

## Long-term Strategies and Programmes for Mechanization of Agriculture in Agro Climatic Zone–XIII : Gujarat Plains and Hills region

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1. NAME OF AGRO CLIMATIC ZONE : Gujarat Plains and Hills region
2. STATES UNDER THIS ZONE : Gujarat, Dadra & Nagar Haveli, Daman & Diu



### 3. SUB-AGROCLIMATIC ZONE WITH THEIR CHARACTERIZATION

This zone covers the entire State of Gujarat. It can be broadly divided into South, Middle, North and Saurashtra-Kachchh regions. Large parts of the State are plains, mountainous parts lie on the eastern border with States of Maharashtra, Madhya Pradesh and Rajasthan. Nearly 20% of the area is considered drought prone. The southern parts of the State have a good canal network. The State has been divided into seven agro-climatic regions. These are discussed below.

#### 3.1 Southern Hills

This is a small but largely a tribal belt covering the districts of the Dangs and Valsad. The area receives about 1800 mm of rains and the climate is semi arid dry sub humid; the soil is deep black, coastal alluvium. About 43% of the area is under forests and a similar proportion is cultivated. Irrigation is spread over about 24% of the cultivated area.

#### 3.2 Southern Gujarat

This sub-zone, covering the districts of Surat and Bharuch, has seen rapid industrial development in the recent decade or so. Over half of the land is cultivated and about a fifth of the cultivated area is irrigated. The area receives a little less than 1,000 mm of annual rainfall. The climate is semi-arid dry sub-humid and the soil is deep black coastal alluvium.

#### 3.3 Middle Gujarat

Although this area is well developed industrially, it is also the most agrarian in Gujarat. Nearly two-thirds of the area is under cultivation and nearly a third of this is irrigated. Rains reduce progressively as we move into north Gujarat. In the middle areas, which include Vadodara, Panch Mahals and Kheda districts, the precipitation is of the order of 900 mm annually. The climate is semi-arid and the soil is medium black.

#### 3.4 North Gujarat

This sub-zone covers Banas Kantha, Mehsana, Sabar Kantha. Gandhinagar and Ahmedabad districts. Land productivity is very low. Rainfall is only around 735 mm per annum. The climate is arid to semi-arid and the soil is grey brown coastal alluvium. About 63% of the area is cultivated and a little over a third of this is irrigated. The chief source of irrigation is ground water. However, in some areas, there is overdrawal of ground water.

#### 3.5 North West Arid

This is the vast expanse of the Kachchh district. Rainfall is only about 340 mm per annum, the climate is arid and the soil is grey brown deltaic alluvium. Less than 13% of the area is cultivated. Nearly one-third of the geographical area is wastelands.

#### 3.6 North Saurashtra

This sub-zone includes the districts of Amreli, Bhavnagar, Jamnagar, Rajkot and Surendranagar. The region receives 537 mm of rainfall and the climate is semi-arid. The soil is medium black calcareous. About 63% of the area is cultivated, of which 24% is irrigated. Agricultural productivity is relatively high in Saurashtra essentially because of the cultivation of groundnut in this region.

#### 3.7 South Saurashtra

The South Saurashtra sub-zone includes only the district of Junagadh at the south western end of the State. This area receives a little better rain than the non-south-Gujarat parts of the State. The annual precipitation is about 850 mm, the climate is dry sub-humid and the soil is coastal alluvium medium black. About 56% of the region is cultivated.

### 4. STATUS OF PRODUCTION AGRICULTURE IN GUJARAT

- (a) **Location and Area:** Gujarat lies between 20°1' and 24°7' N latitude and 68°4' and 74°4' E longitude. Its area is 19.6 mha making for 6% of India's geographic area.
- (b) **Population:** The population of Gujarat in 2001 was 5,05,96,992 comprising 2,63,44,053 males and 2,42,52,939 females. It formed 4.93% of India's population. Compared to the national average of 72.22%, only 62.65% of Gujarat's population lived in villages. Population density in the State was 258/km<sup>2</sup>. Central and Southern plains of Gujarat were the most density populated while Kachchh had the lowest (34/km<sup>2</sup>) density.
- (c) **Agro-Climatic Zones:** Traditionally Gujarat was divided into three regions, viz. (i) the main land plains extending from the Rann of Kutch and the Aravalli hills in the north to Damanganga in the South, (ii) the hilly peninsular region of Saurashtra and the rocky areas of Kutch and (iii) the north-eastern hill tract. Now it is divided into 7 sub agro-climatic zones based on the characteristics of their agriculture and climate.

- (d) **Climate:** Most of Gujarat falls under mega thermic category with mean soil temperature exceeding 28°C. Air temperature in January normally remains over 10°C. Maximum temperature in May goes over 40°C in north and north-west Gujarat. It is more moderate in the coastal area of Saurashtra and south Gujarat. Rainfall is the most dominant climatic factor. Average rainfall is 828 mm, received in 35 days mostly from June to September with a coefficient of variation (CV) of 50%. Spatially it ranges from 300 mm in north-west to 2,000 mm in south-east. Twelve out of 26 districts of Gujarat are drought prone. In years of poor rainfall, the yields of important crops like groundnut which are mainly rainfed can reduce by 70% or more.
- (e) **Economy:** While Gujarat occupies fourth position amongst Indian States in terms of per capita GDP, behind Punjab, Haryana and Maharashtra only; it stands 9th in terms of per capita agricultural GDP. Agriculture contributed only 16.05% to State GDP in 2001–02 compared to 41.18% and 42.77% contributions of industry and service sectors respectively. Compared to the national figure of 67%, only 56% of the State's work force is employed in agriculture. Only 14.07% of Gujarat's population falls below the poverty line. Gujarat has a relatively strong economy which depends more on the industry and service sectors rather than agriculture.
- (f) **Infrastructure:** All villages in Gujarat region have been electrified. Small hamlets in the Dangs district may be the only exceptions. Over 6.7 lakh pumps were energized till 1999–2000, although there was a large variation in number of electrical pumps between the districts depending upon the rainfall, availability of ground water and topography. There were 101 such pumps in the Dang district (high rainfall and hilly tract) and 90,972 in Junagadh district. The total road length in the State was 73,397 km and the road density at 0.37/km<sup>2</sup> was quite satisfactory. Average vehicle density was 31/km<sup>2</sup>. In 2001–02 there was one telephone connection for 18 persons, one bank branch for 13,500 persons, one primary school/1,275 persons and 47 students/primary school teachers. A large number of whole sale markets for different agro-commodities exist, although they lack facilities for grading, scientific, packaging, low temperature storage, etc. Separate figures for rural sector are not available but the overall picture of infrastructure in Gujarat is quite good.
- (g) **Area under Agriculture:** The net cropped area has varied from 9.60 million hectare to 9.67 million hectare during the last 10 years. This is a little over 49% of the total area of Gujarat. Cropping intensity varies according to rainfall and it has been about 105% in the recent years.
- (h) **Land Holdings:** There were 35,32,000 agricultural holdings in 1990–91. This number increased to 37,81,000 in 1995–96 and the average size of operational holding was reduced from 2.93 ha to 2.62 ha in the same period. About 55% of the holdings fell under marginal and small size group in 1995–96, against 78% at the national level. Average size of holding was 86% larger than the national average.
- (i) **Length of Growing Period:** Total rainfall and the limited period during which it is received limit the growing period which is more than 150 days only in the southern part of the State. As one moves towards north-west, the growing period goes on shortening till it becomes less than 60 days in Kutch district. Not much can be grown in Gujarat is *rabi* without irrigation. Erratic rains with CV exceeding 50% make irrigation a necessity for ensuring good performance of most crops except in south Gujarat.
- (j) **Irrigation:** The ultimate irrigation potential is estimated at 6.5 million hectare (mha); 2.55 mha of ground water the rest of surface water. About 55% of the irrigation potential has been harnessed. About 80% the ground water resources are already utilized and future expansion of irrigated area will be mostly through the use of surface water. Rice and wheat use up about one third of irrigation water even though the performance of these two crops is not good in the State. More judicious use of irrigation resources can enhance the State's returns from agriculture.
- (k) **Major Crops and their Performance:** Performance of rice, wheat, pulses and cotton in Gujarat is below the national average. It is substantially above the national average for coarse cereals, oils seeds and onion. Although potato is not a major crop, its yields in Gujarat are high. The State finds a place among the top 3 in terms of productivity of bajra, groundnut, sesame, rapeseed and mustard, castor, onion, banana, chikoo, guava, cauliflower and tobacco.
- (l) **Energy Sources and their Contribution:** As in the rest of India, there has been a steady shift from

animal power to electro-mechanical sources of power in Gujarat although the rate of change has been slower than that of the leading agricultural States. The availability of power is estimated at 1.20 kW/ha. Out of this about 90% comes from tractors, engines and motors.

(m) **Farm Machinery Manufacture:** It is not well organized. Subsidy on agricultural equipment is given if obtained from State government approved manufacturers.

(n) **Training, Research and Extension in Mechanization:** Junagadh Agricultural University offers under graduate and post-graduate training in agricultural engineering/agricultural mechanization. Research in farm power and machinery is limited. Extension is nominal. Department of Agriculture of Gujarat and its Agro-Industries Corporation have no major programme or activity to provide training and guidance to farmers in the selection, operation, maintenance and general management of machinery and power units. Tractor dealers do not have technical capability to guide client farmers in selection of matching equipment.

(o) **Other Sub-Sectors of Gujarat Agriculture:**

1. Largest producer of marine fish. There has been some reduction in the catch recently. Trash fish handling and drying is unsatisfactory.
2. Gujarat has excellent breeds of draught cattle and milch buffalo. Fodder scarcity in years of poor rains seriously effects animal health and milk production. The milk cooperatives have played a crucial role in the development of dairy in industry in India.
3. The oil mills, dal mills and onion drying plants need to be modernized. Gujarat has the potential to become a major fruit and spices processing State.

## 5. SWOT ANALYSIS OF AGRICULTURAL MECHANIZATION PROGRAMME IN GUJARAT REGION

### Strengths

1. Average size of holdings in 1995–96 was 2.62 ha compared to the national average of 1.41 ha. Area under medium and large holdings was 51.3% of total cultivated area. This figure increased to 78.7% if semi-medium holdings were grouped with medium and large holdings.

2. Plains dominate the topography.
3. Alluvial soils and medium black cotton soils which are suitable for mechanized cultivation account for 70% of area under cultivation.
4. Soil and ambient temperatures favour cultivation of commercial crops like groundnut, cotton, vegetables, selected fruits and spices which imparts economic viability to mechanization.
5. Survey data confirms that the 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.
6. Good draft cattle are available for mechanization of crop production operations under poor traction conditions (heavy black cotton soils) using animal drawn equipment.
7. Good infrastructure, extensive banking network and a strong industrial sector have created the potential for manufacture, marketing and introduction of better farm power sources and equipment.
8. Sardar Sarovar project will increase the area under irrigation which will raise intensity of cropping and land productivity and encourage investment on mechanization.
9. Remittance of money by non-resident Gujaratis who have their roots in Gujarat villages offers a source of funds for investment in agricultural machinery and power units.
10. Government has planned substantial increase in production, productivity and cropping intensity in the next few years.
11. Govt. plans to expand and strengthen agro-processing activities, particularly for export purpose, which will require good quality raw produce.

### Weaknesses

1. Twelve out of 26 districts of Gujarat are drought prone. Without assured irrigation, the risk of crop failure is too high. This discourages investment on mechanization.
2. Heavy allocation of irrigation resources to grow crops like rice and wheat, which yield below the national average, restricts the potential to shift to the cultivation of high return crops.
3. The State does not have any policy or plan to encourage and promote the use of better power sources and machinery. On the other hand Gujarat

Agro-Vision 2010 proposes a substantial increase in the number of persons engaged in agriculture which will lead to more fragmentation of holdings and increase in the number of inadequately employed persons in the rural sector. In the Agro-Vision 2010 document farm mechanization is not even recognized as an important input to upgrade State's agriculture.

4. Capacity and facilities for manufacture and repair and maintenance of farm machinery are inadequate.
5. Extension and training programmes to acquaint the farmer with the development in 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.
6. The Department of Agriculture is short of well trained and experienced agricultural engineering experts to plan and execute agricultural mechanization programme.
7. R&D programme in agricultural mechanization is very limited.

### Opportunity

1. A time bound programme to extend water conservation activities to all drought prone areas to achieve better crop stand and extend the growing period can greatly reduce the risk of crop failure.
2. A judicious allocation of irrigation resources will allow increase in the production of commercial crops which will give higher returns to the farmer and improve his capacity and bankability to invest in mechanization.
3. 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.

### Threats

1. In view of the diminishing contribution of agriculture to State GDP, agricultural development in general and its mechanization in particular may be relegated to a position of low priority.

2. In its anxiety to absorb more people in agriculture, State may deliberately discourage agricultural mechanization.
3. The emphasis on self sufficiency in cereals like rice and wheat, a carry over from the days of general shortage and ban on inter-State movement of these commodities, may lead to status quo in respect of allocation of irrigation resources and prevent shift in favour of commercial crops which could have created adequate financial capacity at the farmer's end to improve production technology including the use of better power sources and equipment.
4. Lack of attention to water conservation oriented practices including irrigation, ground water mining may accelerate and adversely affect the agricultural development programmes.
5. In the absence of proper equipment and technologies, quality of raw material may be too poor to produce processed products of acceptable/marketable quality.

### 6. STATE PLAN (GUJARAT AGRO-VISION 2010)

The Government of Gujarat undertook a detailed exercise in the year 2000 to develop a plan and strategy for the development of the State in the next 10 years, i.e. till 2010. The agriculture related plan, Gujarat Agro-Vision 2010, has given the details of strategy to upgrade the State's agriculture. Some of the goals and objectives listed in this document are:

1. Annual growth 6.35% in agriculture.
2. Doubling of per capita income in real terms.
3. Reversal of migration to increase rural population from 63% of State's population to 67%.
4. Making Gujarat farmer a knowledge worker who has access to technology and who takes decisions on commercial considerations.
5. Development of state-of-art infrastructure.
6. Making full use of advantages Gujarat agriculture enjoys in the production of selected crops like cotton and groundnut.
7. Development of excellence in the production and processing of horticultural produce.
8. Creation of bankability for agriculture sector.
9. Emphasis on food processing.
10. Creation of legal frame work between producer and processor.

The document details the strategy to achieve the above objectives through improved management of land and water resources, of inputs like seeds, fertilizers and chemicals and through improvement in marketing,

financing and infrastructural facilities. It makes no mention of farm mechanization or of the need to improve agricultural tools and implements and to provide more and better quality power to the rural sector. The document has set the targets for raising the productivity of different crops. These are given in Table 1 & 2.

Table 1. Planned Increase in Productivity (%) During the Period 1998–99 to 2009–10

Crop	Increase	Crop	Increase
Wheat	23.5	Sugarcane	30.2
Rice	83.7	Tobacco	12.4
Bajra	102.6	Banana	22.2
Pulses	49.4	Mango	10.0
Groundnut	20.5	Chikoo	8.3
Sesame	42.5	Potato	4.6
Mustard	14.9	Onion	11.4
Castor	25.2	Tomato	9.5

Table 2. Gujarat Agro-Vision 2010 also envisages considerable increase in area and production of most commodities as shown below:

Commodity	1998–1999		2009–2010	
	Area (mha)	Production (mt)	Area (mha)	Production (mt)
Cereals	3.04	4.93	3.40	8.53
Oilseeds	0.86	0.63	1.20	1.20
Castor	2.58	3.18	3.20	4.64
Sugarcane	0.35	0.69	0.70	1.75
Fruits	0.20	1.36	0.30	2.47
Vegetables	0.18	2.29	0.63	15.89
Spices	0.19	3.26	0.56	9.42
	0.23	0.35	0.70	0.91

## 7. SOME ISSUES

The farm mechanization strategy should be kept in line with the overall strategy to develop agriculture and agro-processing industries in the State as envisaged in the Agro-Vision 2010. This requirement raises certain issues which need to be addressed before the formulation of the strategy for agricultural mechanization. These issues are:

- Although 37.83% of gross cropped area (1999–2000) is irrigated, Gujarat agriculture remains highly rain dependent. The yield figures for 1997–98 and 2000–01, given in Table 3, the good and poor rain years respectively, make the point clear.

Table 3. Yield of main crops

Crop	Yield (kg/ha)		Change
	1997–98	2001–02	
Food grains	1400	827	–41%
Rice	1550	810	–48%
Bajra	1364	830	–39%
Groundnut	1358	395	–71%
Cotton	356	120	–66%
Maize	1664	750	–55%

More attention needs to be given to dry land agriculture which can make best possible use of the limited and variable precipitation. In such a case soil moisture conservation and speed of land preparation and planting operations will assume a great significance for achieving proper stand and ensuring moisture availability during the growth period even after the rains end.

- (a) Rice and wheat use up a large part of Gujarat's irrigation resources. The average yield of both these crops are below the national average. Most of Gujarat is water deficit and rice can not be grown without heavy irrigation. Similarly, because of dry and short winters wheat yields remain low though 84% of area under wheat is irrigated. Low yields and high intensity of irrigation of wheat and rice crops is not an indication of a judicious use of limited water resources. The Country is now surplus in these two cereals and there are no inter-State restrictions on their movement. The irrigation resources committed for rice and wheat cultivation can be more productivity utilized to stabilize the yields and production of oil seeds and cotton for which Gujarat offers ideal production conditions with irrigation and which are of greater economic and commercial importance to the State. Also, the land and irrigation resources released from rice and wheat can be more beneficially utilized to extend the cultivation of vegetables, spices and fruit crops like banana. Such an approach will be in keeping with the objectives stated in Gujarat Agro-Vision 2010. In fact, without reallocation of irrigation resources and appropriately mechanizing production the ambitious plan to increase the area under and production of spices, fruits and vegetables can not be realized. The hardware and its management for mechanizing production of these crops will be different from what is used now for the production of cereal crops.

- (b) The cropping intensity will have to be raised to achieve the planned 33% increase in gross cropped area. This will reduce the time available between the harvest of one crop and planting of the next crop and require changes in the equipment and practices for seed bed preparation, planting and harvesting.
- (c) Gujarat has the advantage of relatively larger land holdings and more land per agricultural worker. The plan to increase the population engaged in agriculture will destroy the present advantage and it will go against the State's plan to modernize its agriculture, make Gujarat farmer a 'knowledge' worker and substantially improve per capita income of the farming families. A plan to create more employment in the rural sector should be based on development of non-land economic activities like agro-processing and improvement of infrastructure and services.
- (d) The ambitious plan of the State to develop agro-processing industries and enter into large scale export of processed products will be realized only if the quality of raw materials (agricultural produce) improves and adequate sanitary and phyto-sanitary measure are taken. Further, the chemical residues in the raw produce and processed products will have to be below the globally acceptable levels. This requires knowledge and skills and proper equipment and machinery from plant protection to final packaging and transport of processed food and other materials. Recent studies have shown that the incidence of exceeding permissible maximum residue level of harmful chemicals in food commodities in India is 10 times of world average. Fruits, vegetables and milk are the most highly contaminated commodities. Also, the pesticide residue in baby milk powder ranged from 8.3 times of permissible level in Bangalore to 253 times in Himachal. The contamination starts during plant growth and often gets to higher levels of concentration during subsequent usages and processing. This is particularly true of horticultural products.
- (e) Knowledge based plant protection involving the choice of the right chemical and the equipment for its application, proper operating skills and awareness of the harmful effects of excessive use of chemicals will ensure protection of the crop without loading the produce with excessive levels of chemicals residues. A good harvester will

reduce damage to potatoes. Controlled drying of groundnut pods after harvest will avoid the development of mould and aflatoxin and grading for size/colour will make the produce more acceptable in the market. These are only few examples of the need for integrated mechanization of production and post harvest/processing operations.

## 8. STRATEGY

The strategy for mechanization of Gujarat agriculture suggested below is based on the assumption that the above issues will be suitably addressed by the State to achieve the overall goal of more income for the agricultural worker and improvement in Gujarat's position amongst the States known for their progressive agriculture.

### 8.1 Farm Power

1. Availability of adequate farm power for mobile and stationary farm operations should be increased from the present level of about 1.2 kW/ha to about 3.00 kW/ha in Gujarat, by 2020. For stationary operations like water lifting, threshing, chaff cutting, cane crushing, cleaning, grading and other agro-processing and value addition activities, adequate electrical energy should be provided. For this it should be ensured that the villages get at least 16 hours uninterrupted electrical power supply every day. If grid power availability is not assured, decentralized power generation using locally available materials should be encouraged in rural areas.

### 8.2 Improved Agricultural Implements and Machinery for Crop Production

2. Gujarat is an important producer of castor, groundnut, cotton, spices, banana, mango and tobacco. These crops require specialized equipment for planting, crop care and harvesting. Such equipment should be provided.
3. For timely farm operations, reduction in cost of operations and saving energy in tillage and sowing/planting/transplanting operations, large scale adoption of rotavators, conservation tillage technologies (promotion of zero till drills, strip till drills, roto-drills, till-plant machines, raised bed planters, ridger seeder etc.) and promotion of precision drills, planters and transplanters for all crops should be promoted and given high priority. Check row planters for cotton and other

crops will have to be introduced. Electronic devices for identifying gaps and counting seeds/seedlings in planters/transplanters will be required to be introduced and popularized.

4. Power operated weeders for narrow and wider row crops will have to be introduced and popularized. High clearance tractors with narrow tyres will be required to be introduced for intercultural operations.
5. Aero blast sprayers, orchard sprayers and electrostatic spraying equipment will be required to be introduced for proper spraying in field and tall crops/orchards and for better deposition of chemicals.
6. Precise land levelling and use of sprinklers and drip irrigation systems to economize in water requirement, should be given high priority.
7. For making farm ponds, bunds, farm roads, drainage channels etc. power operated trenchers, angle dozers, drudgers, buck scrapers and other earth moving machinery will be required to be introduced on large scale.
8. In order to make efficient use of available human and animal energy, improved, efficient and ergonomically designed hand tools and matching animal operated equipment for different operations like seed bed preparation, sowing/planting, weeding/interculture etc. should be promoted and popularized.
9. Equipment and practices suitable for dry land agriculture should be popularized.
10. Raised bed cultivation of irrigated crops should be promoted and appropriate equipment for this purpose should be introduced. Combined with furrow or drip irrigation, this will save water, improve fertilizer use efficiency and raise yields.

### **8.3 Mechanization of Horticulture Crops**

11. Whole set of equipment for mechanization of orchard crops-pit making, transplanting of saplings, pruning, spraying in tall crops, harvesting of fruits etc. need to be identified/imported/developed, introduced and popularized.
12. Vegetable crop production has to be mechanized for which full set of equipment from seed bed preparation, planting, transplanting of seedlings, inter culture, irrigation, spraying harvesting, picking/digging has to be identified/developed and introduced.
13. Different types of manually operated and power operated garden tools will have to be introduced

and popularized for promotion of raising of seedlings for growing of fruits, vegetables and flowers and for work in the gardens.

14. Equipment for laying plastic mulch, low plastic tunnels for cultivation of vegetables, cut flowers etc. will be required to be introduced and popularized.
15. Equipment for mechanization of cultivation in green houses should be introduced and popularized.
16. Packages of prime movers and equipment for the production, harvesting and primary processing of selected vegetables and fruits, spices and special crops like Isabgol should be identified, tested, improved and supplied to the growers. This will require a careful look at the specialized designs of tractors and equipment available in the global market.

### **8.4 Feeds and Fodders**

17. Equipment for harvesting of fodder crops, making silage, feed blocks, feed pallets will be required to be introduced and popularized in future.

### **8.5 Biomass Management**

18. Equipment for harvesting, retrieval, densification, fortification, handling and transport of crop residues will be required to be introduced in large numbers for making best utilization of straw and other crop residues for feed, fodder and energy.
19. For organic farming demand of good quality manure will increase. Equipment for handling, transport and application of manure in the field in liquid and solid forms will be required. Such equipment will be required to be imported/developed and introduced on large scale.

### **8.6 On-farm Post Harvest Technology**

20. Post harvest equipment and technology will be needed for cleaning, grading, drying, cooling, evaporative cooling, storage, cold storage and handling of farm produce to improve their quality and shelf-life. Cool chains for transport of perishable materials like fruits, vegetables, milk and milk products, fish, meat etc. will be required in large numbers to reduce losses.

### **8.7 Infrastructural Improvements**

21. Testing facilities for agricultural machinery and agro-products for quality control should be created in the region and manufacturers,

- processors and experts should be helped in improving the quality of their products.
22. Agricultural Engineering College located at Junagadh should be adequately strengthened in its testing facilities and it should be approved for testing of certain types of agricultural machinery and quality certification of agro-products.
  23. A Display Centre of Improved Agricultural Machinery be established in this region with full information and video clippings of the working of different types of equipment, from where the farmers/extension workers/policy makers etc. can get information about different types of agricultural machinery, their specifications, source of supply and cost. An experienced agricultural engineer should man this center. The center should also have the information on the improved agricultural machinery being used in other advanced countries.
  24. Farm machinery being a costly input to agriculture, farmers should be provided information and properly guided in selection of appropriate equipment for them. For this purpose use of IT (information technology) and kiosks centers should be extensively used. An experienced agricultural engineer should man these centers.
  25. Farm machinery exhibitions and demonstrations should be organized at important places in the region every year and groups of farmers should be taken to these exhibitions to see those improved equipment and their working and to identify items which may be of interest to them.
  26. Adequate facilities should be created and present facilities expanded for training of trainers, farmers, drivers/operators, mechanics, and manufacturers to support the agricultural mechanization programmes. Nationalised banks, Fertilizer companies, tractor/power tiller/combine/engine manufacturers should be involved in organizing such training programmes.
  27. Training programmes should be organized for the entrepreneurs in manufacture/running of custom service centres/Agri-clinics/repair and maintenance workshops and providing contract services for different farm operations.
  28. For creating awareness amongst the farmers and extension workers, regular programmes should be broadcasted/telecasted on radio and TV networks. Video films on the working of different equipment should be prepared and shown to the farmers. Front line demonstrations of new equipment should be conducted in farmer's fields and large number of farmers should be invited to see the demonstration.
  29. A proper mechanism should be developed to collect information, annually, about the production and sale of different types of agricultural machinery in the State, on the pattern on which crop production and yield data are being collected. This will help in getting better idea about the present trends and demand of different types of agricultural machinery and will help in better planning for the future agricultural mechanization programmes. Such data should be published annually and should be available on computer/internet.
  30. Visit of selected groups of progressive farmers should be organized to other States/countries where they can see the modern farms and use of improved agricultural machinery. Similarly visits of selected manufacturers of the region should also be organized to progressive States and countries to see modern farms, manufacturing units and get information on different types of improved agricultural machinery. A team of Research Engineers/Scientists, manufacturers, policy makers should be sent to National/International Farm Machinery Shows to identify potential machinery for introduction in the region/State/Indian conditions for future adoption and popularization.
  31. Research and development and training in the field of agricultural mechanization should be strengthened in the four Agricultural Universities of Gujarat.
  32. Gujarat does not have good facilities for the manufacture of farm machinery. Incentives should be given for local manufacture of farm machinery of good quality. Wherever feasible BIS certification should be considered for the purpose of subsidy.
  33. Incentives should be provided for custom operation of farm machinery by persons trained in farm power and machinery management.

### 8.8 Institutional Framework

34. A Farm Mechanization Development Council, under the Chairmanship of Minister of Agriculture be setup at the State level to plan, guide, review and monitor the programmes related to agricultural mechanization in the State. This

council should be represented by the officials of the Deptt. of Agriculture, Agricultural Engineering, Animal Husbandry, Horticulture, Fisheries, Irrigation, industries, manufacturers of agricultural machinery, leading banks, Agro industries Corporation, State Planning Commission, ICAR Institute in the region, State Agricultural University and Progressive farmers. This council should meet twice a year.

35. The existing infrastructure and manpower for identification, planning, execution, guidance and monitoring of agricultural mechanization and agro-processing activities in the State is poor and inadequate. There is a strong need for creating a separate Directorate of Agricultural Engineering

in the State to plan, execute, review, and monitor various programmes related to agricultural mechanization and post harvest activities in the State. A Monitoring Cell should also be established in the Directorate of agriculture/ Agricultural Engineering for this purpose. This Cell should maintain computerized databases and progress reports of all the programmes.

#### **8.9 Policy Issues**

36. To put agricultural mechanization on sound footing there should be a State Policy for agricultural mechanization. It should provide for incentives for efficient use of energy.

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