of the economy.
- People in the state are always industrious and hard-working and hence a science based technological back-up can go a long way in improving agricultural production.
- The rail as well as road transport system, which are essentials for agricultural development, are also well – knitted in the state
- Both urban and rural electrification is almost 100 percent in the State and acts as the catalyst for the growth of the State economy.
- As the urbanization and industrialization is on the accent in the recent years, the demand for quality agricultural products and protective foods like milk, fruits and vegetables is getting increased. These indicate the opportunities for increasing the yield per acre, the milk production, vegetables and fruits production etc. in the years to come. The demand for ready to cook as well as ready to eat foods is also increasing. Thus, there is ample opportunity for the agri-processing units to flourish in the years to come in the State.
- The agricultural and allied sector development department in the state are also well equipped with technical human power and the much needed infrastructure, to keep agricultural development going.
- Available surplus in Spices, Onion and Cucurbits and strong production base for horticulture crops especially fruits and vegetables with scope for further development, processing and value addition.
- Additional sources of income to farmers from animals and easy marketability for fluid milk and its by-products and heavy demand
- Suitable climatic condition and the local breeds and low input requirement
- Easy flock / herd management
- Sizable sheep and goat population and
- Availability of waste lands and fallow lands
- Sizable cattle population in the State
- Readily available bank credit
- Largest milk producer with highest milk production growth
- Strong successful cooperative dairy
- The innovation of cost effective post-harvesting equipment has been under taken by the universities which satisfy the needs of farmers.
 - Many leading agro processing equipment and machinery manufacturers are also located.

- Number of tractor users is much larger than the number of tractor owners and relatively few farmer's depend on draught animals and labour alone for power.
- The multi-farm use of tractors and farm equipment has already become a common practice.
- Good draft cattle are available for mechanization of crop production operations using animal drawn equipment.
- Lot of scope for cultivation of cereals, oilseeds and pulses organically.
- HYVs available with different grain types and different maturity duration.
- A number of promising varieties for different ecological situations for choice of farmers.
- Feasibility of summer cultivation of many cereals with high yield potential and high productivity per day.
- The diseases and insects pest pressure is in general at a very low profile.
- High productivity of wheat/day
- Better chapatti & bread quality of wheat
- Bajra is C4 type crop so have high biomass productivity.
New high yielding varieties of bajra are available.
- Low cost sesame and soybean crop, fitting well with inter-cropping system
- Highly protein rich with good amount of oil containing castor crop
- Mustard is suitable to fit in various cropping sequence, inter / mix cropping
- Congenial atmosphere of soil and climate for mustard crop.
- Mustard is suitable for rain fed as well in irrigated conditions and for salt affected soils
- Favourable soil and climate for production of different fruit crops like banana, mango, papaya and citrus as well as flowers like rose, tuberose, marigold, golden rod, lilly, etc.
- Leading state in Kesar mango production and is being famous at international level.
- Lot of scope of organic mango cultivation, production and its export
- Geographical Indication Registration (GIR) No. 185 was made for Kesar mango as "*GirKesar Mango*"
- Fruit and flowers are highly remunerative cash crop
- Early harvest and six to seven times more yield and high export potentiality as compared to field crops
- Our state being blessed with the unique gift of nature due to diverse climates and distinct seasons. It makes possible to grow an array of vegetables whose number exceeds thirty.
- Seed spices have greater potential to grow in arid and semi-arid regions
- Seed spices are short duration in nature and less requirement of inputs
- High remunerative and dominant foreign exchange earnings by spices crops
- Less risky crops like ajwain and dill seed
- The state has vast scope for increasing the forest area due to various climatic situations through social and agro-forestry
- Large number of well-established forest nurseries are readily available for supply of good planting materials of valuable species
- Leading state in cotton production and productivity, lot of scope of organic cotton cultivation as well as hybrid (Bt and non Bt) seed production

- Cotton is high remunerative cash crop in irrigated area and having black fertile soil which is most suitable for cotton
- Cotton is amenable to cultivate in all kinds of soil and topography
- Sugar factories are 100 % in Cooperative basis.
- Sugarcane survive in different agro climatic conditions
- Gujarat is High recovery and high productivity zone for sugarcane.
- High quality and improved nutrition providing food and environmental safety
- Improved soil health and sustainable crop production
- Premium prices and preserves traditional varieties
- Availability of ample solar and wind energy round the year
- Good transportation, port and marketing facilities attract many industries in the state
- Good potential of exportable fish fauna, marine fish catching and fish processing industries.
- **Energy Security:** Abundant renewable sources like solar, wind and biomass for energy generation. Conversion of organic waste into fuel will lead to energy security.
- **Food Security:** The energy security will help to improve farm productivities, handling, storage and processing activities in rural area causes food security for the nation.
- **Pollution Control:** The renewable energy sources are eco-friendly reduces greenhouse gas emission and helps in arresting depletion of the ozone layer.
- **Rural Sanitation:** With proper management of animal and other agriculture/organic wastes/village will be clean leading to better health and hygiene in rural areas.
- **Reducing Drudgery:** Rural families particularly women would benefit from reduced drudgery and saving time from collecting wood and water from long distance and minimizing health hazards of cooking in Smokey kitchen.
- **Employment generation** Creates jobs especially in rural areas so helps to reduce migration to city.
- **Socio-Economic Up-liftment:** The energy security creates better income, facilities and an additional distribution channel for agricultural products and rise the income for farmers hence improves socio economic status of the rural people
- **Subsidies:** Feedstock production for energy purposes can reduce agricultural premiums and subsidies.
- More than 40 recommendations for farming community on use of bio-fertilizers in various crops by SAUs to curtail cost of cultivation with yield increase as well.
- Recommendations on AAU native BF bacterial cultures in different agro-climatic zone of Gujarat for farming communities:
 - Strong extension institutional setup and technically skilled human resources
 - The training and visiting (T & V) of extension
 - Well established agri-clinic , KVKs, SHGs, ATMA and DOA and convergence work
 - *Krushimahotsav*
 - Centre for excellence in environment, climate change, weather forecasting and agro-advisory services
 - Agro-meteorological database at Anand
 - Eight agro-met advisory service centres of IMD, one in each agro-climatic zone

Weaknesses: The major weakness of the State are:

- 70% area depend on rain : After completion of *Sardar Sarovar* Project it will be 49%
- Uneven distribution of rain : *In Kachchh – 400 mm & In South Gujarat -1500 mm*
- Drought prone area
- Arid and semi arid area : *19.61% & 9.46% Respectively share in India*
- Declining land holding
- Saline and water logged area
- Low technology assimilation capacity in rural areas
- High cost of power
- Flood /erosion
- Adverse impact on soil health and productivity due to imbalances in fertilizer application coupled with intensive agriculture. Application of organic fertilizers is very low with less than 10% area coverage
- Inadequacies in availability of quality seed/plant material for all the major crops grown in the State resulting in low levels of seed replacement
- Post-harvest glut in commodities and price crashing
- Fragmented Processing industry, total dependence on other states like Punjab for meeting the seed potato requirements. Absence of exclusive cold storage facilities for seed potato affecting seed quality and viability
- Though the State is a major producer of fruits and vegetables, inadequate post harvest handling and cold storage facilities for perishable horticulture produce including potato is resulting in seasonal gluts and distress sales besides huge losses.
- Shortcomings in marketing, absence of adequate ice plant and cold storage facilities at the production point.
- Lack of adequate demand for processed fruit and vegetable products and infrastructure facilities for processing value-added products.
- Inadequate network of extension machinery in the State.
- Unorganized / conventional slaughtering methods
- Pricing of sheep by subjective assessment and exploitation of farmers by the Middleman
- Inadequate grazing land / seasonal grazing in cropped fields during off-season.
- Unrecognized breeds of goat / sheep in the State
- Non-availability of veterinary aids within the easy reach of sheep/goat farmers
- Lack of quality germplasm
- Lack of technological interventions
- Lack of scientific method of feeding, breeding and health management
- Scarcity of fodder
- Improper / insufficient housing leading to low productivity and disease problems
- Creation of social problems due to indiscriminate grazing at the gardens of neighbours
- High susceptibility to mastitis due to nomadic type of herd farming Indigenous non-descriptive cattle population with low milk productivity account for 70% of the cattle population due to non availability of Quality animals with better productivity.

- Potential for commercial ventures in poultry farming is not fully exploited
- Low milk productivity Poor veterinary services
- Lack of data on dairy sector
- Poor raw milk quality
- Lack of Good dairy practices
- Low dairy plants efficiency
- Most of the fruit crops are highly season-bound and hence the year-round production is not possible.
- Capacity and facilities for manufacture and repair and maintenance of farm machinery are inadequate.
- Extension and training programs to acquaint the farmer with agricultural mechanization, to carry out farm machinery demonstrations, to help the farmer in the selection of farm equipment and train him in its operation and maintenance and to train rural/small town artisans in repair and maintenance of farm machinery do not exist.
- The Department of Agriculture is short of well trained and experienced agricultural engineering experts to plan and execute agricultural mechanization programme.
- R&D programme in agricultural mechanization is very limited.
- Injudicious (unwise) use of insecticides / pesticides eradicates the beneficial insect pest creating an imbalance in the ecosystem.
- Short & mild winter in Gujarat unsuitable for wheat
- Poor coordination among consumers, produces, millers, processors and trades
- Products of bajra have rough texture so less prefer by consumer.
- Abrupt rise in temperature at sowing time and maturity in mustard causes drastic yield losses
- Stringent rules and regulations for logging, harvesting and transpiration of wood based products from agro-forestry
- Complex genetic constitution and seed loose its germinability in very less time
- Sugarcane is long duration crop
- Non-synchronous flowering and maturity in most of the grasses and legumes.
- High cost involved in seed production of fodder.
- Productivity gaps, inadequate processing unit and lack of established markets for organic products
- Low R&D investments on organic farming research
- Poor infrastructural facilities at Taluka places
- Extensive R & D is required to make compatible with conventional energy.
- There is lacking of scientific and technical manpower at State to carryout qualitative R & D work and produced sufficient number of skilled manpower to meet the target. Needs to find and train the staff members in quite restricted local conditions.
- Bio-fertilizers yet not reached to the end users effectively. Hence, Needs district-wise, set up of Bio-fertilizer production plants to make them available to the door step of farmers.
- Less access to information from different sources (TV, Radio, Folders, Articles etc...)
- Less number of farmers interest group in village level
- Insufficient attention towards extension personnel's

- Lack of long period climatic data of taluka and districts
- Lack of standard agro-meteorological observatories at all research stations
- Lack of trained manpower for meteorological observation and analysis
- Lack of knowledge on weather variability and climate change
- Lack of knowledge on impact of climate change on agricultural production
- Lack of knowledge on understanding of weather forecasting
- Lack of coordination in climatic data sharing
- Inadequate data on environmental health monitoring
- Uneconomic size of very large number of marginal and small farms and poor economic status of the farmers and the low literacy level among farmers affect the full adoption of scientific technologies.

Opportunities: The major Opportunities of the State are:

- GM crops, Biotechnology
- Horticultural development
- Agri export zone : *Groundnut, Potato, Castor, Isabgul, Fruits. Datepalm, Duram wheat etc*
- Organic farming: Special Zone, Market for organic product
- Agro processing industries : *Cotton, Oilseed, Tomato, Cumin, Isabgul, Castor, Papaya, Fruits & Vegetables*
- Export potentiality : *Cotton, Cumin, Onion, Garlic, Castor, Isabgul, Mango, Other fruits & vegetables , Flowers, Duram wheat, Processed maize etc*
- May be exploited as quality groundnut zone
- New high yielding varieties are available for major crops.
- Corporate and contract farming
- Investment in agriculture sector : Private Market, Terminal Market, E-market
- IT network
- Public – Private partnership, NGOs work
- Use of solar energy in agriculture, Benefit of natural resource
- Better organic input supply through development of ‘Organic Inputs Production Hubs’, promotion of FYM and vermicomposting at farmers’ fields
- Rational utilization of ground water resources through adoption of micro irrigation system. Promotion of rain water harvesting structures for ground water recharging and supplemental irrigation.
- Augmenting seed production through promotion of seed villages for production of certified seed with centralized processing/quality control facilities at block /district level.
- Export market potential can be tapped further especially for flowers, fruits and vegetables.
- Installation of agri-processing units can be taken up at an early date
- Scope in area expansion of fruits crops
- Potential to increase production and export of Banana, Mango, Potato, Onion, Cumin, Fennel & *Isabgol*
- Vast potential for cultivation of medicinal and aromatic plants

- Shifting consumer preference
- Season-bound production, highly perishable nature of products and the year round demand provide excellent opportunity for the agro-processing entrepreneurs.
- Crop diversifications from low-return field crops to high-earning crops and raising the horticultural crops are the other possible opportunities.
- Adoption of technology interventions by illiterate shepherds
- Constantly increasing demand for milk and milk products from both domestic and export markets.
- The performance of genetically up-graded non-descript local breeds are quite promising in terms of increased milk productivity
- Technology empowerment on scientific dairy farming among farmers / rural women to boost milk production.
- Large rural market
- Increasing quantity of available milk for processing
- changing life style and preference for milk and milk products,
- Ample of demand for the quality fresh perishable production in the State.
- Efficient irrigation techniques like drip irrigation, production techniques like raised bed cultivation and precision in seed placement and application of fertilizers and plant protection chemicals will not only increase production but also improve the quality of produce and reduce the expenditure on cash inputs.
- Keeping in view the small holding nature where individual ownership of farm equipment is not a feasible and viable proposition, the concept of **“Farm Machinery Hub”** has wide opportunities in the state.
- Feasibility of inclusion of legume crops for sustainable soil fertility in Paddy-Wheat cultivation.
- To mitigate the harmful effects of methane gas (CH₄) **methanogens** (harmful methane (CH₄) producers) and **methylootrophs** (beneficial methane (CH₄) suppressors) micro flora are available in the low land paddy soil.
- May be exploited as quality wheat zone
- New quality durum varieties of wheat are available
- Alternative uses of bajra for poultry and animal feed and value addition of fodder through chopping.
- Bajra as a iron rich food in the scenario of iron deficiency in normal diet.
- Possibility of exploitation of sorghum for industrial use, particularly in sugar industries.
- Vast scope of exporting soybean and its preparations
- Soybean gives good quality oil.
- Mustard based cropping sequence is best suited sequences, possess higher yield potential
- Cereals, oilseeds and pulses fodder for supplement of fodder.
- Develop water harvesting structure in rain fed area for promotion of arid/minor fruit crops.
 - Scope for increasing production through high density planting (HDP) in fruit crops
 - Up gradation of post-harvest processing and marketing network and facilities for fruits and vegetables

- Scope for mechanization and use of renewable resources for fruits and vegetables
- Strengthening research for good quality production of fruit and flower crops
- As against the per capita per day requirement of 300 g by WHO, the present intake and availability of vegetables is only 170 g.
- Government of Gujarat declared Middle and South Gujarat as Agri Export Zone for vegetables and fruits as this area has assured irrigation facilities.
- Vegetables are fit for precision farming, protected cultivation and other high tech Olericulture practices.
- Spices have long range of value added products and have high medicinal value
- Fast growing demand spices crops are in domestic as well as international markets
- Increasing area under forests through plantation in community lands, agro-forestry and urban forestry
- Wasteland or unused lands of agriculture can be improved through plantation establishment
- Establishment of windbreak and shelter belt in the farm to protect crops against wind and soil erosion
- Promotion of wood/plywood industries and high value tree plantation
- Introduction of new short rotation tree species for agro-forestry
- Development of suitable agro-forestry models in different agro-climatic zones
- Potential for higher income generation and livelihood promotion
- Promotion and value addition of forest products from agro-forestry
- Research scope in development of compact, long staple, GMS cotton and Bt stable variety through tissue culture, breeding and biotechnology approach
- Research scope for increasing domestic consumption of cotton through innovative research and upgrading textile handloom and power loom sector.
- Growing forage crops as sole crop or in existing cropping systems, utilizing marginal and problematic soils is practiced to a varying degree throughout the country.
- Soil Health Card is a scientific tool to address soil health issues.
- Growing health awareness, purchasing power of consumers and market potential for organic products
- Improve water use efficiency and irrigation efficiency through micro irrigation system (MIS) and productivity enhancement.
- Conjunctive use of surface and groundwater
- Watershed management for water harvesting and Soil and Water conservation.
- Drainage of waterlogged saline and degraded soils.
- Treatment of waste water & reuse for irrigation to enhance agricultural productivity.
- Modernization and renovation of existing irrigation projects
- Better design, planning and management of canal networks including lining
- Creation of water user associations and developing mechanisms for proper operation & maintenance of the irrigation infrastructure.
- Protected cultivation in green house and shade net (low cost) for off season vegetable cultivation.

- Linking of local rivers/ponds at macro and micro level for increasing irrigation productivity.
- Expansion of inland and brackish water aquaculture.
- Scope for export of processed food products to other countries.
- Utilization of nonconventional energy sources solar, wind and sea waves in agriculture to meet the energy demand for pumping ground water.
- Improvement of drainage structure in high rainfall zone and to develop water harvesting structure in rain fed area and promoting micro-irrigation.
- Development of equipment for wastewater treatment and separation technology
- Development of new methods process configurations for water production from wastewater.
- Development of low cost and wastewater specific membranes for water reuse/reclamation.
- Development of energy efficient advanced oxidation for organic and recalcitrant compounds in wastewater.
- Alternative disinfection systems for wastewater including ozone, UV, chlorine dioxide and gaseous/liquid chlorine.
- Improvements and cost reductions in thermal processes for chemicals and energy recovery such as evaporation and plasma incineration.
- Delineation of treatment option/schemes to reduce energy consumption and hazardous wastes disposal.
- Development of instrumentation package for automation of the treatment package and bringing down cost of components.
- Gujarat has the highest share of renewable energy potential (25%) in the country.
- Out of total energy being consumed only 18.0 % comes from the RES as compared to TN 40.46%, Karnataka 28.63% and Rajasthan 26% despite of state is very rich in renewable Energy Sources.
- The Gujarat state has very high potential of solar energy utilization for different applications like crop drying, cooking, power generation, greenhouse crop production, etc.
- There is a good scope to replace a large percentage of fossil fuels with bio-fuel.
- The state has Out of total potential wind energy generation only 15% is yet to be explored, Biomass generation and utilization for energy has tremendous scope in Gujarat using biomass gasification and co-generation technology. Another important RES is the biogas for cooking and vehicle fuel need to be paid attention.
- There is good opportunity to carry out R &D activities in the above areas and new area like fuel cell, small wind mill and Hydrogen fuel technology and other RES to obtain better efficient and adoptive technology.
- Possibility to bridge the gap between demand and production of bio-fertilizers and thereby decrease subsidy load on chemical fertilizers
- e-learning through email....etc
- m-learning through text & voice messages
- Use of KIOSK
 - Effective radio & TV talk
 - *Kisancall* center
 - Market facilitation

- Establishment of network of agro-met observatory at each agricultural research stations
- Setting up of automatic weather stations (AWS) in each taluka
- Weather based assessment of crop growth and production
- Sharing of past and current climatic data
- Establishment of weather forecasting centres
- Making climate smart village
- Weather based advisories at village level

Threats:The major threats of the State are:

- Inadequate and erratic nature of rainfall
- Frequent draught
- Soil erosion, Depletion of water table, Salinity ingress / Sea water ingress
- Problems of blue cow and Sambhar
- Market fluctuation
- Inadequate processing facilities
- Smaller land holdings limiting the scope for adoption of intensive crop production technologies, which are capital intensive
- Increasing production costs especially labour due to proximity to metro city coupled with un remunerative/ fluctuating prices for produce severely affecting the profitability of agriculture
- Farmers may shift to other occupations to other area.
- Excessive use of chemical fertilizers & pesticides limiting the scope for adherence to quality standards with special reference to exports
- Changes in socio-economic conditions, with younger generation from farming community preferring urban employment in place of agriculture
- High fluctuations and non-remunerative prices of farm products and consequent non-profitability of the farm business perforce many farmers to quit the agricultural profession itself.
- Fast urbanization and industrialization and indiscriminate conversion of agricultural lands to non-agricultural purposes, pose a great threat of contraction of land put to agricultural uses and consequent reduction in production.
- Resistance to adopt new technologies by illiterate shepherds
- Frequent occurrences of killer diseases like Blue tongue, sheep pox, PPR etc.
- Inadequate / non-availability of sufficient quantity of vaccines
- Diminishing grazing land area
- Increasing cost of feeds for animals
- Uncontrolled use of antibiotics and medicines on milch animals
- Comparatively high cost of packaging and storage cost of finished produce
- In its anxiety to absorb more people in agriculture, State may deliberately discourage agricultural mechanization
- Inadequate financial capacity at the farmer's end to improve production technology including the use of better power sources and equipment.

- In the absence of proper equipment and technologies, quality of raw material may be too poor to produce processed products of acceptable/ marketable quality.
- Competition with cash crops due to drudgeries in cereals cultivation.
- Lower / fluctuating unreasonable market price for the producer farmers.
- Within few years, there might be shortage of fodder for milk cattle
- Aflatoxins problem in groundnut kernels
- Spread of soil-borne diseases
- Most of the vegetables are perishable to semi perishable in nature
- Unstable and wide fluctuating market price for fruits and vegetables
- Too many hybrids/varieties (costly) have unstable performance over years
- Long rotation of tree species
- Lack of marketing for minor forest products including medicinal and aromatic plants
- Flower structure is very small and delicate in most of the forage crops which make difficult the breeding work.
- Sea water intrusion in aquifers of coastal talukas and over exploitation of groundwater to cater the needs of drinking and irrigation.
- Climate change is a threat for sustaining productivity from field and horticultural crops.
- Deteriorating quality of rivers and soil due to discharge of Industrial and residential effluents without treatment
- Out of 225 talukas of the state, as many as 56 talukas are drought-prone which suffer from drought or scarcity condition at regular interval
- Drought, Flood and Cyclone raise after some interval badly affect agriculture of the state and also economy of the farmers.
- Heavy rain after long dry spell also affect the standing crops and also soil erosion
- Less interest of rural young generation in agriculture due to heavy loss and low revenue.
- Problem of salinity and water logging in coastal area
- Irregular and erratic rain threat timely sowing and sometimes resowing
- Labour shortage and Un-experienced laborers for irrigation cause wastage of irrigation water.
- The market of transport fuels is dominated by fossil fuels and will likely be so in the foreseeable future.
- The political lobby for RE is weak when compared to the lobby of fossil fuels.
- Discoveries of new oil fields rapidly decreased in the last few years The RE market is a relatively new market
- Restricted resources for R & D (financing and human capital - researchers),restricted innovation resources andrestricted job opportunities for the Graduates
- Increase in extreme weather events
- Natural disasters may cause losses
- Large inter and intra-seasonal variability in rainfall

District Wise Developmental Plans for Agriculture and Allied Sectors:

According to 35 thematic area following points are discussed in chapter 4.

- Vision
- Mission
- Crop/ Area issues
- Priorities for field, horticultural, forestry, other Crop Cultivation, animal production, animal health and fisheries
- Ongoing Special Projects/ Programs like Agriculture Technology Management Agency, frontline demonstration, National Food Security Mission, Rashtriya Krishi Vikash Yojana and supply of drip irrigation system by Gujarat Green Revolution Company
- Renewable Energy Potential of the State of Gujarat in terms of Solar, Biomass, Biogas, Biogas Energy Plantation, Wind and Tidal Energy
- Biological and Socioeconomic constraints associated with low productivity
- District Wise Area under *Kharif*, *Rabi* and *Summer* crops during last five year plan
- District-wise Large Animal Population and Total Milk Production in Gujarat
- District-wise Sheep and Goat Population and Wool Production of Gujarat State
- District-wise Population of Rabbit in Gujarat
- Detail of Poultry Production along with its growth in Gujarat State
- Pack animal Population and Growth Rate over Previous Livestock Census 1951-2007
- District-wise Cultivation of Fodder Crops in Gujarat State (Year 2011-12)
- Category and District-wise Poultry Egg Production in Gujarat State (2012-13)
- District-Wise Poultry Population of Year 2012-13 - Gujarat State
- District Wise and Category Wise Inland Fish Production Since 2008-to 2012-13
- Species Wise Inland and Marine Fish Production of Gujarat State from 2008-09 to 2012 – 2013
- Species-wise Marine Fish Production (T) Since 2008-09 to 2012-13
- District-wise and Species-wise Marine Fish Production for the Year-2012-13
- Details of Fish Seed Farm of Gujarat State (Year 2008-09 to 2012-13)
- Item-Wise/ Species-wise Foreign Export of Fish and Fish Products from Gujarat (2008-09 To 2012-13)
- District-wise Inter-State Export of Fish & Fish Products in quantity and value
- Annual Plan Outlays and Expenditure in Fisheries sector during 2008-09 to 2012-13
- Agencies/Organization Activities as Per the Poultry Development 2012-13 in Gujarat
- Yearly Trend of Change in No. of Productive Cattle and Buffaloes from 2000-01
- Trend of Change in Per-Animal Productivity and Annual Milk Production from 2000-01
- District-wise Milk Production in Gujarat for the year 2013-14
- Trend of Change in No. of Productive Goats from 2000-01 to 2012-13
- Trend of Change in Per-animal Productivity and Total Milk Production in Goat from 2007-08 to 2012-13
- Year and district wise Area, Production and Yield of different crops during 11th plan
- Year and district wise Area, Production and Yield of irrigated and unirrigated crops
- Characteristics different common, popular and improved/ hybrid varieties of various crops grown in Gujarat

- Input management for seed, fertilizer, insecticide, pesticide, fungicide, weedicide, farm equipment, etc. required for 12th Five Year Plan
- Projected (year wise) Targeted Area (ha) and Targeted Seed Replacement Rate (SRR) and different seed requirement Based on Seed Rate (kg/ha) during 12th Five Year Plan
- Year and district wise different types of fertilizer Requirement for the different Crops
- District-wise Yearly Requirement of Pesticides/Fungicide of different Crops
- Year wise and District-wise Present Scenario of Chemical Pesticides in Gujarat
- Farm Mechanization/Farm Equipment suitable for different farm operation in various crops
- Constraints Analysis and Recommended Interventions for Yield Gap Analysis
- The region wise constraints for low productivity in different crops
- Sustainability Issues, Gap Analysis and Strategies, Approach and Methodology and Performance Indicators to Enhance the Productivity of different Crops, animals, poultry and fisheries
- Bridging the Gaps for Realization of the Vision for different Crops, animals, poultry and fisheries
- Issues, Mode of Action, Collaborator/Target and Suggestions for different Activities for Integrated Water Management (IWM), Management of Salinity Stress, Resource Conservation Technology :Zero tillage, laser land levelling, Green manuring & Bio-fertilizers and Quality Seed production
- Sustainability Issues and Gap Analysis of Productivity in Dairy Husbandry for Breed of Animals, Housing management, balanced feeding, Health of animal and calf mortality
- Strategic Frame and Long Term Goals / Targets for poultry
- No. of Disease Investigation Work in 2012-2013
- Details of Soil Testing Laboratories of Gujarat State with Full Address, Phone Number & Group
- Low and Medium Status of OC, Fe, Zn and Sulphur in Different Districts of Gujarat
- Year wise and district-wise Additional Area Coverage under Organic Farming
- District Wise Annual Rainfall (mm) During 2009 to 2013
- Annual Rainfall (mm), Maximum Temperature (T_{max}, C), Minimum Temperature (T_{min}, C) and Relative Humidity (RH,%) at Different Stations in different districts of Gujarat
- District wise Existing Marketing Infrastructure facilities (2011-12)

Detailed Action Plan with Costs:

District wise and year wise Comprehensive package of activities discussed those are very vital for farmer's welfare, increasing their farm income, the overall productivity enhancement, employment generation with an environment friendly and Sustainable approach:

- Year wise and District-wise State Level Training Proposed for Capacity Building of Staff of Agriculture and Allied sectors for different activities in numbers and finance
- Year wise and District-wise Training Proposed for Capacity Building of Farmers at district level in numbers and finance
- Year wise and District-wise Training Proposed for Capacity Building of Farmers at State Level on Different Technologies like Integrated Nutrient Management, Natural Resource Management, Integrated Pest Management, Biological Control for Pests and Diseases Management, Resource Conservation Technologies, Water management, drip irrigation, Post-

Harvest Management, Women empowerment, Credit & marketing, Seed Production, Farm waste management, Vermicomposting, Farm Mechanization, Renewable energy, Organic Farming, Green House / Net house (protected cultivation), Urban peri urban vegetable gardening, Integrated Weed Management and Forestry, Farmers/Bamboo Crafts & Minor Forest Products, Fodder Production, fisheries, Renewable Energy Technologies, Waste Management

- Year wise and District-wise Demonstration programmes for crop Varieties, Seed Planning/ Seed Village Program (Seed Production Enhancement), Integrated Nutrient Management, Plant Health Management, Soil Health Management, Resource Conservation Technologies, Laser Leveling, Inter Cropping, Green Manuring & Mulching, Seed Treatment, Organic Farming, Bio-fertilizer and Bio-compost, Integrated Weed Management, Fruit Crops (*Vadi Model*), high density planting of fruit crop and Water Resources Development (Farm Ponds, Bunding, Water Harvesting, Well Recharge, etc.) on farmers' fields, Agroforestry/Social Forestry/Bamboo Cultivation, forage crops in area/number and finance
- Year wise and District-wise Farmer Field Schools Covering Identified Critical Technologies for different Crops in numbers and finance
- Year wise and District-wise Group Formation /Commodity Interest Groups Formation for Specific Activities for different Crops in numbers and finance
- Year and district wise Area, Production and Yield of different crops during 12th plan
- Year wise and District-wise Establishment of Agro Processing Units numbers and finance
- Year wise and District-wise establishment of Farm Level Storage, Model Floriculture Centers in number and finance
- Year wise and District-wise Establishment of Small Scale Nurseries in number and finance
- Year wise and District-wise Establishment of Model Nurseries in number and finance
- Year wise and District-wise Establishment of Poly Houses for Flower Crops in number and finance
- Year wise and District-wise Establishment of High Tech Green Houses in number and finance
- Year wise and District-wise Establishment of Low Cost Net House in number and finance
- Year wise and District-wise Establishment of Farm Level Small Pack House in number and finance
- Year wise and District-wise Establishment of Farm Level Low Cost Ripening Chamber in number and finance
- Year wise and District-wise Establishment of Farm Level Precooling Chamber in number and finance
- Year wise and District-wise Establishment of Mango, Banana Large Scale Ripening Chamber in number and finance
- Year wise and District-wise Supply of Tree Cover as Wind Break/for Social Forestry/Wasteland Development in number and finance
- Year wise and District-wise Action Plan of Social Forestry/Agroforestry Plantations, Forest Nursery Establishment/ Demonstration of Agroforestry-Social Forestry in number and finance
- Year wise and District-wise Proposal for the Development of Panchayat Land for plantation in number and finance
- Sugar Factory -wise Training Proposed for Capacity Building of Agricultural Staff for Sugarcane in number and finance

- Training Proposed for Capacity Building of Farmers (Sugar Factory Wise) on Different Technologies of Sugarcane in number and finance
- Sugar Factory-wise Demonstration on Variety, INM, IPDM, Seed/Sett Treatment, Resource Conservation (Inter-cropping), on Sugarcane crop in number and finance
- Year wise and District-wise Proposal for Capacity Building of Livestock and small ruminant Farmers in Gujarat State Along with Financial Requirements (Quality Improvement of Feed, Enhancement of Milk Production, Improvement of Reproductive Efficiency)
- Year wise Capacity Building for the State in Poultry Sector with Action Plan and Cost
- Year wise and District-wise No. of Fertility Camps to be Organized Under Fertility Improvement Program in the State
- Year wise and District-wise Supply of Breeding Bulls to Villages in the State and their maintenance in number and finance
- Year wise and District-wise No. of Commercial Dairy Farming Units Along With Financial Requirements
- Year wise requirement of Seed Cost for Forage Crops
- Year wise requirement of Fertilizer Cost for Forage Crops
- Year wise and District-wise No. of Cattle Shed for Dairy Farmers along with Financial Requirement
- Year wise and District-wise Supply of Dairy Utensils to A.H. (Dairy) Farmers in number and finance
- Year wise and District-wise Details of Expenditure for Calf Rearing Unit of 10 Calves (Concentrate, Fodder, Mineral Mixture, Medicines and Housing) in number and finance
- Year wise and District-wise Provision of Artificial Insemination Facilities in number and finance
- Year wise and Zone-wise Capacity Building for Rabbit Rearing in number and finance
- Year wise and District-wise Proposals for Milking Machines in number and finance
- Year wise and District-wise Proposals for Supporting Women Dairy Cooperatives in number and finance
- Year wise and District-wise Training proposed for capacity building of Dairy farmers on different Technologies on clean milk production, Preliminary knowledge on composition and nutritive value of milk and Manufacture of indigenous milk products in number and finance
- Year wise and District-wise Estimated cost for fodder seed production unit for Green fodder in number and finance
- Year wise and District-wise Estimated cost for fodder seed production unit for Dry fodder in number and finance
- Year wise and District-wise Fodder Banks for storage Dry grasses from forest in number and finance
- Year wise and District-wise proposal for no. of Portable FRP Carp Hatcheries for fish seed production units along-with financial requirements
- Year wise and District-wise no. of demonstration units of Freshwater Prawn in Village ponds along-with financial requirements
- Year wise and District-wise no. of Village pond units for development for fisheries along-with financial requirements

- Year wise and District-wise no. of Cage/Pen Culture units in Reservoirs lakes and canals along-with financial requirements
- Year wise and Fishing port-wise replacement of no. of units of the codend of trawl net along-with financial requirements
- Year wise and Fishing port-wise no. of Biometric cards to fishermen/crew and tandels along-with financial requirements
- Year wise and District-wise Financial Requirement for modernisation and developments of existing Fish markets
- Year wise and District-wise Material required for demonstration of seaweed cultivation in number and finance
- Year wise and District-wise Demonstration of seaweed liquid fertilizer to farmers in number and finance
- Year wise Approximate Cost of Subsidies for Soil Amendments like Micro-nutrients, Manures and Gypsum for Soil Health
- Year wise Approximate Cost for Soil Health Card Program
- Year wise and District-wise Proposal for Organic Seed Storage Structure in number and finance
- Year wise and District-wise Proposal for Strengthening of Research on Organic and Testing Facilities in number and finance
- Year wise and District-wise Proposal for Vermi-compost Units Establishment in number and finance
- Year wise and District-wise Establishment of NADEP Compost Unit in number and finance
- Year wise and District-wise Proposal for Infrastructure Development for Storage of Organic Produce in number and finance
- Year wise and District-wise financial requirement of Proposal for Providing Processing Tools and Facilities
- Year wise and District-wise financial requirement Proposal for Marketing, Supply Chain, Certification *etc* under Organ Farming
- Year wise and district-wise Proposal of supply of Tractors, Mini Tractors, Power Weeder, Rotavator, Diesel Engine with Pump, Threshers, Laser Leveler, Cotton Shredder, Plant Protection Equipments, Tractor and Bullock Drawn Seed cum Fertilizer Drill / Planter, Combined Harvester, Cultivator and Different Plough, Power Tiller, Castor Decorticator, Groundnut Decorticator, Maize Sheller, Paddy Transplanter, Sugarcane Transplanter, Reaper, Potato Planter, Potato Digger, Groundnut Digger and other Miscellaneous implements/ Small Tools for Gujarat State in number and finance
- Year wise and district-wise Water Resources Development: Water Harvesting Structures (WHS)/WHS Kachha, de-silting of check dams, ponds, well, bore well recharge, recharge structures, etc. in number and finance
- Year wise and District-wise Watershed Development in number and finance
- Year wise and District-wise Land development: Land Reclamation, Bunding, Soil Conservation, Amelioration of Water Logged and Saline Soils, Land Leveling, etc in hectare and finance

- Year wise and District-wise Soil and Water Conservation (SWC), Loose Bolder Checks, Recharge Structures, Pipelines, Desilting of Chedkdams, Ponds, Rain Water Harvesting, etc. in number/ hectare and finance
- Year wise and District-wise Soil survey (Topographic survey)/ land survey in hectare and finance
- Year wise and District-wise Micro Irrigation System (MIS) in hectare and finance
- Year wise and District-wise Water Management Works, Farm Pond, Community Tanks, Minor Irrigation in number/ hectare and finance
- Year wise and District-wise Dug / Bore Well , Pump Sets, Lift Irrigation Sets, Minor Irrigation in number and finance
- Year wise and District-wise Provision of Adequate Drainage Systems/ Structures in number and finance
- Year wise and District-wise Gobar Bank and Community Biogas Plants (85 M³ Capacity, Each) in number and finance
- Year wise and District-wise Domestic Biogas Plants (2 to 10 m³ Capacity with average 6m³) in number and finance
- Year wise and District-wise Biogas Purification and Bottling Unit (Average 2000 M³/Day Capacity) in number and finance
- Year wise and District-wise Briquetting Units (Waste Utilization) in number and finance
- Year wise and District-wise Biomass Gasification Units in number and finance
- Year wise and District-wise Biomass Cookstoves/ Smokeless Chulas in number and finance
- Year wise and District-wise Bio-Ethanol^a(10,000 Liter Capacity) and Bio-Diesel Production^b (5000 Liters Capacity) Units in number and finance
- Year wise and District-wise Solar Cookers in number and finance
- Year wise and District-wise Solar Street Lights in number and finance
- Year wise and District-wise Solar Lantern (6-8W) in number and finance
- Year wise and District-wise 5hp Submersible Solar Water Pumping System
- Year wise and District-wise SPV Solar Photo Voltaic Power Plant (10 Kw) for Remote Villages in number and finance
- Year wise and District-wise 1 MW Agriculture (Greenhouse) cum SPV Power pilot project at SAUs @ 12.0 cr/plant^a, in number and finance
- Year wise and District-wise SPV Operated Cold Storages for 1000 MT Storage Capacity^b @ 15 cr in number and finance
- Year wise and District-wise on Farm Fruits and Vegetable Storage for 10MT Capacity @ 20 Lakh in number and finance
- Year wise and District-wise Roof-top Small Solar cum Wind Turbine for Power Generation in number and finance
- Year wise and District-wise Wind Pumps in number and finance
- Cost for the Strengthening of Training Infrastructure Facilities for Training Hall, Information technology Lab, Automatic Weather Station, Well equipped training hall, E-connected computer lab and Soil testing lab at FTC (District level) and FIAC (FIACs – at block level). (Rs in lakh)
- Year wise and District wise Strengthening of APMC in number and finance

- Year wise and District wise Establishment of Rural godown in number and finance
- Year wise and District wise Number of processing units and financial requirements
- Development of Terminal Market in Four Zone and financial requirements
- Year wise and District wise Establishment of small scale fruit and vegetable processing units in number and finance
- Year wise and District wise Establishment of Cold Storage in number and finance
- Year wise and District Wise Establishment of Location Specific Research Unit for Value Addition in number and finance
- Year wise and District-wise supply of Small Scale Power Operated Cleaner cum Graders for Cereals in number and finance
- Year wise and District Wise Strengthening of Infrastructure Facilities for Strengthening of Processing Facilities for Establishment of Mini Dal Mills in number and finance
- Year wise and District Wise Processing Units and Financial Requirements for Oil Mill, Cotton Ginning
- Year wise and District Wise Establishment of Spice Processing Unit (Cleaning/Grading/Mill) in number and finance
- Year wise and District Wise Strengthening of Infrastructure facilities for rural godowns for storage of food grains including cereals, pulses, oilseeds, spices, Onion and Garlic, etc. in number and finance

Researchable Issues:

Future researchable issues for different crops on development of suitable varieties/ hybrids, insect, pest & diseases management, Protected cultivation and precision farming, Small equipment, changes agronomical practices due to weather effects, micro nutrients for increasing fertilizer use efficiency, Post-harvest techniques, fertigation & Water use efficiency, high density planting of orchards, Livestock Improvement, Animal Genetics & Breeding /Animal Biotechnology, Research in Embryo-transfer Technology/Veterinary Gynaecology, Animal Nutrition, Livestock Production and Management, **Solar Thermal Energy**, Solar PV, **Bio-Energy**, **Biofuels**, Export oriented research for post harvest treatments, proper ripening practices, Research on storage and processing practices, etc..

Following new/ special innovative projects are proposed for 12th five year plan with proper justification, objectives, action plan and proposed outlay

- Bracing Up Nutritional Deficiencies and Value Addition of Wheat Through Blending with Locally Available Low Cost Food Grains
- Value Enhancement of Wheat through Organic Cultivation
- Proposal for Establishment of Advance Technology Expansion through Rejuvenation in Fruit Crops
- Value enhancement of seed spices through organic cultivation
- Control of calf mortality in north Gujarat
- Diagnosis and control of haemoprotozoan disease in north Gujarat
- Strengthening of existing Fisheries training centres
- Research on Genetic up-gradation of indigenous fish species
- Establishment of marine fish hatchery at Okha

- Strengthening of aquaculture research centres
- Establishment of Regional Fisheries Trainers' Training Centres
- Strengthening of existing ornamental fish breeding centres (three) functioning under the State fisheries department, Government of Gujarat
- Establishment of Fish Disease Diagnosis Centre in South Gujarat, Central Gujarat and Saurashtra
- Establishment of modern aquaculture farm complex
- Establishment of quality control laboratory for fisheries in Saurashtra and South Gujarat
- Establishment of Research and Training Centre for Seaweed
- Establishment of Matsya Vignan Kendra at the campus of Kamdhenu University
- Establishment of College of Aquaculture Engineering in Kamdhenu University
- Training cum Research centre for Ornamental fish Breeding
- Research in low saline areas of Saurashtra to develop Aquaculture
- Development of backyard hatcheries – cum – grafting units for brackish water pearl production
- Centre for PFZ at Kamdhenu campus
- Proposal For Establishment Of National Institute Of Renewable Energy
- Establishment of Liquid Biofertilizer Mass Production Units (Biofertilizer Plants) for fertigation and soil health improvement
- Establishment of District level Training cum Advocacy Centers for empowerment of rural women
- Establishment of Farmer's Training cum Exhibition Centre
- Strengthening of KVK by developing models of agriculture at KVKs
- Establishment of Agrinet For Gujarat State
- Dissemination of Information to farming community through Android based Mobile App (M Agriculture)
- Establishment of Community Radio Station
- Project for Solar Agriculture KIOSK
- Climate Change Impact Assessment, Adaptation and Mitigation Strategies in Gujarat
- Taluka/Village wise Weather forecasting on short range, medium range and extended range time scale
- Capacity Building for adopting Climate Change
- Effect of Environment on Phenotypic Performance of Dairy Cattle/Bufaloes and Strategies to deal with in Climatic Conditions of Gujarat

State Plan

Major sector wise growth drivers were indicated to achieve the target plan. Compiled state plan according to 35 thematic area discussed in chapter 5. Detailed Component wise and programme wise plan are also discussed and overall State Plan is given here under.

**Table- Overall financial requirement proposed for development of all sectors under SAP
(Sum of all district)(Rs. inLakh)**

S N	Crop/Enterprise	1 st year	2 st year	3 st year	4 st year	5 th year	Total
		Fin	Fin	Fin	Fin	Fin	Fin
1	Rice	3,234.00	3,237.24	3,240.55	3,243.92	3,247.36	16,203.07
2	Wheat	6,739.63	6,740.03	6,740.23	6,729.18	6,729.18	33,678.23
3	Maize	990.68	1,431.78	1,431.78	1,431.78	1,431.78	6,717.80
4	Bajara	592.69	592.69	609.69	609.69	629.69	3,034.45
5	Sorghum	1,284.75	1,284.75	2,484.75	1,284.75	1,284.75	7,623.76
6	Small Millet	153.60	154.60	156.10	156.10	158.60	779.00
	Total	12,995.35	13,441.09	14,663.10	13,455.42	13,481.36	68,036.31
7	Sugarcane	802.80	802.80	802.80	802.80	802.80	4,014.00
8	Cotton	1,049.27	1,049.27	1,049.27	1,049.47	1,049.47	5,246.76
	Total	1,852.07	1,852.07	1,852.07	1,852.27	1,852.27	9,260.76
9	Groundnut	828.10	828.10	828.10	828.10	828.10	4,140.50
10	Castor	5,088.16	5,088.16	5,088.16	5,088.16	5,088.16	25,440.80
11	Mustard	1,450.07	1,440.32	1,440.32	1,440.32	1,440.32	7,211.35
12	Sesamum	505.25	505.25	505.25	505.25	505.25	2,526.25
13	Soyabean	539.55	539.55	539.55	539.55	539.55	2,697.75
14	Niger	35.66	35.66	35.66	35.66	35.66	178.30
	Total	8,446.79	8,437.04	8,437.04	8,437.04	8,437.04	42,194.95
15	Pulses	4,034.00	4,034.00	4,034.00	4,034.00	4,034.00	20,170.00
	Total	4,034.00	4,034.00	4,034.00	4,034.00	4,034.00	20,170.00
16	Fruit and Flower	9,365.80	9,310.80	9,310.80	9,310.80	9,310.80	46,609.00
17	Vegetables	229.97	241.67	249.47	261.17	268.97	1,251.25
18	Spices	4,294.34	4,294.34	4,294.34	4,294.34	4,294.14	21,471.48
19	Agro forestry	318.00	317.82	367.98	318.45	453.25	1,775.50
	Total	14,208.11	14,164.63	14,222.59	14,184.76	14,327.16	71,107.23
20	Large animal	32,992.94	34,958.19	33,422.74	33,422.74	33,422.74	168,219.35
21	Small Ruminant	45.90	45.90	45.90	69.30	69.30	276.30
22	Poultry	141.00	141.00	141.00	141.00	141.00	705.00
23	Pack Animal	0.00	0.00	0.00	0.00	0.00	0.00
24	Fodder production	364.00	364.00	391.00	391.00	418.00	1,928.00
25	Fishery	700.55	707.55	928.15	3,436.95	3,238.55	9,011.75
26	Dairy Science	17,060.06	17,059.61	17,059.61	17,058.71	17,058.01	85,296.00
27	Animal Health	120.00	80.00	60.00	60.00	40.00	360.00
	Total	51,424.45	53,356.25	52,048.40	54,579.70	54,387.60	265,796.40
28	Post Harvest	627.40	657.40	663.40	5,019.40	4,369.40	11,337.00
29	Re. Energy	67,022.18	65,090.92	70,166.20	81,170.06	77,692.48	361,141.83
30	Organic Farming	9,439.90	8,074.10	8,344.50	4,549.30	4,521.00	34,928.80
31	Soil Health	2,250.00	2,250.00	2,250.00	2,250.00	1,650.00	10,650.00
32	IPDM	385.35	385.35	385.35	385.35	385.35	1,926.75
33	Farm Mechenization	45,966.70	47,119.72	48,453.26	49,861.60	51,407.76	242,809.03
34	Soil & Water Mng	381,064.1	406,637.2	435,810.2	442,466.3	455,555.3	2,121,533.3

S N	Crop/Enterprise	1 st year	2 st year	3 st year	4 st year	5 th year	Total
		Fin	Fin	Fin	Fin	Fin	Fin
		3	7	2	9	2	3
35	Ext & ICT	57,326.95	37,179.53	31,455.16	6,987.46	7,094.88	140,043.98
36	Marketing	13,072.12	13,254.72	12,673.00	12,782.70	12,812.80	64,595.34
37	Climate Change	4,486.40	2,020.40	1,720.80	927.20	940.70	10,095.50
	Total	581,641.13	582,669.40	611,921.89	606,399.45	616,429.69	2,999,061.56
	GT	674,601.89	677,954.48	707,179.09	702,942.64	712,949.12	3,475,627.21

Infrastructure Development Plan

Total 77 projects including two flagship programmes in detail with objectives, plan of work, total outlay in five year break up are discussed in chapter 6.

**Table- Total Financial Requirements For Various Projects Proposed under SIDP
(Rs. in Lakh)**

Sr No	Projects	1 year	2 year	3 year	4 year	5 year	Total
1	Establishment of Liquid Biofertilizer Mass Production Units (Biofertilizer Plants) for Fertigation and Soil Health Improvement						7260.00
2	Establishment of Agrisnet for Gujarat State						359.06
3	Establishing of centre of Nano Technology for Enhancing Grain Mold Resistance for Sorghum	50	50	50	50	50	250.00
4	Project for Demonstrations on Agroforestry Technologies in Gujarat State	6279	3666	1274	1248	1196	13663.00
5	Infrastructural Strengthening for Research on Cotton at Main Cotton Research Station, NAU, Surat	528	11.9	10.9	10.9	10.9	572.60
6	Gujarat Goat Development Corporation	400	300	100	100	100	1000.00
7	Establishment of Gujarat Goat Research Institute	200	150	50	50	50	500.00
8	Strengthening of existing Goat / Sheep Farms (State Government and University Farms)	40	40	40	40	40	200.00
9	Establishment of Elite Buck / Ram Mother Farms for various breeds of goats / sheep	240	240	240	240	240	1200.00
10	Establishment of new Sheep and Goat Conservation Farms in Gujarat	300	180	140	140	140	900.00
11	Establishment of New Sheep and Goat Feed Manufacturing Factories	500	500				1000.00
12	Strengthening of Existing mMarket Yards / Ghenta-Bakra Mandies for Small Ruminants	100	-	-	-	-	100.00
13	Sheep and Goat Mobile Clinics (van)	40	40	40	40	40	200.00
14	Establishment of Regional Rabbit Farms	29	29	4	4	4	70.00
15	Establishment of Poultry Extension and Research Institute (PERI) in the State	3280	1790	4300	4360	2920	16650.00
16	Establishment of Central Poultry Disease Diagnostic Laboratory	1780	790	1150	960	970	5650.00
17	Establishment of Mobile Poultry Health Monitoring Units (regional)	235	270	80	100	115	800.00
18	Establishment of Regional Poultry Farmer's Training Centers	2850	1250	50	50	50	4250.00
19	Strengthening of Existing Poultry Breeding Farm and Hatcheries	1000	300	200	230	270	2000.00
20	Establishment of New Breeding Farm and Hatcheries	2000	550	770	780	400	4500.00
21	Strengthening of Existing Poultry Feed Production Units	470	330	400	400	400	2000.00
22	Strengthening of Existing Vaccine Production Unit in the Public Sector	220	120	120	120	120	700.00

Sr No	Projects	1 year	2 year	3 year	4 year	5 year	Total
23	Creation and Improvement of Cold Storage Facilities for Poultry Products	500	130	145	160	165	1100.00
24	Strengthening of Existing and Establishment of New Poultry Feed Testing Laboratories	1050	200	200	225	225	1900.00
25	District Wise Proposals for Cold Chain of Milk Handling (Bulk Milk Coolers)	2476	2476	2476	2476	2550	12454.00
26	District Wise Proposal for Automated Milk Collections System (AMCS)	640.71	618.4	613.4	608.9	608.9	3090.50
27	Centre for Post Graduate Studies for Dairy Science and Research, Kamdhenu University, Gandhinagar	1000	1500	1500	1000	1000	6000.00
28	Establishment of Pack Animal Research Institute (PARI)	12000	7000	5000	3000	3000	30000.00
29	Strengthening of existing dairy industries to process and Market camel milk	1940	740	440	440	440	4000.00
30	Value addition and Marketing of camel and donkey hair By-Products	520	320	120	120	120	1200.00
31	Improve and Increase Biomass to Enhance Camel Milk Productivity	150	110	80	80	80	500.00
32	Establishment of State Epidemiology cum Surveillance Center for Animal diseases	2000	1000	750	750	500	5000.00
33	Establishment of Center of Excellence in Ruminant Medicine	800	600	200	200	200	2000.00
34	Establishment of Regional Fisheries Trainers' Training Centres	20	20	20	500	440	1000.00
35	Strengthening of existing Ornamental fish breeding Centres	30	30	30	90	90	270.00
36	Establishment of Fish Disease Diagnosis Centre in South Gujarat & Saurashtra	30	30	30	405	405	900.00
37	Establishment of Modern Aquaculture farm complex	40	40	40	400	280	800.00
38	Establishment of quality control laboratory in South Gujarat & Saurashtra	30	30	30	405	405	900.00
39	Establishment of Research and Training Centre for Seaweed	67	67	47	42	42	265.00
40	Establishment of plant health clinical laboratories	4405.5	1361.25	1497.37	1647.11	1811.82	10723.05
41	Establishment of Bio-control Laboratory	4702.5	1361.25	1497.37	1647.11	1811.82	11020.05
42	Establishment of Pesticide Residue Laboratory	2958	415.8	457.38	503.12	553.43	4887.73
43	Strengthening of existing soil testing laboratories of the state	478					478.00
44	Establishment of new soil testing laboratories	420	270				690.00
45	Strengthening of STLs of APMC's, Science colleges and Sugar co. op.		140				140.00
46	Establishment of Advance Research cum Training centre on soil health at four SAU's	699.2	111.8	123.1	135.6	149.25	1218.95
47	Establishment of training center for repair and maintenance of farm implements & machineries in the state	7200	1200	1200	1200	1200	12000.00
48	Vocational courses institute for maintenance & repairs of agricultural implements	1090	170	100	110	85	1555.00
49	Establishment of implements/ machinery testing centre at Banaskantha and Vadodara districts of Gujarat	400	50	50	50	50	600.00
50	Establishment of Special Production Zone for agricultural implements, equipments, machinery and irrigation equipments at Porbandar, Banaskantha, Vadodara and Navsari districts	0	100	100	100	100	400.00
51	Strengthening of training infrastructure facilities at farmers Training Center (district level) and Farm information and Advisory Centers (FIACs – at block level)	44000	33000	27500	2961	2961	110422.00

Sr No	Projects	1 year	2 year	3 year	4 year	5 year	Total
52	Establishment of Community Radio Station	824.46	334.82	111.81	111.81	111.81	1494.71
53	Climate Change Impact Assessment, Adaptation and Mitigation Strategies in Gujarat	550	353	256.3	60	64	5133.20
54	Taluka/Village wise Weather Forecasting on Short Range, Medium Range and Extended Range Time Scale	2140	542	44.2	46.6	49.7	2822.50
55	Establishment of Post Graduate Institute of Veterinary Education & Research at Kamdhenu University	2788.6	1000	1000	2076.6	1665.8	8531
56	Strengthening of Vice Chancellors Office at Kamdhenu University	200	100	129	150	350	929
57	Establishment of Veterinary Hospital at Kamdhenu University	1164.5	1129.6	1164.5	1507	1129.6	6095.2
58	Establishment of Fisheries Education and Research Station at Kamdhenu University	356.6	322.1	356.6	662.5	322.1	2020
59	Establishment of Instructional Farm for Veterinary Science at Kamdhenu University	221.5	66	221.5	393.9	66	968.8
60	Establishment of Farmers Training Center for Animal Husbandry, Dairy and Fisheries at Kamdhenu University	200.8	99.4	200.8	312.3	99.4	912.6
61	Development of Animal Forage Farm at Kamdhenu University	143	101	143	339.5	101	827.5
62	Establishment of Information and Communication Technology Center in Animal Science at Kamdhenu University	100	100	100	160	100	560
63	Establishment of Students' Training Dairy at Kamdhenu University	464.4	158.8	464.4	616.5	158.8	1863
64	Establishment of Post Graduate Center for Dairy Education and Research at Kamdhenu University	1102.4	785.2	1102.4	1066.6	785.2	4841.9
65	Establishment of Dairy Animal Farm at Kamdhenu University	413.8	144.3	413.8	652.9	144.3	1769
66	Establishment of Camel Research Station at Kamdhenu University	200	200	200	500	200	1300
67	Establishment of Sanctuary for Dangi at Kamdhenu University	350	400	350	650	400	2150
68	Development of e-Animal Health Card under Flagship of Kamdhenu University	200	200	200	300	200	1100
69	Establishment of Mobile Veterinary Ambulatory Clinic at Kamdhenu University	46	16.2	46	34.2	16.2	158.6
70	Establishment of Central Library at Kamdhenu University	5	30	5	870	30	940
71	MATSYA VIDNYAN KENDRA at the campus of Kamdhenu University	17.5	15	17.5	35	15	100
72	Establishment of College of Aquaculture Engineering in Kamdhenu University	356.5	322	356.5	662	322	2019
73	Training cum Research centre for Ornamental fish Breeding	15	17.5	15	35	17.5	100
74	Research in low saline areas of Saurashtra to develop Aquaculture	30	35	30	70	35	200
75	Development of backyard hatcheries – cum – grafting units for brackish water pearl production	15	17.5	15	35	17.5	100
76	Establishment of modern aquaculture farm complex	20	50	20	60	50	200
77	Awareness programme for PFZ (Potential Fishing zones) at Kamdhenu campus	5	15	5	20	15	60
	Total	122117.97	70252.82	60233.83	39606.15	32855.03	336534.95