

WHAT AILS OUR AGRICULTURE?

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Foreword

I first met Dr. Kirit N. Shelat in Kutch in 1977. At that time he was part of the Rural Development Department. He had developed guidelines for micro level planning for poverty-ridden families. We developed a long term association. We were in Kutch working on agricultural and rural livelihood programmes.

While his last book *Mapping Development* (May 2004) documented the development processes that helped Gujarat's rapid growth over the past 40 years, he has, in his present book documented the development of agriculture and its unique features. The concluding chapter focuses on the major issue that faces our country today - "What Ails Our Agriculture?"

This is a wonderful book. It covers almost all aspects related to a healthy sustainable long-term growth of our primary sector - agriculture. It outlines a strategy for removal of rural poverty. Dr. Shelat paints two pictures. The former shows that sustainable agriculture growth can occur even under adverse circumstances. He has taken the illustration of Gujarat. More than half of its area is in semi arid to arid zones. With clear, determined, well-implemented action plans backed by strong political will, it reached out to all its farmers. The latter illustrates how society gets disrupted due to farmers' suicides and the spread of Naxalism.

Gujarat developed well-designed programmes for rapid growth in agriculture. This was followed by re-structuring of the agricultural sector including re-orienting its administration. It has been brought about through active participation of farmers and voluntary agencies. In recent years, Gujarat has become the number one state in the country in agricultural development.

Sadly we see what happens when State Governments don't act with such clarity. We have farmers who through indebtedness and in utter despair commit suicide. We also see that the younger generation takes up the destructive route of embracing Naxalism. This is disrupting the basic fabric of our society. This has not remained a scattered or isolated case of insurgency. More than a quarter of our country is under such turmoil. This is expanding in other areas at a very fast rate.

This reminds me of our Lakhpat experience. Lakhpat is one of the most difficult habitats of Kutch district. It has scarce population, saline soil, and scanty rainfall. This makes sustainable agriculture very difficult. There are large patches of wasteland and fallow agriculture land developed over years. Even in this difficult area, water conservation under watershed approach backed by scientific agriculture has brought changes. Sustainable agriculture has been made possible. Migration has been reduced to a minimum. There is upcoming greenery all around creating a green belt. The farmers' eagerness to adopt modern farm practices was amazing. In fact the implementation involved about twelve youths of the area who were locally trained. This remarkable story should confirm our confidence in the Indian farmer. He

has the capacity to learn, adopt, implement and grow. What he needs is focused assistance and guidance. Kutch district earlier suffered from recurrent droughts. Even when the rest of the state had no problem, Kutch was affected. This required large-scale migration of human and cattle resources. Many of its people migrated permanently. But now, all this has changed. With the scientific agriculture supported by a massive water conservation programme and the availability of Narmada water, Kutch now grows the best of cotton and horticultural crops like grapes and Kesar Mangoes. It has huge energy plantations. These were never heard of. The regular migration of cattle and people has almost stopped.

The country has seen a breakthrough in agriculture production. There are many achievements that we can be proud of. We had a history of importing food grains. There were famines in which people and cattle perished due to lack of food, fodder and water. We have now emerged as a very strong nation. There is self-sufficiency on the food front and even export. However, the other side of the picture, which the author has narrated, is quite true. It needs immediate attention of all those who are interested in not only sustaining agriculture but also in keeping the democracy alive.

The author has rightly stated, "In the same village with similar land and the same crop, one farmer makes a profit and becomes prosperous, and another farmer becomes poor and commits suicide." He has added that "All farmers or their children do not commit suicide – some of them go the wrong way – take the law in their own hands – start a government of their own – call them Maowadis, Naxalites, whatever you like. It is poverty and helplessness, which drives them to such groups."

Both these groups and others who live hard lives are people who are left out of development processes. The violence in rural areas is dangerous. Its ramifications are far more serious than people realize. It is not merely a law and order problem. It requires a comprehensive development approach. It needs to be tackled. If it is not done, we may end up losing the fruits of democracy. I like the suggestion to re-activate district and village level administration, but more important is to make the Chief Secretary accountable to the persons and or families who are left out of development process.

Some of the most important chapters in this book relate to micro-level planning with a soil health card for every farmer and a new extension and management approach under the Krushi Mahotsav model. These have been recently introduced in Gujarat. They have a great impact on the farmers by improving their condition and developing sustainable agriculture. But the most interesting is the concluding chapter "What Ails Our Agriculture?".

Dr. Kirit Shelat recently retired as the Principal Secretary of the Agriculture and Co-operation Department of the Government of Gujarat after forty years with the Government of Gujarat. One of his most outstanding contributions during his tenure was the introduction of "Micro Level Planning" for every village for agriculture and introduction of Soil Health Card based on soil health and moisture analysis to guide each individual farmer for selecting crops which can be effectively sustained. This has been effectively implemented in Gujarat.

Dr. Shelat's book is a must for all students of agriculture. It will also be of interest to all those who are concerned with agriculture including administrators, politicians, corporate leaders and responsible citizens. They will enjoy reading this wonderful story about how the essential path for sustainable agriculture growth and poverty removal in our rural area can be implemented if there are determined minds.

Shri Kantisen Shroff

ACKNOWLEDGEMENTS

I am thankful to innumerable readers who welcomed my first book on the Gujarat experience, *Mapping Development* which dealt with the theory of development process in a developing country. This encouraged me to take up further work on a major issue that concerns our policy makers - *What Ails Our Agriculture?* Again, the Gujarat experience became useful for drawing an outline.

I am thankful to a wide spectrum of people including farmers, students, university scientists, VLWs, agriculture officers, animal husbandry and veterinary officers, executives of NGOs and a wide variety of people who are dealing with agriculture including input dealers. They provided me feedback and basic material for writing this book for which a lot of research has gone in.

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I am thankful to my wife Ila and sons Vrajesh and Mitual who encouraged me to write this book.

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DR.KIRIT N SHELAT

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CHAPTER 1: INTRODUCTION

India's economy has made noteworthy progress in last fifty years of development. Starting with a slow growth rate of 2% to 3%, it has increased to 7% to 8% per annum in the new millennium. The agriculture sector played an important role in this process of development. Although its growth was sluggish, it was enough to meet challenges of food scarcity and reduction in rural poverty. The country became self-sufficient in food grains and imports were no longer necessary. However, over a period of time, the contribution of the agricultural sector to the GDP came down to 25% from 60% prior to independence. But agriculture continued to be a major source of employment, directly and indirectly through self-employment and wage employment. Approximately 75 percent of poor families in rural areas depend on it to some extent for their livelihood. Agricultural labourers, along with small and marginal farmers constitute 80% of the rural poor.

Agriculture is the base for activities and provides multiplier effect for rapid growth. It has been the key player in India's economic development process and is therefore called the country's primary sector.

Taking a closer look at the Indian context, the country that was importing wheat in early '50s and '60s, began exporting the cereal in 2004-05. Food production has also gone up from 60 million tonnes in 1950 to 205 tonnes of food grains now – enough to meet the requirement of our billion-plus population. There has been a sustainable growth in agriculture all over the country. This is quite satisfying for a largely subsistent nation, where agriculture was used only for getting one's food requirements. In fact, for several years, small and marginal farmers remained below the poverty line. However, over the past 50 years of growth, the number of families below poverty line has come down substantially from 80% of rural families to 20% at present. This is a remarkable achievement.

There are, however, some problems. Growth in the agriculture sector has been very slow, with even the modest target of 4% proving impossible to achieve. There are a number of provinces – states of our country – where agriculture is not booming. There are also pockets within progressive states where agriculture is not doing well. Despite the reduction in poverty, some poor farmers are still being left out of developmental processes. Despite tremendous overall growth, some farmers are still committing suicide due to crop failures, a trend in place for some time now. According to the Union Agriculture Minister, Shri Sharad Pawar, more than 15,000 farmers have committed suicide in the last five years. This is tragic.

But on the other, more dangerous side of this phenomenon, are young educated farmers who get attracted with ideas of 'Naxalism', and prefer to work with such terrorist groups participating in looting and violence despite the danger to their life. Naxalism-type of terrorism is spreading across a large number of states in our country, under different names. According to one estimate, it has spread from 55 districts in nine states in 2003 to 156 districts in 13 states in 2004, and to 170 districts in 15 states in 2006 – out of the 604 districts of our

country. They are running a parallel administration. Naxalism is a violent movement against the rule of state, in place by terrorist groups within and outside our country, supported by neighbouring countries who are using it to disrupt the development process and our democratic set-up and create anarchy.

So, alongside growth, we have farmers committing suicide and with the rural youth, turning into Naxalites, and then into terrorists. The entire movement is a ticking time-bomb, working against the basic fabric of our country and challenging the nation today.

It is essential to pay attention to the growth of the poor and marginalized sections of society, since specific development of agriculture for poor families is more important than overall growth. Within the same village, with similar land and similar crop, one farmer makes money and another commits suicide. The responsibility for this state of affairs belongs to the state government. The district level, taluka and village administration need to be activated. The state government must ensure that the fruits of development reach the families who are left out of development process. The administration must reach out to villages and poor farmers and other poor families. If this is done, Naxalism could be eliminated.

Gujarat provides an example. The odds are stacked against the state, with 70% of its agriculture being rain-fed. Also, half its districts are drought prone areas, and one-fifth its area is tribal, surrounded by undulating terrain where, even with good rains, crops get ruined and washed away. It has frequent droughts that account for almost three years per decade. There have even been instances when drought hits the state in consecutive years. Even in good rain years, there are gaps – i.e., there is a delay between one spell of rain and another, and untimely rainfall.

Other times there are heavy rains and cyclones, that wash crops away. The state also houses the ever expanding Great Rann of Kutch. This coupled with the sea surrounding the state on three sides and underground faults resulting in saline water penetrating the land, the productivity of farm land is affected adversely.

In the first four decades, Gujarat had an uncertain agricultural growth. There were great fluctuations in agriculture production and productivity, and even negative growth in certain years. This has been primarily due to uncertainty of the monsoon and lack of assured water supply. Recurrent crop failures resulted into heavy pressure on the State and Central exchequer for providing scarcity relief work and payment for crop insurance.

The period on which this book is focuses, 2001-05, heralded a remarkable change, with the state's agriculture stabilizing and crop productivity increasing tremendously. Growth in agriculture sector reached as much as 11% per annum during these years when Gujarat became number one in agriculture, surpassing states like Punjab and Haryana.

It is therefore necessary and important to document the reasons for Gujarat's stable and rapid growth in agriculture – how each village and each farmer was approached by the district administration to tackle basic problems; how agricultural scientists came out from their ivory

tower to visit villages and meet farmers at their doorstep; how scientific agriculture based on soil health analyses came about.

The first part of the book looks at Gujarat at large, followed by a comprehensive picture of the agricultural scene at the national level. It includes detailed descriptions regarding the status of agricultural and horticultural crops over the past four decades in addition to looking at the development of animal husbandry and dairy development, fisheries, cooperatives, credit support, agricultural research and development and education, agro industry development, laws applicable to agriculture, organic crops, biotech development, constraints in development, and new initiatives taken.

The fourth chapter deals with recent developments in management of water resources, highlighting new initiatives in water conservation, crucial for the development of sustainable agriculture. The chapter following this deals with the status of farmers, on the basis of NSSO data and case studies of farmers in three of Gujarat's most backward tribal areas. The position of women farmers has been described in brief.

Chapter six deals with new significant measures, starting with micro-level planning for season-wise crop production followed by the scientific approach individual farmers took, with an IT network helping them select crops based on soil and moisture analysis.

The next chapter deals with the new management approach for integrated agriculture development aimed at doubling the income of farmers and especially reaching out to the poorest farmers individually. This model known as 'Krishi Mahostav' is under implementation in State and involves everyone from the Chief Minister and Chief Secretary to village level extension workers, Sarpanches, teachers, and progressive farmers with the objective of making the 'farmer' as the 'focal point' for rapid agricultural development.

The concluding chapter, 'What Ails Our Agriculture', focuses on motivating and pushing the local administration to take up the challenge. Dealing with state level and district level administration in particular, I have tried to examine the role of the Chief Secretary of State and his accountability to poor, debt ridden families left out of the developmental process who are at the cross roads between suicide and Naxalism. Poverty is the main reason behind either choice. However, there are others who choose neither of these, remain poor and live impoverished lives.

This challenge can be met by bringing back the personal approach to assist poor families of rural areas – both farmers and non-farmers. The Chief Secretary at state level will have to take lead to motivate the district level and village level administration to do this, and to dissuade farmers from committing suicide, helping them live honourable lives as citizens of this great country. The Chief Secretary along with the Director General of Police will have to stand up and eradicate violent movements like Naxalism to keep democracy intact. This is an attainable task.

CHAPTER 2: GUJARAT OVERVIEW

Gujarat is one of India's leading states as far as development is concerned. Its growth rate has gone up from 9% in the '90s, to about 10-12% in the first five years of the new millennium.

Gujaratis have historically been entrepreneurs who have traveled all over the world, whether to Middle East and Africa as they did earlier, or Europe, America, Australia, New Zealand, and Russia, as they do now to explore new avenues.

Gujarat is also considered a land of opportunities – anyone who has come to Gujarat and has set up an enterprise has largely been successful. Gujarat has major industrial houses as well as multinationals.

Gujarat's farmers are no different from anyone else in the state - progressive, ready to learn and adapt, they are also enterprising, alert, willing to try new crops, adopt latest technologies and take bold decisions.

Gujarat is considered a place where new initiatives are taken for rapid economic growth. After it became a State in 1960, development gathered momentum. In fact, it had all possible constraints against rapid development – large arid and semi arid areas with recurrent droughts, rain-fed agriculture, poor industrialization, large under-developed tribal area and more than 60% of its rural population below poverty line.

In the sixties and seventies, the Green Revolution followed by the white revolution triggered growth. In fact, dairy cooperative societies at village level in the pattern of *Amul* provided a cash inflow in rural areas and generated the demand for non-farm products. The Government came out with an aggressive industrial promotion policy. These, I have discussed in greater detail in my earlier book, *Mapping Development*. Even as the eighties and nineties saw a rapid economic development in the industrial and service sectors accelerating growth both in urban and rural areas, agriculture continued to lag behind. Its growth was tardy, erratic and slow. But this sector gained momentum with the turn of the century. Now, all sectors are driving the growth together. Some of the salient features of Gujarat's economy are described below.

All data mentioned and the next chapter are based on the Annual Socio-Economic Report of Director of Economic & Statistics, Government of Gujarat.

Industrial Sector: As per Commissioner of Industries, Government of Gujarat Annual Survey of Industries – 2003-04, the value of output at current prices of all registered factories covered in the survey increased from Rs.1,82,700 crore in 2002-03 to Rs.2,07,316 crore in 2003-04, showing an increase of 13.47%. The net value added by manufacture under factory sector has increased from Rs.22,889 crore in 2002-03 to Rs.43,366 crore in 2003-04. It is worth mentioning that Gujarat ranks second next to Maharashtra in respect of state-wise percentage share in net value added by manufacture generated by factory sector of the country.

Mining: The major produce includes agate, steatite and gypsum. marble, limestone, lignite, bauxite, laterite, dolomite, fire clay, bentonite, quartz, silica sand, chalk, etc. The production of petroleum oil (crude) and natural gas is one of the key factors for triggering a massive expansion of petrochemicals and chemical industries.

Banking: The number of scheduled commercial bank offices in the State is 3,689 as of December 2004. The aggregate deposits amounted to Rs.93,152 crore. The total bank credit advanced was Rs.41,344 crore. The Credit Deposit Ratio (CDR) of the State was 44.38%.

Education: The estimated number of educational institutions for primary education in the State was 37,671 and 82.66 lakh pupils were enrolled. Number of secondary and higher secondary institutions was 7,718 and number of students enrolled therein was 24.64 lakh. With regard to technical education facilities the state has total intake capacity of 13,011 and 2,205 seats in degree engineering and degree pharmacy courses, respectively. The capacities in MBA and MCA courses were 2,911 and 1,732 respectively.

Health: The health infrastructure has significantly improved the health of the people in the State. The birth rate has declined from 34.5 (1981) to 24.6 (2003). The death rate has decreased from 12 (1981) to 7.6 (2003), and the infant mortality rate has also come down from 116 (1981) to 57 (2003). The number of Community Health Centers, Primary Health Centers and Sub Centers functioning in the State has increased to 272, 1,070, and 7,274 respectively at the end of March 2005, from 17, 251, and 2,951 respectively in 1981-82. With regard to medical institutions, the State has 53 district and taluka hospitals, four mental hospitals, two specialized hospitals, and 60 dispensaries with a total capacity of 6,648 beds.

Rural Development: Under 'Swarna Jayanti Gram Swarajgar Yojana', 27,457 *swarajgaris* were covered. Under 'Samporna Grameen Rojgar Yojana', 269.27 lakh mandalays were generated, 22,415 new houses were constructed, and 11,239 houses were upgraded under 'Indira Awas Yojana'.

Location

Situated between 21.1° N and 24.70 N latitude and 68.40 E and 74.5° E longitude, the state has Pakistan to the northwest, Rajasthan to the north, Madhya Pradesh to the east, and Maharashtra to the south and south-east. The plains of Gujarat are watered by perennial rivers like Sabarmati, Mahi, Narmada and Tapti and by smaller rivers like Banas, Saraswati and Damanganga.

Area and Population

The State has 25 districts and 225 talukas, spread over an area of 1.96 lakh sq km, accounting for about 6% of the country's geographical area. According to the Population Census 2001, the population of Gujarat was at 4.84 crore, accounting for 4.93% of the national population.

Density

The population density is 258 persons per sq km. The highest density of 718 persons per sq km is found in the district of Ahmedabad, while the least density of 35 persons per sq km is in the Kutch district.

Electricity

Total installed power generating capacity of Gujarat is 8,713 MW in 2003-04 provided by Gujarat Electricity Board – State Board (4,333 MW), private sector (2,816 MW) and central sector (1,562 MW).

Roads

The total length of roads in the State is 74,019 km. The length of national highways, State highways, major district roads (MDRs), other district roads (ODRs) and village roads (VRs) was 2,382 km, 19,163 km, 20,953 km, 10,422 km and 21,098 km respectively.

Railways

The total length of the railways lines is 5,310 km comprising 2,089 km of broad gauge 2,345 km of metre-gauge and 876 km of narrow-gauge lines.

Airports

The state has seven operational commercial airports at Ahmedabad, Bhavnagar, Vadodara, Jamnagar, Surat, Rajkot and Bhuj and an international airport at Ahmedabad.

Ports

Gujarat has 1,600 km of coastline. It has 11 intermediate, 29 minor and three major ports. The major port at Kandla, managed by Govt. of India, handles about 40 million tonnes of cargo. The other two ports are private – Mundra in Kutch and Pipavav in Amreli. The 40 minor and intermediate ports are located across South Gujarat (13) Saurashtra (23) and Kutch (4). There are two LNG ports, one at Hajira-Surat and the other at Dahaj-Bharuch. Gujarat's ports serve about 30 per cent of India's landlocked states, especially northern States like Rajasthan, UP, Punjab, Haryana, MP, J&K, Chandigarh, Delhi, and Himachal Pradesh.

Post & Telecommunication

There are 8,992 post offices/branches. All talukas and villages have telecommunication facilities while all taluka headquarters have mobile phone connectivity.

Forest Cover

Approximately 18,000 sq km constituting 9.92% of area of the State is under forest cover. The dense forests are spread over less than 2,000 sq km in the districts of Valsad, Navsari and

Dangs. The dry forests are spread over 10,700 sq km in Narmada, Vadodara, Panchmahals, Dahod, Sabarkantha, Banaskantha, Junagadh and Amreli districts. The thorn forests are widely distributed towards West and Northwest parts of the State covering 5,000 sq km in Mehsana, Ahmedabad, Western Banaskantha, Western Sabarkantha, Surendranagar, Bhavnagar, Amreli, Jamnagar, Rajkot and Kutch districts.

Population Below Poverty Line

13.17% of the rural population and 16% of the urban population are below the poverty line (BPL). In the early fifties almost 80% of rural population was below poverty line. This shows significant decline in poverty level due to impact of rapid economic growth.

Classification of Working Population

Classification of population by economic activity as per 2001 Census reveals that:

- Of the total population, 170.25 lakh (33.60%) are main workers, 42.31 lakh (8.35%) are marginal workers, and 294.15 lakh (58.05%) are non-workers.
- Of the main workers, 27.67% are cultivators, 17.91% are agricultural labourers, 1.9% is engaged in household industries, and 52.62% are engaged in other economic activities like manufacturing and the service sector. Thus, about 45.58% working population is actively engaged in agriculture (i.e., cultivators and agricultural labourers).

Structural Changes in the Economy

With rapid economic growth, the share of agriculture in GDP has reduced to 25% at National level. However its contribution to the GDP remains between 30 and 40 percent in states like Punjab, Orissa, Uttarpradesh, Bihar, Haryana and Madhya Pradesh, while in states like Gujarat, Maharashtra, and Tamil Nadu, its share is less than 20 percent. The growth agriculture at national level has remained below 3% per annum.

The rate of growth of GSDP in various sectors of the economy during different decades is as follows:

Rate pf GSDP at constant 1993-94 Prices (Percent)				
Sector	1960-61to 1970-71	1970-71 to 1980-81	1980-81 to 1990-91	1990-91 to 2000-01
Agriculture	2.67	3.15	-0.53	2.53
Manufacturing	2.58	6.62	8.41	9.13
Primary	3.19	3.40	0.03	3.42
Secondary	3.15	6.57	7.87	8.63
Tertiary	3.41	5.31	7.26	8.29
Total GSDP	3.32	4.69	5.08	7.35

Gujarat’s economy has accelerated its growth during each of last four decades. The manufacturing sector has grown at faster rates than agriculture.

Sector-wise Composition of Gross State Domestic Product (GSDP) at Constant (1993-94) prices

Sector	Percentage share to total GSDP for the five years ending					
	1964-65	1974-75	1984-85	1989-90	1994-95	2000-01
Agriculture	42.30	29.60	33.81	25.30	24.35	11.93
Manufacturing	19.90	23.20	23.89	26.70	28.53	34.27
Primary	43.70	31.80	37.24	28.58	29.36	15.86
Secondary	25.20	30.20	29.62	33.13	34.82	41.49
Tertiary	31.10	38.00	33.14	38.29	35.81	42.66

The share of agriculture is continuously on the decline.

Gross State Domestic Product (GSDP) at factor cost at constant (1993-94) prices in 2003-04 has been estimated at Rs. 1,03,951 crore against Rs.75,945 crore in 2000-01. At current prices, GSDP in 2003-04 has been estimated at Rs. 1,67,356 crore, against Rs.1,08,484 crore in 2000-01. The growth in GSDP (at constant prices) at 15.4% was observed to be mainly on account of exceptionally high agriculture production as well as better performance of industry sector.

The share of primary, secondary and tertiary sectors has been reported to be at Rs.2,2676 crore which is 21.8%, 38.1% and 40.1% respectively of the total GSDP during 2003-04 at constant prices. The share of these sectors in the base year 1993-94 has been reported to be as 25.4%, 35.8% and 38.8% respectively. The per capita income (i.e., per capita NSDP at factor cost) at constant prices (1993-94) has been estimated at Rs. 16,779 in 2003-04.

Gujarat has shown rapid growth, with a growth rate higher than the national average. It is even higher than some of the so-called Asian Tiger Nations. Its rapid expansion and momentum has been rightly attributed to unprecedented growth of the manufacturing sector and service sector. Agriculture also had growth although it was slow. But in the new millennium changes have taken place and this sector has also picked up speedy growth. This is outlined in following pages.

CHAPTER 3: AGRICULTURE

Gujarat is divided into North, South, Central and Saurashtra-Kutch regions. Large parts of State are plains. Agriculture provides a major source of income for about 60% of the state's rural population. A population of more than two crore, including farmers and agriculture labourers depend on agriculture. It also provides demands that support a major segment of industries like fertilizers, pesticides, seeds, pipes, pumps and other implements. It also provides raw material for the textile industry, oil processing units and a large number of agro processing units including the dairy industry. It has created opportunities for self-employment and wage employment. Although the share of agriculture in the GSDP has declined over a period of time, its impact on the State economy has been quite high. In years of recurring droughts, when agriculture is affected, overall economy gets slack and at times results in the negative growth of the economy.

Agriculture holds the key to reduction in rural poverty. Poverty in rural areas came down to 13% from 60% in early sixties. Poverty reduction was driven by high yield and growth in important crops along with a strong support by the dairy sector, which provided cash income on a weekly basis to rural families. Even today, agriculture and dairy activities hold the key to removal of poverty of the approximately 12 to 16 lakh families who are still poor.

Some of the important characteristics are:

- Gujarat's agriculture is one of most diverse with a mix of food and non-food grain crops with and a domination of cash crops.
- It has adverse agro climatic conditions with 70% of its area under crops being rain-fed and subject to uncertain monsoons.
- The agriculture sector had a negative growth rate in early sixties and seventies. These decades had of recurrent droughts that continued into the eighties. But the situation changed in the nineties. The agricultural sector grew by 3.9% per annum surpassing the all-India average of 3.2%. In the new millennium, it has had a rapid growth of 11% per annum between 2001-03, becoming the country's number one state in growth of the agriculture sector. This has pushed growth in the non-farm sectors as well, resulting in an overall economic growth of 10%, again surpassing the national average. This also increased per capita income from Rs.9,796 in 1993-94 at current price to Rs.26,929 in 2003-04. Agriculture and livestock sector grew from Rs.9,793 crore in 1993-94 to Rs.30,244 in crore in 2003-04 at current prices.

THE AGRO CLIMATIC REGIONS

There is diversity in the agro climate of different regions of Gujarat. The agro climate divides Gujarat into seven zones, based on geography, climate, average rainfall, and soils. These are as under:

1. **Southern Hills** – This comprises Dangs and Bulsar with average rainfall of 1,800 mm per annum. It has humid to sub-humid climate. The soil is deep black, alluvium coastal. The major crops are rice, sugarcane and fruits like mango and chikoo. Parts of this region, particularly Dangs and Vansda, Darampur and Kaparak of Bulsar district, have dense forest with predominantly tribal population. The agricultural practices in this zone are not modern, with low volume and low-value crops. Efforts are being made to change this. Dharampur farmers are now growing cashew nut. These areas have great potential and need attention since a majority of tribal families still live below the poverty line. The undulating terrain is mountainous and subject to heavy soil erosion that washes away crops during seasons of heavy rainfall.
2. **Southern Gujarat** – This consists of Surat, Bharuch and Narmada districts. The average rainfall per annum is 970 mm. It has semi arid and dry sub humid climate. The soil is deep black, coastal alluvium.

The major crops are vegetables, rice, tuber, cotton, and sugarcane. Narmada and parts of Surat and Bharuch districts have forests and are dominated by tribal population. Some of the areas like Sagbara and Devgadhi Baria have very limited use of certified seeds and fertilizers. The crop yields are poor. Majority of farming families are below poverty line. There are, however, successful efforts to grow herbal crops, cotton, and flowers in these areas. The terrain has hills, mountains and is undulating. Majority of farmers are progressive and are adopting modern agriculture.

3. **Central Gujarat** - This consists of Vadodara, Anand, Kheda, Dahod and Panchmahals districts. It has average rainfall of 900 mm. The soil is black to medium black. The major crops are cotton, tobacco, maize, bananas, sugarcane, rice, and vegetables. Parts of Anand, Kheda and Vadodara districts have richest agriculturists of the State. Regions such as Dahod, parts of Panchmahals and Vadodara have tribal population with forests around. Dahod and Chota Udepur are considered as the most backward area. A quiet revolution is going on supported by minor irrigation networks through horticulture crops. This is described elsewhere in greater details.

The majority of areas of above three regions have the benefit of being irrigated by canals from the Mahi, Kadana, Ukai and, now, Sardar Sarovar reservoirs. These regions grow surplus fodder, with the exception of Panchmahals and

Dahod. In years of droughts, these regions supply green and dry fodder to other affected areas of the State. These regions have maximum water resources. Majority of farmers are progressive and are adopting modern agriculture

4. **North Gujarat** - This comprises Ahmedabad, Gandhinagar, Mehsana, Patan, Banaskantha and Sabarkantha. It has an average rainfall of 735 mm. The climate is semi arid and entire region is drought prone. The soils are grey brown, coastal alluvium. The major crops are wheat, bajra, jowar, mustard, castor, cotton, vegetables, and spices. It has the biggest spice market, located in Unjha, and cotton market centres at Kadi of Mehsana district. The monopoly crops like castor seeds, fennel and isabgol are grown here. Almost all farmers are progressive and adopt latest technologies. It will have benefit of irrigation from Sardar Sarovar and under the Sujalam Sanlam Scheme. The region has the highest discharge of underground water resources, resulting in a continuous salinity ingress.
5. **North Saurashtra** - This region consists of Amreli, Jamnagar, Bhavnagar, Rajkot and Surendranagar. The average rainfall is about 500 mm. The entire region is drought prone and frequently affected by scarcity of water. The soil is medium, black and shallow calcareous. Major crops include groundnut, cotton, gram, tuver, udad, bajra, and jowar. Farmers are progressive and achieve a high yield in cotton and groundnut. The new check-dam scheme and watershed programmes have brought about some stability in agriculture in the last four years. It has paid rich dividends by preventing crop failure situation due to lack of rains. The region is known for its Kesar mangoes.
6. **South Saurashtra** - Junagadh and Porbandar are part of this region. The average rainfall is 850 mm. Soil is medium, black and coastal alluvium. The major crops are groundnut, gram, cotton and bajra, and mangoes. Coconut plantations are also found here. There is continuous increase of salinity due to intrusion of seawater. Farmers are progressive.
7. **North West Area** – This includes the Kutch district, the largest district situated between coasts and Great and Little Rann of Kutch. The region experiences recurrent droughts. Even in normal rainfall years, talukas like Lakhpat, Abdasa and Nakhtrana are affected by scarcity. There is always water and fodder shortage during summers. The soil is gray brown, deltaic alluvium sand and saline. Salinity ingress is taking place due to heavy winds, which bring salty particles and also due to seawater intrusion. The major crops are bajra, jowar, cotton, and groundnut. Date palm cultivation is also practised in the region. Cultivation of mangoes and grapes are being taken up in Bhuj and Rapar talukas in recent times. Average rainfall is 300 mm. The farmers are progressive. Earlier there used to be planned migration of cattle. Now Narmada pipeline provides drinking water to villages. Fodder depots are opened every year.

RAINFALL

The physiological features divide Gujarat into three regions, viz. (1) The main land plains extending from Rann of Kutch and Aravali Hills in the North to the rivers Damanganga in the South; (2) The hilly peninsular region of Saurashtra and Sandy area of Kutch; and (3) the north-eastern hill tract.

The standard climate types are arid, semi arid and sub humid climates spread over different regions of the State. The region in north, comprising of the districts of Kutch, Patan, Banaskantha and parts of Saurashtra have arid climate. The rest of the State is semi arid.

All parts of Gujarat receive rainfall from the South West monsoon, being located at the peripheral boundary of its main current. The distribution has been extremely uneven and irregular. Low-pressure depressions over Bay of Bengal during monsoon months also bring rain to parts of the State and the cyclones that develop over the Arabian Sea produce heavy rains in the post-monsoon season.

The State receives on an average annual rainfall of 807 mm in 34 rainy days. This annual rainfall varies spatially and temporally. It varies widely from 350 mm in western half of Kutch to more than 1,700 mm in southern part of Valsad and Dang districts. Monsoon usually commences by middle of June. It withdraws by the end of September. About 95% of total annual rainfall is received in these four months. About 10-15% of annual rainfall is received in June, nearly 40% in July, 25% in August, and 15%-20% in September.

The number of the rainy days (days with rainfall more than 2.5 mm rainfall) varies between 15 days in Kutch district, to 75 days in Dang district. In most parts of the State, rainfall is received in 20-40 rainy days. The annual rainfall variation in terms of coefficient of variation (CV%) indicates high (60%) in low-rainfall district of Kutch, and low (30%) in Dang district.

Different parts of North Gujarat and Saurashtra are identified as drought-prone regions. The high atmospheric demand for water in these regions makes agriculture more vulnerable to moisture stress condition resulting in high variability in crop production.

LAND USE PATTERN

S. No	Particulars	Area in Ha.
1	Geographical area	1,96,117
2	Forest Area	18,653
3	Area under non agriculture use	25,997
4	Barren and uncultivable land	11,419
5	Permanent pasture and other grazing	8,507

6	Land under misc. trees and crops	40
7	Cultivable waste land	19,849
8	Other fallow	131
9	Current fallow	9,189
10	Net area sown	94,896
11	Area sown more than once	10,074
12	Total cropped area	1,04,970

Crops – Seasons

Crop group	Kharif crops	Rabi crops	Summer crops
Cereals	Bajra, rice, jowar, maize	Wheat	Bajra
Pulses	Tur, moong, urad, math	Gram	Moong
Oilseeds	Groundnut, sesame, castor	Rapeseed and mustard	Groundnut
Commercial crop	Cotton, sugarcane, tobacco	Potato	-

LAND HOLDING PATTERN

The average size of the land holding as per agricultural census 1995-96 is 2.62 ha. This is higher than the national average of 1.41 ha. The number of small and marginal farm holdings account for 55.33%. Area held by such small and marginal farmers is 21.35%. Semi medium and medium farmland holdings were 42.20%. They owned 65.06% of area. Balance land is owned by large farm holders, constituting 2.41% who held 13.60% of total land holdings.

AGRICULTURAL PRODUCTION

The agricultural production has recorded substantial increase over a period of time as will be seen from following table:

Period	Average Annual Production			
	Total food grains (lakh tonnes)	Total oilseeds (lakh tones)	Cotton (lakh bales)	Sugarcane (lakh tonnes)
1951-61	19.52	7.73	9.53	0.76
1961-71	29.52	13.26	15.12	1.88
1971-81	38.54	17.50	19.30	4.62
1981-91	45.56	20.20	15.42	7.29
1991-01*	48.82	27.36	23.33	13.61
2005-06	56.60	44.75	37.63	14.57

Source: The Director of Agriculture Govt. of Gujarat.

PRODUCTIVITY IN AGRICULTURE

The average yield per hectare of various crops has increased as can be seen from the following table

Period	Food grains	Oilseeds	Cotton	Sugarcane
1951-61	369	500	104	5207
1961-71	586	602	148	5646
1971-81	787	768	174	7023
1981-91	926	824	207	7708
1991-01*	1132	945	274	7641
2004-05	1152	1464	1812	7400

Source: Review of Agri. Policy, Arun S. Patel, Agro Economic Research Centre, Gujarat 2004.

It will be seen that there is continuous growth both in volume and in productivity over last five decades. The increase in last four years is more remarkable. There is almost 40% rise in food grains and oil seeds, while the growth in cotton is phenomenal.

CROP PATTERN – PRINCIPAL FEATURES

Changes have taken place over a period of last 50 years of development. The diversification of crops has increased. Food grain crops have declined and there is increase in commercial crops like cotton. Within the group of food grain crops too, there are changes. Rice has remained at around 5-6% while wheat has increased. Bajra and jowar production has declined, while maize and pulses have increased. Among non-food grain crops, groundnut, cotton, castor seeds, rapeseed and mustard have shown a rise.

The total area is 1.96 crore ha. Out of this, 54% is gross cropped area, covering 1.04 crore ha. Agriculture crops have a share of 93 lakh ha, while horticulture and fodder crops have 11 lakh ha. As per latest estimate of the Director Agriculture, in the year 2005-06, cotton occupies maximum area at 20.77 lakh ha, followed by groundnut with 19.72 lakh ha. Among food grain, bajra has highest share at 9.56 lakh ha, followed by wheat at 9.86 lakh ha, followed by rice at 6.83 lakh ha. Food grains occupy maximum area of 40.07 lakh ha, followed by oil seeds at 30.58 lakh ha, and cash crops of cotton, tobacco, sugarcane and guar seeds at 25.70 lakh ha. The food grain area has been declining over a period of time. There is preference for high-yield and high-value crop. Bt varieties are now being cultivated in area under cotton. In fact, Gujarat produced 85 lakh bales of cotton in 2005-06, the highest ever, and is number one in the country both in production and productivity. The area under oilseeds is also growing fast with check dam programmes, with the groundnut crop becoming increasingly stable.

In food grain crops, Gujarat produced surplus wheat for the first time in last five decades with production of 25.30 lakh tonnes. In fact, certain varieties of wheat have received huge export orders.

DRY LAND FARMING

Gujarat has 65% of its total area under dry land farming where agriculture is only supported by rain. These areas have uncertain and often insufficient rainfall. This is the major constraint in the rapid development of agriculture. Occurrence of droughts pushes majority of farmers below poverty line. To meet this challenge, the strategy of watershed management is being adopted along with a number of check-dams and harvesting structures. All these aim at providing assured support of irrigation to agriculture, allowing farmers to have better crop selection. This is supported by highly subsidized drip irrigation schemes. Management of dry farming areas will continue to be crucial for future development. Particular attention is needed for promoting drought-resistant and salinity-resistant crops, high-quality seeds and continuous emphasis on water harvesting and efficient use of water.

IRRIGATED FARMING

Irrigated farmlands cover approximately 30 lakh ha, and is predominant in South Gujarat followed by middle Gujarat, north Gujarat and Junagadh district of Saurashtra.

Canal irrigation is mainly prevalent in South Gujarat with Ukai, Khakarpar and Damanganga dams. In Kheda and Anand, it is Mahi and Kadana canals that make irrigation possible. The Narmada Canal has already started catering to Vadodara, Narmada, Panchmahals, and soon rest of the districts will be covered. In North Gujarat, there is tube well irrigation similar to parts of Saurashtra.

Sugarcane, cotton, wheat, rice, etc., are irrigated crops while groundnut, millet and oilseeds are rain fed.

Pump irrigation has created huge discharge of underground water resources by tube well and has increased ingress of salinity. Canal irrigation in south and middle Gujarat has problems of acidic and alkaline soil. All these need immediate attention.

ORGANIC FARMING

With advancement of the new millennium, old values are increasingly being revived. One such area is organic farming. This is the growing of crops without any inputs, which have chemical base or components. Organic farming uses natural products like vermicompost, bio-fertilizer, bio-pesticides, neem oil, etc.

Gujarat has taken the lead in this area, with increased public-private relationship. Organic products need assured market support and a pre-determined price to attract farmers to use them. It requires certification as per international standards, which may take up to three years. Agrocel Company is a joint venture of Gujarat Agro Industries Corporation Limited with Excel Crop Care Limited. It has taken the lead and has identified more than 60,000 acres of land and got it certified by international agencies. It covers a wide range of products including cotton, basmati rice, sesame, cashew nut, walnut, peanut, cumin, jaggery, etc. It has gone ahead for processing cotton fabric and cotton dress material like sportswear, nightwear, etc., and produced wheat-based pasta. "All these products are marketed abroad," says Dipesh

Shroff, Managing Director of Excel Crop Care Limited. He added further “it was difficult to locate market and farmers in the beginning. Farmers were reluctant, especially since three years is a long period for certifying a farm. Although identifying a market was equally difficult, continuous efforts have led to a demand, with even well known departmental brands buying these products both in India and abroad”.

BIO TECH CROPS

Biotech crops have come as a revolution in cost reduction, improving productivity and even colours of produce. According to an estimate by Clive James of International Service for the Acquisition of Agri-Biotech Applications, global area of approved biotech crops for 2004 was 81.0 million hectares. The countries involved are USA, Argentina, Canada, Brazil, China, Paraguay, India, South Africa, Uruguay, Australia, Romania, Mexico, Spain and the Philippines. USA has 47.6 million hectares (59% of global total), followed by Argentina with 16.2 million hectares (20%), Canada with 5.4 million hectares (6%), Brazil with 5.0 million hectares (6%), China with 3.7 million hectares (5%), Paraguay with 1.3 million hectares (2%), India with 0.5 million hectares (1%), South Africa with 0.5 million hectares (1%), Uruguay with 0.3 million hectares (<1%), Australia with 0.2 million hectares (<1%), Mexico with 0.1 million hectares (<1%), Spain with 0.1 million hectares (<1%), and the Philippines with 0.1 million hectares (<1%). Based on annual percentage growth in area under cultivation of the eight leading biotech crop countries, India had the highest percentage annual growth in 2004, with an increase of 400% in Bt cotton area over 2003, followed by Uruguay (200%).

India first adopted the officially approved Bt cotton hybrids in 2002. Encouraged by their success, by 2004 approximately 300,000 farmers had planted over half a million hectares with a five time increase in area under Bt cotton between 2003 and 2004. India is the largest cotton growing country in the world with 9 million hectares, of which almost half – 4 million hectares – is hybrid cotton. Gujarat too has its share. The area under approved variety of Bt cotton is in approximately 4 lakh ha. But much more area is under indigenous variety of Bt. The reason of popularity of indigenous Bt variety is its low cost at Rs.400 per kg of seeds and higher productivity compared to the approved variety, which costs Rs.1,600 per kg. But farmers have benefited immensely both in reduction in cost due to less use of pesticides and increase in productivity.

Several public institutions and private companies in India have projects to develop improved varieties of other crops. Biotech crops being developed by the public sector include banana, blackgram, brassica, cabbage, cauliflower, chickpea, coffee, cotton, eggplant, muskmelon, mustard / rapeseed, potato, rice (including basmati), tobacco, tomato, and wheat. In addition, the private sector in India has biotech crops under development like brassica, cabbage, cauliflower, cotton, maize, mustard/rapeseed, tomato, pigeonpea and rice. Puri Foundation for Education has set up a state-of-the-art center of excellence for research and development in biotech crops.

HORTICULTURE

Horticulture occupies an important place in the agriculture sector. It increases income per unit area, generates more employment opportunities, helps to improve the environment, ensures better nutrition, and gives higher return. Horticultural crops are generally irrigated crops.

Horticultural crops account for about 9% of the total cropped area with 15% share in value of total crops. The major fruit crops are mango, chikoo, banana, lime, papaya, guava, ber, coconut, aonla, date palm, etc. The main vegetable crops are potato, onion, brinjal, cabbage cauliflower, tomato, okra, cluster bean, etc. Gujarat is a leading producer of spices. The main spice crops are cumin, fennel, garlic, coriander, fenugreek, isabgol, and chilly.

In the last 5 years, area under production of different varieties of Horticulture crops has been increased. There is substantial increase in spice, flowers and vegetable crops.

The spread of horticulture crops is as under:

Districts	Major horticultural crops
Dang, Valsad, Navsari	Mango, chikoo (sapota), banana, coconut, brinjal, tomato, chillies, turmeric, etc.
Surat, Bharuch, Narmada	Mango, chikoo (sapota), banana, coconut, tomato, okra, and beans
Panchmahals, Dahod, Vadodara Kheda, Anand	Mango, banana, chikoo (sapota) and kagzi lime, papaya, potato, brinjal, cabbage, cauliflower, tomato, okra cluster bean, ginger, coriander, chillies, fenugreek, fennel.
Ahmedabad,	Kagzi lime, guava, ber, pomegranate

Gandhinagar, Sabarkantha, Banaskantha, Patan, Mehsana	brinjal, cabbage, okra, tomato, cauliflower, cluster bean, cumin, chillies, ginger, coriander, fenugreek, fennel
Saurashtra and Kutch	Onion, mangoes, date palm, guava, pomegranate, garlic, papaya, etc.

The overall status is as under:

1. Gujarat ranks 12th in area and 7th in production of fruits and in vegetable 12th in area and 9th in production in the country.
2. Gujarat enjoys the monopoly position in the processing of isabgol in the world.
3. The average yield is highest in respect of onion and potato in the country.
4. The State is well known for 'Kesar' mangoes and Kutch's date (*khajoor*).
5. Recently there is introduction of new crops like grapes, aloe vera, palmarosa, lemongrass, patchouli and mentha.
6. Floriculture is becoming popular in recent times. Rose, lily and marigold are sold in domestic market with some export to Europe.

This indicates a tremendous growth in area, production and productivity.

**Area and Production of Major Horticultural Crops of the State:
Year 2003-04**

S. No	Crops	Area ,000 ha.	Production ,000 Tonnes
1	Mango	79.31	595.21
2	Chiku	22.52	224.01
3	Citrus	25.89	263.03
4	Banana	42.91	1,760.90
5	Coconuts	15.70	1,11,721 (nuts)
6	Potato	31.21	704.10
7	Onion	51.50	1315.35
8	Brinjal	50.93	732.11
9	Cabbage	14.10	249.01
10	Okra	35.19	273.70

11	Tomato	22.92	420.69
12	Chillies	27.11	24.57
13	Cumin	203.01	82.00
14	Fennel	36.09	46.80
15	Garlic	37.68	151.37

Source: Director, Horticulture, Government of Gujarat.

PROCESSING OF FRUITS AND VEGETABLES

Majority of fruits and vegetables in India are sold to end users in the raw form. It is estimated that the total quantity of fruits and vegetables processed in Gujarat is less than 2%. There are 70 food processing units having 1.0 lakh tonne production capacity. These units are engaged in:

- Dehydration of fruits
- Herbal drinks, aonla, oranges and lime
- Dehydrated vegetables, onion, potato
- Ready-to-eat foods like Patra, Pav bhaji, etc.
- Pulp and juice making
- Tomato processing
- Freezing and refrigeration

EXPORT POTENTIAL

There is scope for export of horticultural products. The major crops having potential for export are as under:

Name of Crop	Major Importing Countries
1. Banana	U.S.A., Germany, Japan, U.K., Italy, France, Middle East.
2. Mango	U.S.A, Netherlands, China, UAE, France, U. K., Middle East.
3. Potato	U. K., Belgium, Germany, Netherlands, Spain, USA, Italy, Africa.
4. Onion	USA, Japan, Germany, U.K., Canada, Russian Federation, Africa, Middle East.
5. Cumin	U.S.A., Brazil, Singapore, Sri Lanka, U.K., Japan, Spain.
6. Fennel	Germany, U.S.A., Sri Lanka, Malaysia,

Italy, U. K., Switzerland.

7. Isabgul U.S.A., U. K., Mexico, France, Germany,
Bangladesh, Europe, Africa, Middle East.

The projected consumption figure of food products in Gujarat for 2002-03 is Rs.23,606 crores. This was Rs.14,255 crores in 1996-97. The increase in consumption of fruits, vegetables and spices was at the rate of 11%, 12%, and 9% respectively, indicating a growing demand. Suppliers today come from as far as Andhra Pradesh, Himachal Pradesh and adjoining States of Maharashtra and Karnataka.

There is great potential for assured income from horticultural crops. Results, as described elsewhere as in the case of Dahod district, show encouraging results. It is important to promote processing which provides value addition and increases life of products, since vegetables, flowers and fruits are perishable crops. Linkages with market mechanism are crucial.

PROGRAMME FOR FARMERS BELOW POVERTY LEVEL

The Integrated Rural Development Programme (IRDP) introduced a scheme in early '80s wherein input kits were provided to small and marginal farmers below poverty line at subsidised rates. The intention was to make available to them new technology of quality seeds, fertilizers, pesticides, and farm tools. Over a period of time, the IRDP programme lost its focus on farmers and has been converted into a non-farm activity-based programme. Although there is a reduction in poverty, there are still small and marginal farmers who are unable to withstand competition nor are able to adopt new technologies because of their continued debt.

Keeping this in view, a new scheme was introduced in Gujarat with a financial outlay of Rs.1,393 lakh during the year 2005-06. Five poorest farmers are selected each for agriculture, horticulture, and animal husbandry sectors from each village. They are given input kits (improved seeds, fertilizers, pesticides, and improved implements). The Gram Sabha does the selection from persons listed in BPL families. This scheme covers every year more than 2.70 lakh poor farmers.

NATIONAL AGRICULTURE CROP INSURANCE SCHEME

Agriculture Crop Insurance Scheme provides farmers protection against vagaries of weather. Government of India, through Agri Insurance Corporation of India, implements the scheme. Both Government of India and State Government share 50% each of the insurance claims. The farmer is required to pay 2.5% premium for majority of crops. The crops included are:

- **Kharif crops:** Paddy, bajra, maize, ragi, sorghum, tur (arhar), green gram, black gram, math, groundnut, sesame, castor, cotton and banana.
- **Rabi-summer crops:** Wheat (irrigated), wheat (un-irrigated), gram, rapeseed/mustard, summer bajra, summer groundnut, cumin, isabgul, fennel, onion, garlic, and potato.

- The quantitative data on premium collected per crop and compensation paid to the farmers is as per Table 6 in Annexure.

Farmers in Gujarat have been alert in making maximum use of this scheme, and between 1999-2000 and 2003-04, received Rs.1,660 crore.

FARMER ACCIDENT INSURANCE SCHEME

This scheme is implemented in Gujarat only. In case of an accidental death of farmer, his family is paid Rs.1 lakh. This is a Group Insurance Scheme and the entire premium is paid by Government to the insurance company. Thousands of farmers are benefited by this scheme every year.

COST OF ELECTRICITY AND IRRIGATION TARIFF

- a) Cost of supply of electricity for irrigation per unit for the year 2005-06 (BE): Rs.4.15 per unit.
- b) (Rate of charges per unit of electricity consumed for irrigation.)
 - (i) Meter tariff

(a)	Fixed Charges:	Rs.10/HP/month
(b)	Energy charges:	Rs.0.50/Unit/month
 - (ii) Meter tariff (who have opted meter tariff from HP basis)

(a)	Fixed charges:	Rs.10/HP/month
(b)	Energy charges:	Rs.0.70/Unit/month
 - (iii) Connection under Tatkhal scheme

(a)	Fixed charges:	Rs.10/HP/month
(b)	Energy charges:	Rs.0.70/Unit/month
- c) Total quantity of sales for irrigation purpose in the year 2005-06 (BE) is 10,539 MUs.
- c) Amount of budgetary subsidy provided in government budget for the year 2005-06 is Rs.1,100 crores.

CURRENT SCENE

The overall scene has changed. The agriculture has picked up rapid growth. The World Bank study report on “-Re-energizing the agriculture sector to sustain growth and reduce poverty – World Bank – 2005” reveal that Gujarat had 0.2 percent growth in this sector between 1981-82 and 1990-91, 5.7% growth rate in 1991-92, 7% in 1995-96, and 1% in 1996-97. But

thereafter, the scene changed. Between 1999-00 – 2001-02 is 2.6% growth rate with 39% GCA. The so-called advanced agricultural states like Punjab had 1.9% growth rate with 93% GCA and Harayana 1.7% with 79% of GCA. The recent data, based on a study conducted by Andhra Pradesh Government also confirmed same trend in the new millennium.

The current scene in Gujarat's agriculture is one of the best in the last six decades. In fact, in the period between 1998-99 and 2003-04, at constant price (1993-94), the average annual growth has been of 10.08% as against annual growth of GSDP at 6.49% per unit. The average annual growth in 2001-02 has been 7.7%, in 2002-03, 10.1% and in 2003-04 15.4%. Average of 2001-2004 comes to 11%. That makes Gujarat the number one State among all States of country as revealed in the table. This is based on a study conducted by Andhra Pradesh Government, Directorate of Economics & Statistics, Hyderabad ('Inter State Comparison of GSDP of major States'- July 2005). Gujarat is way ahead of States like Punjab, which has 2.8% average annual growth in agricultural sector. In fact agriculture sectors' contribution increased from Rs. 9,926 crore in 2000-01 to Rs.1,935 crore in 2003-04 (please check the figures) at constant price of 93-94.

Comment [p1]: Please check the figures

GSDP of constant (1993-94) Prices – Annual growth (in %)

S. No	State	2001-02	2002-03	2003-04	Ave. Gr
1	Andhra P.	4.6	2.6	7.6	4.9
2	Bihar	-8.6	17.9	-6.7	0.9
3	Gujarat	7.7	10.1	15.4	11.1
4	Haryana	5.3	5.0	8.6	6.3
5	Himachal Pradesh	4.9	4.5	8.2	5.9
6	Karnataka	2.5	5.3	6.2	4.7
7	Kerala	1.5	6.6	6.3	4.8
8	Madhya Pradesh	8.6	-5.6	18.6	7.2
9	Maharashtra	5.0	7.8	7.3	6.7
10	Orissa	6.1	-0.1	14.4	6.8
11	Punjab	1.6	1.4	5.3	2.8
12	Rajasthan	9.4	-6.5	22.3	8.4
13	Tamil Nadu	-2.2	3.0	3.6	1.5
14	Uttar Pradesh	3.0	0.4	5.8	3.0
15	West Bengal	7.0	7.2	7.5	7.2

Source: Inter state comparison of GSDP of Major States and GDP of All India (1993-94 to 2003-04), Government of Andhra Pradesh.

- This increase is almost double and addition of Rs.9,505 crore at constant price in four years. This trend is likely to continue in the coming years. This shows an increase in level of income of farmers.

- The major crops remained wheat, bajra, maize, rice, groundnut, mustard, gram, sesame, pigeon pea, green gram, cotton, and sugarcane.
- Gujarat became largest producer of castor, tobacco, Isabgol, sesame seeds, cotton and groundnut in the country.
- It obtained highest productivity in mustard, castor, and cotton followed by groundnut, bajra, gram and guar in the country.
- It produced 54.53% country's groundnut (4,478 tonnes), 67.54% of castor (541 tonnes), 30.01% of sesame (241 tonnes), and 29.04% of cotton (4,027 tonnes). It produced 1,600 tonnes of bajra, 258 tonnes of tur, and 2,037 tonnes of wheat. It has become a surplus State in wheat.
- Its major horticulture crops remained mango, banana, chikoo, lime, guava, tomato, potato, onion, cumin, garlic, Isabgol, and fennel.
- Gujarat became the highest producer of castor, fennel, and Isabgol in the world.
- The estimated production of 2004-05 of agricultural crops was 153.30 tonnes, while that of horticulture crops was 70.50 tonnes.
- The total area under cultivation was 96.49 lakh ha. There was an addition of 10 lakh ha to 2000-01 figures, which was 86.70 lakh ha. The details are as per annexure
- Area under horticulture crops increased by 57% compared to 2000-01, totalling 7.33 lakh ha.

STATE POSITION IN PRODUCTIVITY

Crop	(kg/ha)		
	Gujarat	India	Rank
Groundnut	2,232	1,364	1
Castor	1,864	1,094	1
Bajra	1,494	1,145	2
Sesame	598	453	2
Rape and Mustard	1,469	1,151	2
Cotton (lint)	464	390	1

STATE POSITION IN PRODUCTION

Crop	(<small>000 tonnes)			
	Gujarat	India	% Share in all-India production	Rank
Groundnut	4,478	8182	54.53	1
Castor	541	801	67.54	1
Sesame	241	803	30.01	1
Cotton (lint)	4,027	13,866	29.04	1
Bajra	1,600	12,119	10.18	2
Tur	258	2,366	10.90	3
Wheat	2,037	72,108	2.82	4

As per 2003-04 position

COMPARATIVE PRODUCTIVITY OF MAJOR FRUITS & VEGETABLES

S. No.	Crops	Productivity (Tonnes/ha)	
		India	Gujarat
1	Banana	32.46	41.04
2	Citrus	9.38	10.16
3	Mango	6.96	7.50
4	Papaya	23.4	36.54
5	Chikoo	13.2	9.95
	Vegetables		
6	Onion	12.5	25.54
7	Potato	18.56	22.56
8	Tomato	14.56	18.36

Source: Indian Horticulture Data Base – 2003 of National Horticulture Board Ministry of Agriculture, Govt. of India.

All these were achieved through a series of effective measures, which included:

- A clear Agro-vision plan was prepared in 2000-01, outlining focus areas and programmes, providing major structural changes that were achieved as narrated above in ensuing years.
- Introduction of scientific agriculture with help of agricultural scientists who were allocated Talukas
- Introduction of Soil Health Card based guidance for crop selection
- Micro-level planting
- Krishi Mahotsav – new extension and management approach
- Use of information technology for farmers
- Administrative reforms and re-structuring of Agricultural Universities
- Crop diversification obtained through above measures from traditional crops of low value and/or low volume to high value and/or high volume crops
- A massive water conservation drive

ANIMAL HUSBANDRY

The tradition of nurturing cattle is age-old in Gujarat. Excavations at 5000-year old Lothal site give proofs of well-established animal husbandry practices. Innumerable documented evidences from folk art and old scriptures point to the commercial and religious recognition of various domesticated animals. Animal husbandry sector has recorded a growth rate of 4.5% and contributes 4.7% to State GDP in recent times.

Seven types of climate and ecological diversities exist in Gujarat. The extremes are deserts of North-west Gujarat to the lush green areas of South Gujarat. This eco-diversity coupled with

old animal husbandry practices has yielded best-adapted species of cattle, buffaloes, horses, camels, sheep and goats.

Gir and Kankrej are well known breeds of cattle. Gir is a docile animal. It gives regular milk production throughout its lactation period (average 1,800 litres). It has early puberty. The genetic material of this breed has travelled up to Brazil. Kankrej has ideal characteristics for draught situations. Aggressive and alert nature, combined with typical gait (*savai chal*), makes it a winner. The bullocks are very useful and provide the draught power for cultivation. There are a number of crossbred cows also.

Buffaloes are a major contributor to milk production. Well-known breeds are Surati, Jafarabadi, Mehsani and Banni. They contribute 64% share in total milk production. Average lactation milk yield ranges between 2,000 and 2,500 litres.

Sheep and goats of Marwari and Patannwari as well as Surati, Mehsani, Kachchi breeds provide a dependable income through wool, milk, meat and offspring. They are of special utility in the dry and arid regions of the State.

Upgradation through cross breeding programme was taken up by importing exotic breeds from West and artificial insemination technique was used to introduce it in early eighties.

The close proximity of southern districts of Gujarat with Mumbai provides a huge market for poultry. Backyard poultry is proving to be a good source of income to tribal and underprivileged families.

Gujarat is the native place for the famous Kathiawari breed of horse, which was the most preferred horse of the Maharajas and Mughal emperors.

Gujarat, besides Rajasthan, is the only State to have a camel population in India and the camel breeding farms at Dhorai (Kutch district) and Mota Jampura (Banaskantha district) have earned the recognition as the reliable and preferred supplier of camels.

ANIMAL HUSBANDRY AND RURAL UPLIFTMENT

Almost 61% families of rural Gujarat are dependent on agriculture and majority of them have milch animals. The women of these families get good activity and income through these animals. Even the illiterate and unskilled persons can take up animal husbandry. AMUL pattern of dairy cooperative has shown a way to prosperity to many districts of the State. Payment for milk is done on a weekly basis by milk union. Out of 12,000 dairy cooperative societies, 1,100 are managed by women. The goal of social upliftment of rural women has been achieved by their active participation in these activities.

Gobar Bank and vermicompost projects aimed at encouraging organic farming and balanced use of fertilizer are increasingly becoming popular.

The livestock status as per 2003 livestock census is as under –

	Numbers (in lakhs)
Cattle	74.23 (35%)
Buffalo	71.40 (33%)
Sheep	20.60 (9%)
Goat	45.40 (21%)
Other	5.05 (2%)

Total:	228.46 lakh
Poultry	81.31 lakh

The total milk production as per estimates of Director of Animal Husbandry is 77.45 lakh tonnes in 2004-05. In 1993-04, it was 39.35 lakh tonnes. It has almost doubled over a decade. Total egg production is 50.31 lakh in 2004-05. The total wool production is estimated at 29.50 lakh kg in 2004-05.

Gujarat ranks fifth in milk production in the country, in eggs its rank is 11th and in wool, it again ranks fifth. Livestock contributed Rs.10.319 crore at current prices in 2004-05, which was 34% of total contribution to agricultural sector.

DAIRY UNIONS

The Cooperative Milk Producers Societies and their unions are the strength of Gujarat. The District Dairy Unions are covering milk procurement, processing of milk products and its marketing in 17 districts of South Gujarat, Central Gujarat, North Gujarat and Rajkot district of Saurashtra region. The 12 unions have set up a Federation for marketing of milk and milk products. They have a turnover of over Rs.3,000 crores. The remaining eight districts of Saurashtra region including Kutch were earlier under Gujarat Dairy Development Corporation. This organisation became defunct and bankrupt. Recently National Dairy Development Board (NDDB), Anand has been entrusted the responsibility of these districts.

Dairy unions are covering nearly 13.32 lakh milk producer members through 12,000 village dairy cooperative societies. The total 12 dairy milk plants have an installed capacity of 69.10 lakh litres per day. They provide veterinary services and services at doorstep artificial insemination etc. to members. They provide training, especially to women for proper care of animals.

The milk products include a variety of milk, butter, ghee, cream, mava, cheese, buttermilk, Amulspray (spray-dried infant milk food), penda, ice cream, shreekhand, gulab jamun, chocolate, paneer, flavoured milk, etc. The milk products are marketed by Gujarat Milk Marketing Federation known as GCMMF under the brand name of 'AMUL' and 'SAGAR' throughout the country and around the world.

ARTIFICIAL INSEMINATION BREEDING CENTERS

Artificial insemination (AI) centres among all villages provide AI services for female breedable animals. Animal Husbandry Department and Dairy Unions provide the services. According to an estimate, there are around 63.75 lakh female animals – crossbred, indigenous cattle and buffalo that can be bred. The Department has four AI production centres for indigenous breeds. NDDDB has a big centre near Bareja for cross breeding animals. Dairy Unions like the one at Mehsana have their own centres.

MARKETS FOR CATTLE

There is no regular market and thus cattle fairs are organised for this purpose. There is a need to have a regular market set up where animals are available with appropriate certificate of their milk yield and health condition.

CATTLE INSURANCE

Public sector insurance companies provide cattle Insurance. Of late, however, insurance companies have become reluctant and they delay the process.

FODDER

Green and dry fodder is deficient in drought prone districts. There is a need to have special programme for development of fodder on grassland and wastelands.

CREDIT

Poor families can get advances for milch cattle from banks and the instalments are deducted by Milk Unions from the receipts of milk sold. The Government is also providing 6% interest subsidy for milch cattle, sheep and goat units, and camel unit. This is available to all categories of farmers.

FISHERIES

Gujarat's coastline is 1,663 km long, which is more than 20% of the Indian coastline. It is broken by several bays, inlets, estuaries and marshlands. It has a continental shelf of 65,000 sq km. It has rich marine fishery. The area available for fishing activities extends from Lakhpat in Kutch district in the north to Umargaon in Valsad district in the south. Important commercial varieties of fish are Pomfret, Jew fish, Bombay duck, prawn, lobster, squid, cuttlefish, Silver bar, Hilsa, shark, catfish, and mullets. In addition, the Gulf of Kutch has congenial conditions for growth and sustenance of different types of oysters, shellfish and seaweeds. According to Livestock Census of 2003, there are 970 fishing centres, classified into marine (217) and inland (665), with about 4.93 lakh fishermen. The estimated total standing fishable stock up to Exclusive Economic Zone is 7.03 lakh tonnes.

Private companies, cooperative societies and individuals undertake fishing activities. Gujarat mainly produces sciaerids (33%), Bombay duck (13%), shrimps (8%), Ribbon fish (9%), catfish (4%), and others (34%). On an average, production of marine fish is 7 lakh tonnes valued at Rs.400 crore.

There are special fishing harbours at Veraval, Porbander, Mangrol, Jakhau, and other places.

A comparative position of resource base of agriculture in Gujarat vis-à-vis India

Character	Gujarat	India
1. Rainfall: (Percentage of NCA covered under rainfall)		
Below 750 mm	67	34
750-1,150 mm	25	36
Above 1,150 mm	8	30
2. Share of Gujarat in India for (per cent):		
i) Geographical area	5.96	-
ii) Net cropped area (NCA)	6.91	-
iii) Total irrigation potential	5.71	-
iv) Developed irrigation potential	3.99	-
v) Utilised irrigation potential	3.51	-
vi) Arid area	19.61	-
vii) Semi-arid area	9.46	-
3. No. of drought prone districts	11	67
4. Population in drought prone area as % of population	18	12
5. Percentage of drought prone area in total area	29	19
6. Percentage of irrigated area in GCA	32	39
7. Percentage of adversely affected salinity area to total irrigation utilisation	21.80	9.37
8. Percentage of waterlogged area in total irrigation utilisation	16.52	9.67

Source: *Review of State Agri. Policy in Gujarat*, Agro Economic Research Centre, Vallabha Vidyanagar, Gujarat – 2004.

COOPERATIVES

Cooperatives have played a very important role in promoting agricultural development. It is a story of success. It caters to following major areas:

- Cooperative credit institutions with State Cooperative Bank at apex level, District Cooperative Bank and primary cooperative credit societies at village level.
- Supply of inputs through multipurpose cooperative societies with apex body known as GUJCOMASOL – a State level sales and purchase union.
- Agricultural Produce Marketing Committee (APMC) for purchase of agri produce and open auction.
- Cooperative district level Milk Producers' Union with apex marketing federation.

Some of significant figures in this regard are as under:

1. Agri. Produce Marketing Committees (APMC)	178	
Total marketing yards	235	
Marketing yards in Tribal areas	77	
Regulated commodities	104	
Specialized market		
Cotton		Kadi – Mehasana
Spices		Una-Mehasana
Groundnut		Rajkot
Total value of goods arrived		Rs.778 crore
2. Co-operative infrastructure		
Crop godowns	3,940	
APMC godowns	2,015	

	5,955	
3. Cooperative credit district level banks	18	
Primary cooperative societies	7,430	
Member farmers	23 lakhs	
Agri. Finance	Rs.2,640 crore	
Kisan credit cards	2.48 lakh	
Cooperative dairy sector:		
District milk unions	12	
Members	12 lakh	
Turnover	Rs.3,000 crore.	

THE MINIMUM SUPPORT PRICE SCHEME

In order to provide remunerative price to farmers, the Government of India on recommendation of the Commission for Agricultural Costs and Prices (CACP) announces the Minimum Support Price (MSP) for each crop season, i.e., Rabi and Kharif, for various agricultural commodities. The National Cooperative Marketing Federation of India Ltd (NAFFED) implements the Price Support Scheme. NAFED is the Central Nodal Agency for procurement of oilseeds (mustard seed, groundnut-in-shell, soybean, safflower seed, sesame seed, niger seed, copra, toria) and pulses (gram, arhar, tur, urad, moong, masoor) under Price Support Scheme. NAFED undertakes procurement of these oilseeds and pulses under PSS as and when the prices of these commodities fall below the Minimum Support Price. Purchases under PSS are continued till the prices are stabilized and rise above the MSP. The objective of scheme is to ensure that farmers get the minimum price. The minimum support price is based on average cultivation cost provided by State Government.

MARKET INTERVENTION SCHEME

Market Intervention Scheme (MIS) is for procurement of horticultural and perishable agricultural commodities. The MIS is implemented in order to protect farmers making distress sale in the event of bumper crop during the peak arrival period when prices tend to fall below the production cost. This scheme is implemented through NAFED as central agency and other agencies designated by the concerned State Government. The share of Government of India and State Government is fifty-fifty.

TRADE

World Trade Organisation (Agreement on Agriculture) – Negotiations

The Agreement on Agriculture (AoA) under the World Trade Organisation (WTO) came into effect on January 1, 1995. It incorporated the results of the Uruguay Round of multilateral trade negotiations. The AoA sought to establish a fair and market oriented system. The process involves negotiations of commitments on support and protection through operational rules and disciplines in the area of market access, domestic support and export subsidies. A progressive reduction in agricultural support and protection over an agreed period of time would result in correcting distortions in world agricultural markets. This will result in greater improvement in opportunities for realisation of market access for member countries, particularly the less developed countries.

AGRICULTURAL TRADE

Despite being an agrarian economy where the agricultural sector provides employment to approximately 67% of the population and contributes 25% to the GDP of the country, India has remained a marginal player in world agricultural trade. Currently, it has a share of less than 1% of the world trade in agriculture. The share of agricultural products including coffee, tea, and fisheries in the total exports of India was around 12.65% in the year 2003-04. The import of vegetable oils (fixed), pulses, cashew nuts, and wood products dominate agricultural imports. There has been a significant increase in the import of edible oils over the years.

Gujarat has been exporting spices, castor seed-oil, and fruits such as banana, mangoes and the like. In recent years, there has also been export of sesame, wheat, and groundnut.

As a new initiative, government has set up a Market Research Cell in Junagadh Agricultural University. It has put up a website and brings out a weekly printed bulletin on trends of prices of agricultural crops. It is also intended to provide information on prices of farm-inputs and details of agri-commodities, which have demand within and outside country, where exports could be made.

(Refer to Tables 7 and 8 in Annexure for Statements showing import and export of agricultural products).

CREDIT SUPPORT

Gujarat has 53 commercial banks including 26 private sector banks, nine regional rural banks, one State cooperative bank, 18 district central cooperative banks and a State cooperative agriculture and rural development bank. The number of branches total 5,124. The population per bank branch is 9,945. The deposit with scheduled commercial banks was Rs.82,000 crores and advances were Rs.35,500 crores constituting credit deposit ratio of 43.15 as at end.

The convener of State Level Bankers Committee is Dena Bank. All the districts are distributed between three commercial banks as Lead Banks, viz., the State Bank of Saurashtra, Bank of Vadodara and Dena Bank. NABARD is taking active interest in pushing credit flow to agriculture and monitoring, apart from providing refinance. Flow of credit to agricultural and rural sector was Rs. 6,700 crore in the year 2003-04. It increased to Rs. 8,700 crore in 2004-05, indicating an increase by 28%. For the year 2005-06 credits flow is expected to reach Rs.10,700 crore, an increase of about 28%.

Sector-wise disbursements during he year 2003-04 & 2004-05 (Rs. In lakhs)

Sl. No.	Agency	Disbursements		Share in %	
		2003-04	2004-05	2003-04	2004-05
1	Agriculture and term loan out of which crop loan	4,73,548	6,02,076	70.34	70.35
		3,69,678	4,43,214	54.91	51.05
2	Non farm sector	90,444	1,02,140	13.43	11.76
3	Other priority sector	1,09,275	1,63,953	16.23	18.89
	Total	6,73,267	8,68,169	100	100

Source: NABARD, Ahmedabad, Gujarat

The share of agriculture in the priority sector was 70.35% whereas 73.61% of agricultural loan was crop loan. The effective rate of interest was between 9% and 10%.

Kisan Credit Card (KCC) Scheme

The KCC scheme is a major source for crop loans says Chief Manager NABARD, Shri Bhawar Puri “ the scope of the scheme was enlarged to cover term loans for agriculture and allied activities. Under the scheme, the borrowers are given credit cards and pass books, which includes the name, address, particulars of land holding, borrowing limit, validity period, etc”. They serve as identity cards. It is also a record of transactions. Credit is provided in the nature of revolving cash credit. They also enable the borrower to draw credit without the formalities of filling application for each and every activity. More than one million farmers are covered under this scheme.

Micro Finance

The programme envisages organising the rural poor with a focus on women. Self Help Groups (SHGs) are organised. Training is provided to group members to learn the art of thrift and credit management. This fund meets small credit needs and provides access to larger resources in the form of bank loans.

Farmers' Club Programme

NABARD is promoting banks and NGOs to organize farmers' club. The club organises interaction of farmers with bankers and government officials and among farmers themselves. Farmers' club programme has progressed very well. There are at present 1,026 clubs.

WASTELAND

Gujarat has 85.92 lakh ha of wasteland, which is about 45% of the total geographic area. These wastelands include barren and uncultivable wasteland (14.2%), permanent pastures and grazing land (4.6%), cultivable waste (10.3%), and current fallows (16.5%)

These wastelands are difficult to develop because of several soil-related constraints like water erosion (52.1 lakh ha, 26.5%), wind erosion (4.43 lakh ha, 2.3%), salinity (2.94 lakh ha, 1.5%), salinity and water erosion (13.65 lakh ha, 7.0%), salinity and wind erosion (2.99 lakh ha, 1.5%), and salinity with water logging (5.23 lakh ha, 2.7%). In general, out of total wastelands, almost 81.34 lakh ha (41.5%) are affected with some kind of soil related constraints.

Reclamation of wasteland is being done through the implementation of Integrated Wasteland Development Programme (IWDP), Drought Prone Area Programme (DPAP) and Desert Development Programme (DDP). These programmes are in action for the last one to three decades. However, all of these programmes need rejuvenation by infusion of modern approaches and technologies as these programmes have so far had marginal impact. Plants useful as energy sources, like Baval and Jatropa, can be developed on such lands.

RESEARCH AND DEVELOPMENT

Agriculture received high priority after the establishment of Gujarat as a separate state in 1960. New colleges for higher education in agriculture were started at Junagadh and Navsari and a number of new research stations/projects were added in order to cater to the technological needs in the field of agriculture and other related rural occupations. In 1972, a separate university, the Gujarat Agricultural University (GAU), with triple functions of teaching, research and extension education units was established. All colleges and research centres were brought under it. The GAU subsequently expanded its activities by adding colleges; one each for agriculture, veterinary, dairy science, agriculture engineering, horticulture and forestry, fisheries, and home science, and few research stations in areas not represented earlier.

To meet the challenges of the new millennium and provide further push to the development of agriculture, and promote research based diversity of crops and agro climatic conditions, the government re-organised the Agriculture University and created four agricultural universities located at Sardar Krushinagar in North Gujarat, Junagadh in Saurashtra, Anand in Central Gujarat, and Navsari in South Gujarat. These agricultural universities have the mandate to bring Gujarat's productivity equivalent to global performance and to concentrate more on level direct link with farmers at the village level. Each university is in the process of setting up centres of excellence for research and education as under:

Junagadh Agriculture University	- Soil and water management
Sardar Krushinagar Agriculture University	- Castor seeds
Navsari Agriculture University	- Post-harvest technology
Anand Agriculture University	- Biotechnology

The Agri Business Management School at Navsari, Information Technology in Agriculture at Anand, and Centre for Market Research and Export at Junagadh are also in the process of development. A special cell for research in organic sustainable agriculture has been set up at all universities.

There are 64 research stations located in different agro ecological regions spread over the State. Each centre has the specific mandate to conduct research on particular crop/commodity and subject.

These centers are in the category of main centres with multi disciplinary research team and statewide mandate, regional/sub centres with regional or location-specific research mandate, and research verification centres with the responsibility of validation of developed technologies.

Though agriculture is state subject, agriculture research is more of a centre subject. Indian Council for Agriculture Research (ICAR) has its institutes/centers in all the states depending upon importance of crop/subject. Gujarat has two important ICAR institutes, for groundnut at Junagadh and medicinal and aromatic plants at Anand, besides projects for arid horticulture at Godhara, arid conservation at Valsad, arid salinity at Bharuch, fisheries at Vadodara and Veraval, and animal husbandry at Dharmpur. Public organisations like GSFC at Vadodara and

private institutes like Vivekanand Research & Training Institute (VRTI) at Mandvi-Kutch are also engaged in research and development in selected fields.

TECHNOLOGICAL DEVELOPMENT

Science and technology has spearheaded transformation of agriculture during second half of the 20th century. New seeds were the instruments of change and ushered in the much-awaited Green Revolution, helping India in achieving self-reliance and self-sufficiency in food grains. The breakthrough in genetics has helped in development of high yielding varieties of rice and wheat the large-scale adoption of which resulted in the Green Revolution. Equally magnificent have been crop improvement work in Gujarat; especially in crops like cotton, castor, bajra, and tobacco, which not only helped in enhancing production of food grains but also contributed very significantly in reducing poverty and bringing prosperity by increasing the production of cash crops. Gujarat takes pride in being a pioneer in exploitation of hybrid seeds in cotton, castor, tobacco, etc. More than 95% area under castor and bajra is grown with hybrid seeds in Gujarat. Large-scale adoption of hybrid seeds has helped in manifold increase in productivity. Development of stable cytoplasmic genetics in pigeon pee (tur) through wide hybridization is noteworthy. Sardar Krishinagar University has already released one hybrid (GTH-1) for general cultivation.

High yielding varieties of wheat (GW496, GW173, GW273, GW322), rice (Gurjari, GR7, Ambika), and groundnut (GG2, GG7, G20) have been adopted by the farmers. Similarly, recently released varieties of mung (GM4), cowpea (GC4), mustard (GM2), Sesame (GT2), cumin (GC4), fennel, potato, and other vegetables have spread fast. Bajra hybrids (GBH 558, GBH 577) developed at Jamnagar are also popular with farmers. Farmers are very innovative and receptive in adopting the new varieties. The second phase of crop improvement in the form of transgenic seeds has gone well with the farmers of the state. Bt cottonseeds are grown in 90% of the irrigated cotton belt resulting in very high production of cotton for the last 3-4 years. Surat centre of Navsari Agriculture University with the financial support of Gujarat Seed Corporation entered into MOU with National Botanical Research Institute, Lucknow to develop transgenic seeds of cotton with *Swadeshi* technology. The successful cultivation of transgenic cotton in the State is going to be followed by transgenic seeds in mustard, maize, rice, brinjal, tomato, etc. Anand Agriculture University is taking up work on genetic engineering in crop plants with the establishment of centre of excellence for biotechnology.

“Genetic improvement alone cannot lead to high yield on sustainable basis,” says Dr. M.S. Jadon, senior scientist, “without appropriate agronomic practices, water management, soil health care, plant protection, agricultural implements and post harvest technologies. It is therefore imperative to develop technologies for higher production per unit use of nutrients, water, energy, space, time, labour.”

Technologies having significant bearing on productivity at farmers’ field in Gujarat includes following:

- Fertilizers are most important input in crop production. Area specific regional fertilizer recommendations have been developed for all major crops, based upon soil test value for crops in sequence taking variability and changes in soil nutrient status, crop

demand and crop management. Integrated nutrient management technologies with the inclusion of FYM and/or organic manure, use of bio-fertilizers and other needed micronutrient are gaining ground with the support of government through different technologies. Vast areas of land affected by salinity and alkalinity have poor productivity. These can be corrected by application of gypsum as a soil conditioner and ameliorant for problematic soils and also as nutrient source of calcium and sulphur. Gypsum treatment is very effective for reclaiming saline soil.

- Water is currently the most limiting resource for crop production and is also recognized as most critical resource for future agriculture. Use of sprinklers and drips as water saving technologies is receiving highest priority.
- Research on biological control of pest and diseases by AAU, Anand has received appreciation at national level . This has formed an important part of organic agriculture. Biopesticides and predators are now available for commercial use for safer pest control. Horticultural crops like mango, banana, chikoo, aonla and lime are spreading to newer areas with the technological support from SADS and Department of Horticulture. Quality planting material is made available to the farmers and growing awareness on processing like grading and cleaning has been created. INM technologies along with use of drip irrigation are adopted on a large scale. Similarly, animal husbandry technologies on nutritional management, hygiene, vaccine and other animal health care management are contributing to increased productivity.
- Research in energy plantation for using water and land to meet energy needs to convert non-productive land into productive assets is underway at Junagadh Agriculture University. It has taken up plantation of Jatropha on 300 ha of land. It is identifying high-yielding varieties of Jatropha seeds.

All these efforts are changing the agriculture scene of Gujarat in recent years.

Extension education is very important. There are diploma courses. Farmers are provided guidance and information about latest developments at various extension centres all over the State. The junior scientists are allocated four talukas each and a senior scientist is given charge of one district. This is described in greater detail elsewhere.

Kisan Vikas Kendras are distributed between universities and Voluntary agencies. Their functioning is being improved.

The State has set up Agriculture Council headed by Minister for Agriculture to oversee total development and to look after internal coordination and prioritisation of projects. All Universities and Boards of Departments are its members.

LAWS FOR AGRICULTURE

Gujarat Cotton Act

The main objective of this Act is to maintain purity of products by prescribing specific cotton varieties for cultivation. Crop zones are identified and specific varieties selected to be planted in the prescribed areas as per the procedure laid down in the Act in the wake of globalisation. However, this Act has become redundant. No effective measures are undertaken under this to implement provisions of this Act.

Cotton Ginning Pressing Act

The main objective is to maintain purity of lint. It provides for licensing for new unit for cotton ginning and pressing.

Cotton Transport Act

The Act deals with restriction on movement of cotton varieties across cotton zones. Permit for transport is required. This is an obsolete Act in the current days of globalisation. It needs to be repealed.

Fertilizer Control Order

The Act controls quality and prices of chemical fertilizers. It prescribes sale of fertilizers only by registered dealers. There is a provision to draw samples and take penal action against those selling sub-standard or fraudulent material.

Seeds Act

The objective is to provide farmers quality seeds. Certification of seeds of notified varieties is to be done by State Seed Certification Agency. There are many loopholes in this Act. Fraudulent seeds are propagated and sold as genuine varieties. This is a central Act. It needs to be strengthened and streamlined.

Insecticides Act

It controls the formulation of insecticides as per required standards. It provides for compulsory registration for production. License is required for sales. It provides for drawing of samples and penal action for sale of sub-standard or fraudulent products.

Agriculture Produce Market Committee Act (APMC Act)

The Agriculture Market Product Committee Act is for regulated markets of agriculture products. The farmers are expected to bring their product to market, where they are sold under open auction. The market prices are widely published. With introduction of contract farming, certain amendments are required under the Act to facilitate private market operations.

Bombay Agricultural Tenancy Act

This Act was brought about in early fifties. The objective was to make the tiller, the tenant, owner of the land that is being cultivated. It provided a mechanism for tenants to become owners of land by paying easy instalments. It prevails over North, Central and South Gujarat. In Saurashtra regions, the Tenancy Act is implemented and this Act is not applicable. This Act is also a nuisance in the current situation. All earlier tenants have become farmers. In fact, it gives opportunity to local revenue clerk/talati to play with village records and harass farmers. It needs to be repealed as soon as possible. It is a major deterrent for high investment in land

as farmers are afraid that if they employ labourers, their ownership could go away any time under this Act by mischief from local revenue clerks, the talati.

Gujarat Agricultural Land Ceiling Act

This was also brought about as a part of land reforms. It provided a ceiling to holding of land, which a person can keep. Surplus land has to be surrendered to government. Irrigated and un-irrigated lands have different ceilings. All such surplus land is distributed to landless persons. This Act is also fully implemented. It needs to be repealed.

Land Revenue Code

This Code is over 100 years old. Majority of its provisions have no relevance today. It is a tool to harass farmers by local revenue authorities like talati. It needs to be replaced by a simple legislation.

AGRO INDUSTRIES

Value addition is the key to rapid progress. It is the need of the day for farmers and agricultural sector. Historically, Gujarat started with processing of cotton and Ahmedabad became, as it was known in early days, the 'Manchester' of India. It was the capital town for cotton textile like ginning, spinning and processing under comprehensive textile mills. Over the years, other sectors like oil seeds, sugarcane, and dairy developed. Gujarat provided special incentive to agro-based units, including infrastructure for agro processing units.

Cotton - Although old cotton textile mills have withered away, cotton textile is still a major industry. Gujarat produces 30% of country's cotton with 85 lakh bales in the year 2005-06. It has a large number ginning and spinning units. Surat and Ahmedabad have approximately 8 lakh power looms.

Oil Seeds - Gujarat produces more than 3.0 million tonnes of oil seeds. Groundnut, castor seeds, soyabean, cotton seeds, mustard seeds dominate the sector. There are more than 1,200 oil mills and 60 solvent plants. Majority of units are in Saurashtra and North Gujarat.

Sugarcane - Sugar mills are under cooperative sector while jaggery units are decentralized. The annual production of sugarcane is 16 million tonnes. There are about 18 active sugar cooperative unions. The large units are in South Gujarat.

Milling - These comprise of wheat milling units, rice milling units and pulse milling units. They are concentrated around Ahmedabad, near Changodar and Bareja.

Maize - There are two large units in Ahmedabad, which produce a variety of products including glycerin and glucose. There are units making corn flakes and baby corn.

Tobacco - The processing units are mainly located in Anand and Kheda districts. These are all powder making and chewing tobacco units.

Guar Gum - This is an important area of development. The major units are located in Mehsana and Banaskantha.

Spices - Majority of units are in North Gujarat. The products are chillies, turmeric, cumin and fennel. New units of ready-to-use spice powder for cooking known as 'Masala' are coming up. There are also units making better food and mouth fresheners prepared from fennel, ginger, amla, etc.

Onion – Onion, Aonla and garlic powder units have come up around Bhavnagar and Amreli.

Food Processing Sector - This is an important and growing sector. The food processing industry covers products of meat, poultry, fishery, consumer food, soft drink, 'Ready-to-eat' food known as 'farsan', pickles, khakhra, 'ready-to-fry' food, like papad, mathias, kachories, potato chips, etc., fruit pulp units like mango pulp, banana pulp, etc. Majority of these units are small scale, household based units in large numbers in the unorganised sector. There are frozen food units. MACINS an MNC has set up potato processing unit.

Cold Chain - There are more than 300 cold storage units. Deesa, Banaskantha has a storage facility for potatoes, while Kheda and Anand have units for bananas. Onions are typically stored in open 'mandis', which are in Bhavnagar district.

Dairy - This is mainly in the cooperative sector. There are 12 unions. Each has a major processing plant to manufacture a variety of milk products. The combined turnover is more than Rs.4,000 crores. In the private sector, ice cream making units have come up. In the unorganised sector, sweet making units with farsan shops have come up in a very large number, almost one in each village.

Cattle Feed - They are linked with the cooperative milk union. There are a few private units in cattle feed and poultry feed.

Tissue Culture - It started with Gujarat State Fertilizer Company Limited, a public sector company, which initiated a range of tissue culture research and development projects. It has developed tissue culture in banana and sugarcane. Well-known private sector companies like Cadila and others have set up similar units.

Vermi Compost - These are also of very recent origin. They are on outskirts of major metropolitan cities. They supply worms to farmers for making their own vermicompost, while ready bags are sold for urban kitchen gardens.

Seed Production Units - Quality seeds are in demand. A number of units have come up and branded sale is taking place. The major share is of course with Gujarat State Seeds Corporation.

Medicinal Plants - Zandu Pharmaceuticals, Dabar, Unjha Pharmacy and other smaller Ayurvedic medicinal units based on local herbs are spread all over Gujarat.

Flowers - Flowers, especially roses, are now exported to Europe from Gujarat. There are a number of small high tech nurseries with cooling facilities for local consumption.

Furniture Making and Wood Processing Units - Basically wood processing units are sizing and seasoning units. The wood log is processed on decentralized basis. There are a large number of units near Alang and Gandhidham for imported or wood obtained from ship breaking units. Plywood and fibreboard industry has also come up; some of them are based on rice husk and wheat chaff. Mini charcoal making units, based on Baval, have come up in the unorganised sector in Kutch district.

Forest Products - This is mainly under control of Gujarat State Forest Development Corporation which deals with raw material. Honey and Jebota seeds are also sold by it.

Agro industries offer immense opportunities. Primary processing of many products like castor oil and isabgol is still being done. This also applies to entire fruit and flower sector and vegetables. Gujarat has, however, developed a large infrastructure base for the introduction of advanced processing of such agriculture produce. Gujarat has expanded its base of Agro Industry Sector. This has impact on income of farmers.

INFRASTRUCTURE FOR AGRICULTURE

The status of development of essential basic services related to agriculture sectors have been analysed by NABARD in its State Focus Paper 2006-07. This is as under:

The classification of the State on each of the infrastructure component has been made on a 5-point scale: 'A+', 'A', 'B', 'C' & 'D' depending upon the deviation from the All India level position.

Where the State indicator is 100% or more of the All India indicator	- A+
Where it is between 85% to 99.9%	- A
Between 70% to 84.9%	- B
Between 50% to 69.9%	- C
Less than 50%	- D

While categorizing under each infrastructure component, care has been taken to identify as to what is the better position under it. Accordingly, All India average has been taken as 100.

Infrastructure Status of Gujarat State vis-à-vis All India Average Indicators

S.	Infrastructure component	State	All India	Category
1	Electricity			
a	Percentage of villages electrified (2003-04)	99.5	87.21	A+
b	Percentage of rural consumers to total consumers	45.8	NA	
2	Transportation			
a	Road density per 1000 sq.km	702.0	747.3	A
b	No of transport vehicles (registered vehicles of all	31,000	18,000	A+

	types) per 1000 sq.km			
c	Villages connected by pucca road (% to total villages)	95.8	75	A+
3	Irrigation			
a	Irrigated area to net cropped area	29.75	40	B
b	% area irrigated through ground water	86.80	58.06	A+
c	% area irrigated through surface water	13.20	41.94	D
d	No of tube wells per 100 ha of cropped area	0.55	NA	-
4	Communication			
a	No of telephone line per hundred population	9.17	7.02	A+
b	Population served per post office	5,586	6,602	A+
c	Average area served per post office (sq.km)	21.00	21.13	A+
5	Education			
a	Literacy rate (%)	69.10	64.8	A+
b	Literacy rate Male (%)	79.70	75.26	A+
c	Literacy rate Female (%)	57.80	53.67	A+
d	No of schools (elementary education up to standard 8 th) per 1 lakh population.	80.20	81.76	A
e	No of secondary and Sr. secondary schools per 1 lakh population	13.31	11.37	A+
f	No of Degree and professional college per 1 lakh population	1.20	0.96	A+
g	Teacher-Pupil ratio			
	<i>Up to class V</i>	1:67.8	NA	-
	<i>Class V to class VIII</i>	1:35.8	NA	-
6	Health			
a	Birth rate (per 1000 persons)	24.7	25	A+
b	Death rate (per 1000 persons)	7.7	8.10	A+
c	Infant Mortality rate (IMR) per 1000 live births	60	63.00	A+
d	Life expectancy at birth			
	<i>Male</i>	60.9	60.1	A+
	<i>Female</i>	62.9	61.0	A+
e	Average No. of villages served by PHCs	18.64	25.55	A+
f	Average No. of villages per community health centre	87.51	200.07	A+
g	Average No. of villages served by Sub-centres	2.48	4.27	A+
h	No. of beds in hospitals per 1 lakh population	79.90	86.86	A
i	No. of doctors registered with IMC	33,904	58,2771	-
7	Water Supply			
	% of villages having drinking water supply (fully or partially)	100	NA	-
8	Agriculture Markets			
	No of agriculture markets per 100 sq.km	0.20	NA	-
	Average are served per regulated market in sq.km	49	NA	-

9	Poverty (1999-2000)			
	% of rural people below poverty line	13.20	27.1	A+
10	Productivity of major Agriculture Crops in kg/ha (avg. of trienniums ending 2002-03)			
	Wheat	2,044	2,696	B
	Rice	1,125	1,927	C
	Total Cereals	1,202	1,867	C
	Total Pulses	424	572	B
	Total food grains	1,037	1,640	C
	Cotton	160	190	B
	Ground nut	495	946	C
	Total oil seeds	604	811	B

Source: State Focus Paper – Gujarat. 2006-07 National Bank for Agriculture & Rural Development (NABARD), December 2005.

RECENT INITIATIVES

Agri Export Zone

- The Government of India, policy for Agri Export Zone (AEZ) was announced in March 2001. The objective was of doubling Agri-exports by 2007. The AEZ aims at developing infrastructure for sorting, grading, processing and packaging. Gujarat has AEZ for:
 - § Mango and vegetables, for Ahmedabad, Kheda, Vadodara, Anand, Surat, Navsari, Valsad, Bharuch and Narmada.
 - § Onion-dehydration to cover six districts of Rajkot, Jamnagar, Junagadh, Amreli, Surendranagar and Bhavnagar.
 - § Sesame seeds for districts of Amreli, Bhavnagar, Rajkot, Surendranagar and Jamnagar.
- **Contract farming:** Contract farming is actually a contract to purchase agri produce at a pre-determined price before the season commences. It is not a contract for taking over the farm. Farmers are to be provided a supply of quality raw material and a better price. The processor in turn stands to gain as he has a steady supply for processing ensured.
- **Gujarat policy for contract farming:** The policy provides for (i) tripartite agreement between the farmer, contract sponsor and APMC; (ii) A facilitator role for APMC; and (iii) A provision in the agreement to encompass all the details/specifications of contract.

Hi-Tech Horticulture

In recent times, Gujarat has diversified into innovative, hi-tech/EOU sector in a big way. These are:

- a. Production and processing of fruits, vegetables and flowers for export and domestic markets.
- b. Greenhouse production of fruits, vegetables and flowers for domestic market.
- c. Mushroom cultivation for both oyster and button varieties.

In the agro-processing sector, particularly fruit and vegetable processing, performance is impressive. The total quantity of fruits and vegetables processed is about one lakh tonnes. Most of the canning, pulping and juice making units are located in Valsad, Surat and Kheda districts, whereas, dehydrated vegetable units are concentrated in Bhavnagar.

Reorganisation of Agriculture Universities

The Government have reorganised the existing Agriculture University into four independent agriculture universities with enhanced focus on research and extension.

Agro Industrial Policy

This policy provides interest subsidy and capital subsidy for promotion of Agro-Industries and its related infrastructure.

Market Intelligence Cell - Junagadh

This has been set up by Junagadh Agricultural University to examine growth and productivity in selected crops to meet global market situation. It provides assistance to work out export competitiveness of major agriculture commodities.

AGRICULTURE IN GUJARAT: CONSTRAINTS

There are number of factors which have time and again affected productivity and growth of Agriculture in Gujarat.

- **Depletion of water table:** Due to scanty and insufficient rainfall and continuous discharge from underground water resources, there is depletion of water table. This adds to the cost of irrigation from tube wells.
- **Irregularity of rainfall:** This is a major problem. Even in good years, there is a gap between two spells of rainfall – sometimes exceeding one month or there is delayed rainfall or missing last round of rains in September.
- **Recurrent droughts:** This happens at least thrice in a decade. Sometimes there are two recurring droughts. Many times, two-thirds of the state gets affected. During the

second spell, the entire agriculture fails, often pushing even a well-to-do farmer below poverty line.

- **Increase in cost:** The cost of farming is going up due to rise in labour cost.
- **Salinity:** Soil salinity is one of the major constraints in development of agriculture. This is aggravated by increase in ingress of salinity in different parts of state.
- **Submerged land:** There are areas along the boundary of Ahmedabad – Bhavnagar and Surendranagar district, which were historically the ancient port of Lothal and were submerged by the sea. Large parts of such lands are saline although sea has receded thousands of years ago.
- **Desertification:** There are areas along the periphery of Little and Great Rann of Kutch, particularly of Banaskantha, Patan and Surendranagar districts, which are affected by the advancement of Rann.
- **Salinity ingress:** There is salinity ingress due to heavy withdrawal of groundwater and little recharge. This is happening in Banaskantha, Ahmedabad, Gandhinagar, Sabarkantha and Mehsana.
- **Water logging:** New problem areas are due to water logging in irrigated areas. This is in command areas of Mahi Shetrunj and Ukai. Affected districts are Surat, Bharuch, Panchmahals, Kheda and Anand.
- **Coastal areas:** Salinity in coastal areas is often due to underground faults in seacoast. This is affecting Bhavnagar, Junagadh, Amreli, and Kutch.

CONCLUSION

In conclusion, the following observations can be made about Gujarat:

- Gujarat's agricultural sector has shown continuous growth; however, there were fluctuations from years to year. In several years afflicted by droughts, there has been a negative growth. But with continuous efforts and detailed planning, major changes were introduced to make Gujarat the number one agricultural state in the new millennium. Agriculture has been made sustainable with focus on assisting poor farmers. In fact, in his vision paper on agriculture, Agro Vision document envisaged a 6.4% growth rate that would double farmers' income. The growth rate has surpassed that and at an average of 11% per annum has been obtained in last four years.
- The State has highly diversified agriculture with pre-dominance of cash crops. Cotton is increasingly becoming popular with farmers. Horticultural crops are also on the increase and in the near future, horticulture will have a very important role in enhancing the income of farmers.

- There is a continuous increase in productivity of all crops. Gujarat is occupying the number one position at the national level in a number of crops – both in terms of productivity and volume.
- The State has a number of constraints. This includes uncertain monsoon, large area under dry-land farming, recurring droughts, increasing soil salinity, expansion of the desert of Kutch, and so on. In recent years, floods have become quite common in South and Central Gujarat.
- The State has recognized the importance of biotech crops. There has been phenomenal increase in cotton productivity, almost comparable to international standards during the last four years due to adoption of Bt cotton. This has enhanced the income of farmers, including small and marginal farmers.
- The government has laid emphasis on expanding the base of agro processing sector. It has been proactive with the incentive policy to promote Agro Industries. It has taken definitive steps for credit service network in collaboration with NABARD. Strengthening of agriculture infrastructure includes attention to research, education and extension. Attention has also been paid to conserving available water by taking up major programmes of water harvesting and conservation.
- Gujarat introduced concept of ‘Shram Yogi’ in rural development programmes under which five poorest families are to be identified every year and assisted. This is in addition to 15 poorest farmers identified by Agriculture Team. A BPL (Below Poverty Line families) code has been introduced to reach out to poor families for their needs. Says Minister for Rural Development, Shri Bharat Barot, “through new delivery system, beneficiaries do not have to run from pillar to post to get benefit; instead Taluka Development Officer goes to them”. The same approach as adopted in Krishi Mahotsav management model described in a later chapter.
- Cooperative institutions including cooperative banks, APMC, and producers’ organisations are supporting agriculture in a big way.
- The animal husbandry sector has played a significant role. It has particularly helped small and marginal farmers. The cooperative milk producers’ organisations and village level milk societies have provided weekly cash flow to farmers. Perhaps this is one important reason why Gujarat farmers, despite complete crop failures, have not committed suicides.
- Potential areas of development include expansion of biotech crops, Energy crops like Jatropha, scientific farming based on soil health analysis, drip irrigation, utilisation of wasteland, soil and water conservation measures, utilisation of solar and wind energy, organic and horticulture crops and a close attention to expansion of agro processing at village level.

- Gujarat has emerged as the number one state in the last four years in the country in the agricultural sector. This is a remarkable achievement. It has provided growth at an average rate of 11% in the years between 2001 and 2006, and at this rate, income of farmers will double within seven years. This indicates that a comprehensive approach at the village level can transform agriculture.
- There is need to look at Agriculture Laws – some of them are central laws and others are state level. Some of these laws, like Tenancy, Agri Land Ceiling and Revenue Law, were necessary in earlier phase. Now they have become a deterrent to major capital investment by farmers as Tenancy Act can vitiate his ownership any time. There is need to simplify Land Revenue Code for the benefit of landholders. Other redundant Acts are those concerning movement of agri produce and cattle. What is needed is a strong Seed Act to make available to farmers quality seeds with germination guarantee and scope for drastic action against spurious seed dealers.

In contrast to what has happened in some states, where there are farmers' suicides or spread of Naxalism or both, Gujarat did not face these phenomena due to the above approach. It also explains why, despite debt burden, growing wheat or cotton, poor farmers remained comfortable enough to live their life. In contrast, in regions like Vidharbha – a region of Maharashtra state - more than 2,150 farmers' suicides have taken place since 2001. The main reasons were, of course, high debt burden, and crop failures. Besides, a majority of farmers who had committed suicide had no irrigation support whatsoever.

The reasons why Gujarat is away from such a situation are described further in greater details in ensuing chapters for some of important initiatives.

CHAPTER 4: WATER RESOURCES

Gujarat faces acute water shortage from time to time. There are a number of villages that require water to be supplied to them by tankers in summer even during years of good rainfall. During drought years, the situation is very bad, and calls for planned irrigation. The uncertainty of rainfall and lack of assured irrigation has been a serious handicap for sustainable agricultural activities in many parts of Gujarat.

Kumar has identified in his study major characteristics of hydrological zones as under:

Major Characteristics of Hydrological Zones in Gujarat

Region	Incorporating agro-ecological zones	Districts included	Mean rainfall (mm)	Variability of rainfall	Surface water potential (MCM)	Annual utilizable ground water recharge (MCM)	Recharge rate (MCM/km ²)
South & Central Gujarat	Southern hills, southern Gujarat, middle Gujarat	Dangs, Valsad, Navsari, Surat, Bharuch, Narmada, Vadodara, Anand, Dakor	1,092	Low	32,260	4,533.11	0.199
North Gujarat	North Gujarat	Ahmedabad, Gandhinagar, Mehsana, Sabarkantha, Banaskantha,	627	Extreme	2,012	-	0.106
Saurashtra	North and South Saurashtra	Amreli, Jamnagar, Bhavnagar, Rajkot, Surendranagar, Junagadh,	568	Extreme	3,613	4,539.23	0.087

		Porbandar,					
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Source: Kumar, 2002, IRMA/UNICEF 2001

South and Central Gujarat is a water-abundant region. It receives more than 40% of the State's total rainfall. The large perennial rivers (Mahi, Narmada and Tapi) are here. The surface water potential of the region is very high. But rest of Gujarat is not very well placed in this regard. In north Gujarat there are rivers, but they are seasonal and dry up very fast, once monsoon is over. Similar is the position in North Gujarat, Saurashtra and Kutch.

These areas have insufficient rain and frequent droughts and heavy discharge of groundwater. On the other hand, there is insufficient annual recharge. This is reflected in progressive fall in water table. Again, in the coastal plains, farmers are heavily dependent on groundwater due to the low reliability of rainfall and lack of surface water for irrigation. This has resulted in intrusion of saline seawater into the aquifers.

Kutch district, with an area of 45,652 sq km, is the largest district. It covers about 24% area. Its length covers more than 3° of longitude (68° 09' 46" E to 71° 54' 47"E) while its width spans over 2° of latitude (22° 44' 11" N to 24° 41' 25" N). Within this vast area the district contains one of the world's largest saline and marshy tracts. The Great Rann of Kutch lies all along its northern part. The western part of the district has a marshy tidal flat, while the southern margin is along the Arabian Sea and the Gulf of Kutch.

IRRIGATION

Irrigation is a key factor in increasing agricultural production. The ultimate irrigation potential through surface water as per the latest estimate is assessed at 39.40 lakh hectares. This includes 17.92 lakh hectares to be irrigated through Sardar Sarovar (Narmada) Project. The groundwater resources are relatively limited. Some of the groundwater resources are fully exploited in different parts of the State to the point of ecological degradation.

A scheme called 'Sardar Patel Sahabhagi Jal Sanchaya Yojana' is being implemented by the State Government. Under this scheme, check dams are to be constructed. Village community is required to share 40% of the cost (20% in tribal areas). Government bears remaining 60% of the cost (80% in tribal areas). The basic idea of implementing such a scheme is to create awareness of equality of work among farmers and a sense of ownership, as they spend 40% of the cost, make economic use of water and also shoulder the responsibility of operating and maintaining the check dams. Till date more than 60,000 check dams have been completed. The details of irrigation potential created/ utilized up to June 2004 are as under:

Irrigation potential created/ utilized up to June 2004

S. No.	Item	Ultimate irrigation potential	Irrigation potential created up to June 2004	Maximum utilisation up to June 2004
1	Surface Water	39.4	17.55	15.11

	1.1 Major & Medium Scheme	18	14.61	13.21
	1.2 Sardar Sarovar Project (including conjunctive use)	17.92	0.25	0.25
	1.3 Minor irrigation	3048	2.69	1.65
2	Ground water (including private resource)	25.48	20.35	2.34
	Total (1 + 2)	64.88	37.99	35.45
	Indirect benefit through water conservation programme		3.5	3.5

(Source : Socio-economic review 2004-05)

To prevent salinity ingress in water-scarce coastal areas of Saurashtra and Kutch, a number of salinity ingress prevention works such as construction of tidal regulators, bandharas, recharge reservoirs, spreading and radial channels, etc., have been taken up.

Sources of Irrigation

Canals	3,476
Wells / Tube wells	24,347
Tanks	153
Other sources	84
Net Irrigated Area	28,060
Gross Irrigated Area	33,421

(Source: Socio-economic review, 2004-05 – Department)

Source of Irrigation

The source wise gross irrigated area of Gujarat is shown as under.

Source of Irrigation Area in 00 Hact.

Sr. No.	District	Tank	Canal	Tube Well	Other Well	Other Source	Total
1	Ahmedabad	7	257	877	590	0	1731
2	Banaskantha	2	0	2508	2056	0	4566
3	Baroda	11	389	290	160	0	850
4	Narmada	0	3	100	71	12	186
5	Valsad	17	67	0	390	8	452
6	Navsari	0	604	0	391	0	995
7	Dangs	0	0	0	5	0	5
8	Broach	11	389	290	160	0	850
9	Gandhinagar	0	0	1304	66	0	1370
10	Kaira	66	448	615	651	0	1780
11	Anand	0	131	290	1040	0	1461
12	Mehsana	2	0	2434	273	0	2709
13	Patan	3	0	1253	128	0	1384
14	Panchmahal	29	66	8	249	33	385
15	Dahod	2	2	6	64	19	93
16	Sabarkantha	0	0	467	1415	0	1882
17	Surat	5	1775	0	852	4	2636
18	Amreli	0	0	0	760	0	760
19	Bhavnagar	0	0	0	1134	0	1134
20	Jamnagar	0	18	0	593	0	611
21	Junagadh	0	0	0	1048	0	1048
22	Porbandar	0	0	0	174	0	174
23	Kutch	0	145	35	1589	0	1769
24	Rajkot	0	0	0	1731	0	1731
25	Surendranagar	0	0	794	598	0	1392
	Gujarat State	182	3942	11926	17276	95	33421

Source-Directorate of Agriculture, Government of Gujarat, Gandhinagar, Gujarat.

SARDAR SAROVAR PROJECT

The Sardar Sarovar Project is a multipurpose project that includes construction of a concrete gravity dam across the river Narmada in Narmada district. It will have two powerhouses with a combined installed capacity of 1,450 MW and 460 MW. The long main canal has a discharge capacity of 40,000 cusecs at the starting point and 2,500 cusecs at Gujarat-Rajasthan border with a network of 75,000 km for water distribution system for irrigation. The project will provide annual irrigation benefits in an area of about 17.92 lakh hectares.

This will cover 75 talukas of 15 districts in the state. It is also expected to provide water for domestic and industrial uses in about 8,215 villages and 135 townships. About three-fourths of the command area is drought prone. That is why it is known as the lifeline of Gujarat. This is perhaps one project, which has the capacity to utilise surplus water, which regularly led to floods, affecting the livelihood of poor farmers. It can meet water scarcity and create assured agriculture for poor farmers. Unfortunately for our nation short-sighted NGOs with selfish aims backed by media that did not try to go into depth to understand the significance of the project for poor farmers delayed its implementation and increased the cost. This project could have been completed in a decade but has taken four decades – thanks to such hurdles. This explains how country like China where a similar project has been implemented speedily without hurdles have progressed faster.

The physical status of the dam and canals as of October 2005 is mentioned below.

Main Dam: About 99.34% of the excavation and 93.53% of the concrete work of main dam have been completed. The work of raising the height of dam from 100 metres to 118.64 metres was completed on 30-6-2006.

Main Canal: The progress of Narmada main canal is as under:

Details of Narmada main canal works	Progress of work (in percentage)		
	Excavation	Lining work	Concrete work
Phase I (up to Mahi river, CH. 0 to 144 km)	100.00	100.00	100.00
Phase II (A) up to off taking points of Saurashtra branch canal CH. 144 to 264 km)	100.00	100.00	100.00
Phase II (B) (works beyond Kadi, CH. 264 km to 357 km)	100.00	100.00	100.00
Phase II (C) (works CH. 357 to 458 km)	77.67	9.67	5.38

Branch Canals: Excavation, lining work and concrete work of structures of branch canals are complete for Phase-I. In Phase-II area, work of seven branch canals of off taking from NMC is under progress.

Distribution system: Works of distribution system up to minor channels have been completed in 2.73 lakh ha, out of total 4.46-lakh ha irrigable command. Distribution system of Phase-II, the work of constructing sub minors in 20,137 ha has been completed. The rest will be taken up in ensuing years.

SUJALAM SUFALAM SCHEME

Gujarat in 2002-03, took a series measures for water conservation and transfer of water from one area to another area. Sardar Sarovar Reservoir Project does not cover certain areas of North Gujarat. Government has adopted a comprehensive approach under the project called 'Sujalam Sufalam'. This was launched in February 2004. Its main components are:

- Lifting of water from Narmada and Kadana canals to fill up existing ponds in villages of North Gujarat.
- Recharge North Gujarat aquifers through canals, even by pumping wherever necessary.
- Construction of large check-dams in Kutch, Panchmahals, and Dahod where canal water is not likely to reach.

This project is worth Rs. 6,000 crore. It is a major effort in water harvesting and transfer of water for far-flung areas, which suffer from acute water scarcity time and again. Its objective is to meet drinking water requirement of villages and make water available to farmers for irrigation. Farm irrigation is to be on drip/micro irrigation system to make best use of scarce water resources. The recharge of water is expected to bring up the water table and reduce the cost of harnessing underground water resources by tube well.

The existing scheme of check dam is to be expanded. It is made more liberal with 80% share of Government and 20% share of village communities to meet expenses of constructing a check dam. Earlier it was on 60:40 cost-sharing basis. Over 1,00,000 check dams are planned to be constructed. The experiment of preventing run off and storing rainwater of last rain by putting sand bags has been successful. It is planned to expand this and put up such 'Bori Bunds' in a big way.

This project is under speedy implementation. 60% of link canal work is over. It is one of the most ambitious projects of recent times. It would go a long way in harnessing water resources for agriculture. It aims at providing an assured support of irrigation for better selection of crops and higher yields

Kalpsar Project - The project for future Gujarat: The Government has prepared a master plan for the maximum development and utilisation of water resources. Even after completion of SSNNL, 50% area will have partial benefit of irrigation, industrial and drinking water. Generally, almost all the rivers get water in rainy season for 25 to 30 days. Major rivers like Narmada, Mahi and Sabarmati debouch in the Gulf of Khambhat. The Sardar Sarovar, Kadana and Dharoi dams are built on these rivers respectively. Flood water downstream of these dams is going into the sea. It is necessary to plan to store this water, which is flowing into the sea and is not utilised for irrigation, industry or drinking water. In this context, Kalpsar is viewed as an important multipurpose project to store sweet water in huge quantity. It is proposed to build a dam across the Gulf of Khambhat connecting Ghogha in Bhavnagar and Hansot in Bharuch District. Total length of dam will be 64.16 km. The fresh water reservoir will have an area of 2,070 sq.km. It will store 12,250 million M³ of water. A tidal reservoir of 872-sq km

area will also be formed for tidal power generation. There will also be powerhouse, spillway and navigation locks.

FARM PONDS

In the year 2004-05, a scheme for construction of farm ponds was initiated. The main objective of the scheme was to harness water getting accumulated in a farm by drawing it into a pond created within the farm itself to recharge and increase the moisture level in soils. Under this scheme, a 200-cubic metre of farm pond could be constructed by a farmer on his own land. He is offered 8 kg of food grains per man-day towards costs. More than 1,00,000 farm ponds got constructed under the scheme in the year 2003-04. This was part of SGRY scheme of Rural Development Department. In the first year, all the farmers were eligible. In the ensuing years, this has become limited to families who are below poverty line.

WATER HARVESTING

Water available through rainfall if spread evenly could be enough, but due to regional disparity, there are problems of its scarcity. In such areas, it is necessary to harvest the rainwater by constructing farm ponds, village ponds, earthen and masonry water harvesting structures to allow the rainwater to percolate into subsoil strata to increase under ground water resources.

WATERSHED DEVELOPMENT PROJECT

Details regarding region-wise area, population and water resources situation of the state

Region	% Of area of the State	% Population of the State	% Of available water resources of the state
Kutch	13.00	3.50	2.20
Saurashtra	36.00	28.60	7.00
North Gujarat	23.00	34.20	13.10
Middle Gujarat	14.30	18.00	11.40
South Gujarat	14.00	15.70	66.30

The entire area of the State has been demarcated into region, basin catchment, sub catchment, watershed and sub, mini and micro watershed by the State-level institute known as The Bhaskaracharya Institute for Space Application and Geo-Informatics - Gandhinagar. As per the demarcation, the state has following pattern of watershed:

S.No.	Particulars	No.
1	Region	2
2	Basin	8
3	Catchment	18
4	Sub catchment	40

5	Watershed	217
6	Sub watershed	773
7	Mini watershed	1,896
8	Micro watersheds	9,718

Soil and water conservation work had been started in the late sixties but it was on piece-meal basis. The concept of watershed was introduced by Government of India in 1976. Gujarat created a State and Development Corporation to implement soil and water conservation work. The watershed approach became popular with a big initiative from Rural Development Department.

Objectives of the Scheme

It aims at conservation, development and management of natural resources. Water harvesting is for enhancement of agricultural productivity. It aims at restoration of balance in degraded and fragile rainfed ecosystem. It is an attempt towards and reduction in regional disparity between irrigated and rainfed area.

Guiding Principles

1. Integrated development of natural and social resources
2. Moisture conservation
3. Sustained farming practice
4. Adoption of ridge-to-valley approach
5. Emphasis on production enhancement activities for land owner and livelihood for support to landless families
6. Decentralisation in decision making
7. Transparency in transactions
8. Mobilization of community at village level
9. Prevention of migration
10. Direct funding to community, emphasis on government participation in community schemes
11. Contributory approach for empowering community
12. Relying upon local improvements
13. Initiative and ideas, equity for resourceful poor families and empowerment of women
14. Moving away from subsidy-oriented development to self reliant development
15. Convergence of schemes of Government and NGOs

Self Help Group, Users' Groups, Watershed Association and Watershed Committees are constituted at micro watershed level for undertaking works of this scheme. Watershed Committee is carrying out works in watershed area as per instructions of Watershed Association and under direct guidance of Watershed Development Team.

Training

High importance is given to training and capacity building for technical and management abilities as well as matters relating to community organization. Village community organizations are to be launched to implement and monitor the watershed programme.

Norms for expenditure

A total sum of Rs.30 lakh is provided for 500 ha of area. Of this, 22.5% is provided for management component - 10% towards administration, 7.5% for community organisations, and 5% for training programmes. The remaining 77.5% of total project cost is provided for development components - 50% towards development of natural resources, 20% for land-based enterprises and 7.5% for non-land based enterprises.

Major treatments

People themselves have to implement works under guidance of technical staff of Programme Implementing Agency (PIA). Beneficiaries are inspired for planning treatments on their own fields. In non-arable lands with soil and water conservation, pasture development and fodder production is taken up.

Says B. s. Patel Managing Director of Gujarat State Land Development Corporation, "Various farm production practices are promoted such as nursery, testing of new technology and demonstration, diversification in production system, organic farming, use of bio-fertilizer, integrated pest management, integrated nutrient management, micro irrigation, livestock management". There are more than 3,000 watershed projects in Gujarat. They have yielded remarkable results. One detailed illustration of Chhota Udepur, a remote tribal area, is mentioned else where in this book.

Micro Irrigation

In order to make the optimum use of the available water, the Government is promoting more use of micro irrigation system through the Gujarat Green Revolution Company established by the State Government's Gujarat State Fertiliser Corporation (GSFC). The Government is making available 50% subsidy limited to Rs.50,000 per ha. It is anticipated to cover 1,00,000 ha by 2006-07.

This is a major drive to introduce the concept of economical use of scarce water resources. Already more than 20,000 ha are covered. The supplier company is responsible for guiding farmers in selection of crops and maintenance of system for a period of three years.

CONCLUSION

In conclusion, the following can be observed:

- Gujarat has water resources, but these are unevenly spread. Some areas have surplus water, while a large number of others are water deficit.
- Agriculture is rain-fed in majority of its area, mainly due to insufficient irrigation. As a result, agriculture is vulnerable to vagaries of weather. The State has undertaken a large programme for irrigation. There are major dams like Mahi, Kadana, Ukai, and the like. The Sardar Sarovar (Narmada) project is now emerging as the major source of irrigation.

- The State has followed this up with a massive programme for the construction of check dams, farm ponds, micro-irrigation and the ambitious Sujalam Sufalam Scheme. This is in addition to an existing watershed programme that has provided the required support to agriculture in rain-fed areas. As a result of these initiatives, the storage capacity has increased in past four years in a sizable manner. The State has followed this up with a massive micro-irrigation programme. All these have stabilized agriculture.
- It is important to realize that conserving water, wherever it is available by every available technique – big dam, medium dam, check dam, bori bund, village pond, farm pond, river linking, canal clearing, re-charging wells – have been taken up together on a massive scale to meet the challenges making agriculture stable and sustainable, not to be withered away by vagaries of weather. This is a major structural change. Participative schemes in the check-dam programme have enhanced both public and private investment in a big way. And this has key to bring stability and enhancing growth of Agriculture Sector.

5. FARMERS

Gujarat's farmers are progressive; they like to adopt new ideas and are hard working. Even the illiterate ones have a keen business sense, which explains crop diversity and preference for cash crops. They are also very tough and do not lose hope even during consecutive droughts, persevering instead with patience. They do not give up even in the worst adverse circumstances. They are also aware of market prices and prefer to sell their produce in APMC rather than to a local trader. In the following pages, their factual status is narrated based on a sample survey conducted by National Sample Survey Organization in 2000-01. This is followed by case studies of farmers of Dahod Chhota Udepur and Vyara, some of the state's most backward and remote areas.

Farmers – NSSO Report

The results of NSSO reveal the wide gaps that the extension administration needs to bridge. They also give a clear picture of the alarming extent of rural debt, which is a major cause for concern. The case studies from Gujarat showcase the potential of even the most backward farmers. It also explains why farmers' suicides and Naxalism are absent in Gujarat.

It is important to know the status of farmers in Gujarat and their position vis-à-vis the rest of the country. The National Sample Survey Organization conducted an in-depth study at the national level and published three detailed reports in 2005-06, on the conditions of farmers in relation to use of technology in farming practices and debt.

1. Rural households engaged in farming activities

India	- 60%
Gujarat	- 60% (11 th in India)
Highest	- J & K – 91%

2. Knowledge, preference and behaviour

Educational levels of the farmers

The literacy-rate among the farmers (at all-India level) appears to be high while comparing it with the break-up of general rural population.

The percentage of literates shown below (in the farmer's family 7 years above level).

	Percentage of literate farmers			
	Farmers		All members of farmers household	
	Male	Female	M	F
All India	65	31	72	47
Gujarat	73	38	78	49
Highest in Kerala	94	85	95	99

Awareness of technical and institutional development in agriculture

India	- 18%
Gujarat	- 11%
Highest in Kerala	- 55%

Awareness about minimum support price

India	- 29%
Gujarat	- 25% (13 th)
Highest in Haryana	- 62%

3. Awareness about WTO, some idea about objectives and activities

India	- 8%
Gujarat	- 6% (11 th)
Highest in Kerala	- 44%

4. Inclination towards farming

Members of farming households were surveyed on whether they would continue farming, if given the chance to choose some other career.

Percentage of farmers liking farming

India	- 60%
Gujarat	- 67% (2 nd)
Highest in Andhra Pradesh	- (76%)

5. Membership of registered farmers' organization

Percentage of farmers' households who was a member of registered farmers' organization

India	- 2.2
Gujarat	- 5.9 (3 rd)
Highest in Kerala	- 10.5%

Percentage of farmers' households who have a membership in a self help group

India	- 48%
Gujarat	- 3.2% (8 th)
Highest in Kerala	- 19.9%

6. Service of Co-operative

Six kind of service of cooperative were of interest are:

- Credit
- Marketing services
- Services related to seeds/fertilizer
- Agricultural implements
- Inputs
- Consumers' goods.

Some aspects of the picture of the state and India is shown below

	% of household		Kind of services most commonly availed
	Not members of Co-operative	Members but did not avail services	
Gujarat	51	11	Seeds and fertilizer (22%)
India	71	10	CR & SF (9%)

7. Seeds - Usual source of procurement

Their usual way of procuring seeds are:

- (i) Farm saved seeds
- (ii) Purchase of seeds
- (iii) Exchange of seeds

The percentage of procurement of seeds is as follows:

	Farm saved seeds	Purchased seeds	Through exchange of seeds
All India	47	48	5
Gujarat	35 (12th)	58 (7th)	7 (3rd)
Highest	Chattisgarh (85%)	AP (81%)	Haryana (9%)

How often farmers replace varieties

	Every year	Every alternate year	After three years	After four years
All India	30	32	21	17
Gujarat	39 (6th)	30 (10th)	12	19
Highest in	Andhra Pradesh (57%)	Punjab (48%)		

Extent of use, adequacy, timeliness and quality of the resources (fertilizer, organic manure, improved seeds and pesticides)

	Fertilizer		Organic Manure		Improved Seeds		Pesticides	
	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
All India	76	54	56	38	46	34	46	31
Gujarat	81 (6th)	38 (10th)	71 (4th)	27 (14th)	62 (5th)	29 (10th)	48 (8th)	25 (11th)
Highest	J & K (91%)	Bihar (91%)	J & K (88%)	J & K (80%)	Maharashtra (70%)	WB (58%)	WB (80%)	WB (65%)

Adequacy: During Kharif and Rabi season, 97% of farmers' households who used fertilizers organic manure improved seeds and pesticides considered the quantity adequate for their purpose.

8. Quality

This section includes the percentage of user farmers' households by their judgment of the quality of resources.

Quality of Fertilizer

Kharif

	Good	Satisfactory	Poor
India	65	34	1
Gujarat	80	19	1

Rabi

	Good	Satisfactory	Poor
India	65	34	1
Gujarat	79	21	0

Organic manure

Kharif

	Good	Satisfactory	Poor
India	65	34	1
Gujarat	79	21	0

Rabi

	Good	Satisfactory	Poor
India	70	29	1
Gujarat	78	21	1

Improved Seeds

Kharif

	Good	Satisfactory	Poor
India	61	37	1
Gujarat	71	29	0

Rabi

	Good	Satisfactory	Poor
India	64	35	1
Gujarat	76	23	1

Pesticides**Kharif**

	Good	Satisfactory	Poor
India	60	38	2
Gujarat	59	40	1

Rabi

	Good	Satisfactory	Poor
India	60	38	2
Gujarat	69	30	1

9. Report of farmers for testing facility for fertilizer and pesticides**For Fertilizer**

	Percentage of farmers' households who reported about Facility for fertilizer		
	Available	Not available	Don't know
India	2 (Punjab 9.1%)	51	47
Gujarat	1 (12th)	68	31

For Pesticides

	Percentage of farmers' households who reported about Facility for fertilizer		
	Available	Not available	Don't know
India	2 (Punjab 8.2%)	48	50
Gujarat	1 (12th)	66	33

Land used for different kinds of farming

Cultivation and allied agriculture, orchards and plantations, dairy, fishery and other farming

	Percentage of farmed land used for				
	Cultivation and Allied agriculture	Orchards and Plantation	Dairy	Fishery	Other Farming

	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
Gujarat	99.17 (1st)	98.73 (3rd)	0.61 (14th)	0.93	0.21	0.32	0.0	0.0	0.01	0.02
India	96.22	95.05 MP(99.14%)	3.09 (72.47%)	3.98	0.35	0.55	0.20	0.27	0.14	0.15

Percentage distribution of farmed land possessed by type of agricultural activity for each size class of land possessed in Gujarat State.

Gujarat : Kharif

Size Class of Land Possessed (Hectares)	Cultivation	Orchard And Plantation	Dairy	Farming of goat, sheep etc	Piggery Fishery Bee	Poultry Including Ducks	Farming of other animals
0.01	10.50	0	80.29	8.40	0	0.71	0.11
0.01-0.40	98.13	0.63	1.17	0.05	0	0	0.02
0.40-1.00	98.84	0.88	0.23	0.01	0	0	0.03
1.01-2.00	99.17	0.45	0.36	0.01	0	0	0.01
2.01-4.00	98.90	0.98	0.12	0	0	0	0
4.01 – 10.00	99.40	0.50	0.10	0	0	0	0
>10	99.17	0.61	0.21	0.01	0	0	0.01
All size	99.17	0.61	0.21	0.01	0	0	0.01

Gujarat: Rabi

Size Class of Land Possessed (Hectares)	Cultivation	Orchard And Plantation	Dairy	Farming of goat, sheep etc	Piggery Fishery Bee	Poultry Including Ducks	Farming of other animals
0.01	1.67	0	84.57	7.99	0	0.89	4.88
0.01-0.40	95.40	2.99	1.48	0.12	0	0	0.01
0.40-1.00	98.33	1.39	0.22	0.03	0	0.01	0.02
1.01-2.00	98.52	0.95	0.51	0.02	0	0	0
2.01-4.00	98.79	1.09	0.14	0	0	0	0
4.01-10.00	99.14	0.69	0.14	0	0	0	0
>10	99.95	0	0.05	0	0	0	0
All size	98.73	0.93	0.32	0.02	0	0	0.01

10. Irrigation

Area irrigated from different sources: All crops

Kharif

	Percentage of cropped area irrigated by						Total
	Rivers/ Springs	Canal	Tube Well	Well	Tank	Other Sources	
Gujarat	1.22 (11th)	2.19 (15th)	14.04 (8th)	13.60 (4th)	0.22 (15th)	0.90 (16th)	32.17 (11th)
India	2.00	7.75	21.01	7.94	1.23	2.27	42.20
Highest	J & K 5.12%)	J & K 24.75%	Punjab 90.30%)	T & N (35.98%)	T & N (7.36%)	J & K 7.36%)	Punjab 102.86%)

Rabi

	Percentage of cropped area irrigated by						Total
	Rivers/ Springs	Canal	Tube Well	Well	Tank	Other Sources	
Gujarat	1.17 (11th)	4.79 (24th)	23.68 (7th)	12.66 (5th)	0.24 (16th)	1.08 (14th)	43.62 (9th)
India	2.20	7.68	33.82	9.04	1.13	2.46	56.33
Highest	Jharkhand 7.84%)	Haryana 14.75%)	Punjab 95.62%)	TN (32.08%)	WB (6.07%)	Kerala (17.01%)	Punjab (107.89%)

Major source of irrigation for different crops/crop groups

All Crops

	Kharif				Rabi			
	Percentage of area irrigated by				Percentage of area irrigated by			
	Tube Well	Wells	Canal	Rivers	Tube Well	Wells	Canal	Rivers
Gujarat	44 (6th)	42 (4th)	7 (16th)	4 (11th)	54	29	11	3
India	50	19	18	5	60	16	14	4
Highest	Punjab (89%)	Maharashtra (59%)	Orissa (70%)	Jharkhand (20%)	Punjab (90%)	Maharashtra (58%)	Orissa (56%)	Jharkhand (20%)

Cereals

	Kharif				Rabi			
	Percentage of area irrigated by				Percentage of area irrigated by			
	Tube Well	Wells	Canal	Rivers	Tube Well	Wells	Canal	Rivers
Gujarat	37 (8th)	41 (2nd)	11 (14th)	6 (8th)	49 (9th)	33 (4th)	11 (14th)	4 (9th)
India	53	12	23	4	63	14	14	4
Highest	Punjab (95%)	Maharashtra (52%)	Kerala (75%)	Jharkahand (31%)	Punjab (90%)	Maharashtra (56%)	J & K (68%)	Jharkahand (29%)

Oilseeds

	Kharif				Rabi			
	Percentage of area irrigated by				Percentage of area irrigated by			
	Tube Well	Wells	Canal	Rivers	Tube Well	Wells	Canal	Rivers
Gujarat	44 (9th)	53 (2nd)	0.94 (16th)	2.22 (12th)	66 (7th)	21 (4th)	12 (12th)	1 (10th)
India	40	40	5	10	62	11	18	4
Highest	Uttar Pradesh (88%)	Maharashtra (56%)	Orissa (110%)	Jharkhand (100%)	Jharkhand (100%)	Maharashtra (46%)	Uttaranchal (100%)	Sikkim (100%)

Fibre Crops

	Kharif				Rabi			
	Percentage of area irrigated by				Percentage of area irrigated by			
	Tube Well	Wells	Canal	Rivers	Tube Well	Wells	Canal	Rivers
Gujarat	60 (5th)	36 (5th)	2 (9th)	2 (5th)	66 (6th)	31 (4th)	3 (4th)	0 -
India	45	26	22	2	65	21	7	1
Highest	Uttar Pradesh (92%)	Maharashtra (67%)	J & K (100%)	Kerala (26%)	Punjab M.P. U.P Assam (100%)	TN (78%)	Karnataka (66%)	WB (4%)

Fodder

	Kharif				Rabi			
	Percentage of area irrigated by				Percentage of area irrigated by			
	Tube Well	Wells	Canal	Rivers	Tube Well	Wells	Canal	Rivers
Gujarat	53 (8th)	47 (3rd)	-	-	82	13	5	-
India	69	10	15	1	78	9	10	1
Highest	Karnataka (100%)	M.P. (91%)	J & K (87%)	Himachal Pradesh (49%)	West Bengal Assam (1005)	Kerala (100%)	J & K (60%)	MS (12%)

Devices used for irrigation

This includes farmers' households who had used devices like electric pump, diesel pump, Persian wheel and other devices to irrigate land during the last Kharif or Rabi season. Only 3-5% farmers used irrigation devices like tanks, tube wells and wells but around 80% depended on rivers/springs and 75-79% on canals.

Percentage of gross irrigation area irrigated by different devices

	Electric Pump	Diesel Pump	Persian Wheel	Other Devices	No Devices
Gujarat	3.5 (12th)	6.7 (8th)	0	1.8 (17th)	88.0 (1st)
India	4.1	5.5	0.1	10.9	79.4
Highest	Karnataka 12.6%)	13.8%)	-	J & K 58.8%)	-

11. Energy used for farming and other activities

The different sources of energy considered are: electricity, diesel/petrol/kerosene, solar energy, LPG, gobar gas, dung cake, fire wood, animal power and other sources.

The activities are:

Ploughing, irrigation, harvesting, threshing, care crushing, transport cooking and lighting.

At the All India level, 47% of farmers' households reported energy used for ploughing while 52% used animals. The percentage did not change much with increase in size of land possessed. At the top most level (>10 ha) there was marked increase in the use of tractors and diesel (70%) in this class and about 1-2% used electricity for ploughing.

Percentage of farmers' households ploughing land using diesel and animals

	Diesel	Animal
Gujarat	52 (9th)	47 (10th)
India	47	52
Highest	Punjab (96%)	Jharkhand (98%)

12. Access to modern technology for farming

- ∅ Total villages surveyed : India 6638
: Gujarat 172
- ∅ No. of sample farmer : India 51770
: Gujarat 1330
- ∅ No. of sample persons surveyed : India 286507
: Gujarat 7565
- ∅ **A list of sixteen sources of information was provided to the surveyed farmers' households:**
 1. Participation in training
 2. Krishi Vigyan Kendra (KVK)
 3. Extension work
 4. Television
 5. Radio
 6. Newspapers
 7. Village fair
 8. Government demonstration
 9. Input dealer
 10. Other progressive farmers
 11. Farmers' study tour
 12. Para technician/Private agency/NGO
 13. Primary cooperative society
 14. Output buyers/food processor
 15. Credit agency
 16. Others

Percentage of farmers' household accessing modern technology through major source in Gujarat State and its comparison with national level

Sr. No.	Source	% of farmers household accessing modern technology through major source		
		Gujarat	India	Highest
1	Other progressive farmers	30% (2nd)	16.7%	AP (34.1%)
2	Input dealer	24.3% (3rd)	13.1%	WB (35.6%)
3	Extensive worker	21.9% (1st)	5.7%	Gujarat
4	Television	10.4% (8th)	9.3%	J & K (30%)
5	Newspaper	6.8% (8th)	7.0%	Kerala (37.8%)
6	Radio	6.2% (13th)	13%	J & K (36.3%)
7	Primary cooperative society	-	3.6%	

In Gujarat: Other progressive farmers, input dealers, extension workers and television are commonly used sources.

All India Level: Other progressive farmers, input dealers, radio and T.V. were the most commonly used sources.

Percentage of farmers' households accessing information on modern agricultural technology through different sources

State	Percentage of farmers accessing modern agricultural information
Andhra Pradesh	62.7
West Bengal	60.9
Kerala	58
Gujarat	55.2
Tamil Nadu	50
J & K	48
Maharashtra	46.2
Assam	46.1
All India	40.4

Debt in farmers' households

The main findings on debts in farmers' households are categorised by social group, source of income and size class of land possessed in different state or Union Territories and at all India level. The amount of outstanding loan has been analysed according to both the source of the loan as well as its purpose. Also examined is the variation in average amount of outstanding loan per farmer household over different expenditure classes and over different social groups.

At an all India level 51770 farmers' households were surveyed in 6638 villages out of the country's total of 6760 villages. In Gujarat, 172 villages have been surveyed with a sample of 1330 farmers' households.

Estimated percentage of debt of farmers households vis-à-vis total rural households

	Estimated number of			Percentage of farmers' households indebted
	Rural households ('00')	Farmers' households ('00')	Indebted farmers' household ('00')	
Gujarat	63015 (11th)	37845 (11th)	19644 (11th)	51.9 (9th)
All India	1478988	893504	434242	48.6
Highest	UP(221499)	UP (171575)	UP (69199)	AP (82%)
Highest in			UP – 69199 AP – 49493 Maharashtra– 36098 WB – 34696 MP – 32110	AP – 82% TN – 74% Punjab – 65% Kerala – 64.4% Karnataka- 61.6%

Debt of farmers' households under different social groups

Percentage of farmers' households according to social groups

	Percentage of farmers' households in social groups			
	Schedule tribe	Schedule caste	Other backward class	Others
Gujarat	28	7	35	30
India	13	18	41	28
Highest	Mizoram (97%)	Punjab (36%)	TN (73%)	J & K (69%)

Percentage of farmers' households in debt according to social group

	ST	SC	OBC	Other
Gujarat	23	7	36	34
India	10	18	44	28

Distribution of outstanding loan by purpose of loan
Percentage of outstanding loan taken by farmers' households by purpose of loan

	Purpose of loan							
	Capital Expenditure in farm business	Current Expenditure in farm Business	Non-Farm Business	Consumption expenditure	Marriage	Education	Medical Treatment	Other Expenditure
Gujarat	20 (19th)	50 (1st)	4 (21st)	6 (24th)	10 (10th)	1 (13th)	3 (10th)	6 (23rd)
India	31	28	7	9	11	1	3	11
Highest	Mizoram (81%)	Gujarat	H.P (29%)	Sikkim (20%)	Bihar (23%)	Arunachal Pradesh (20%)	Manipur (22%)	Arunachal Pradesh (41%)

The above data reveals how the farmer in Gujarat is ahead of others in certain significant areas like land use, access to modern technology etc. It also reveals areas where falls behind the national average, and needs initiatives to tackle.

FEMALE FARMERS

- Women account for 48.16% of the country's total population, of which 75% are rural. 34.22% of all cultivators are women, 44.93% women work as labourers with agricultural livestock, and 1.60% works in forestry, fisheries and other allied activities.
- Women play an important role in agriculture; their role in livestock production is far more than that of men. They normally work alongside men to plough and till the land. While women sow seeds and take care of plants they have remained passive, with little enthusiasm or motivation for their jobs. This could be because of the domination of men.
- Dr. Ramanbhai Patel of Navsari Agricultural University has conducted a study with respect to pre-harvest, harvest and post-harvest operations under women in rice farming. Women were involved in the pre-harvest operations of rice farming as follows: transplanting the seedling -70%, nursery sowing 63%, weeding 61%, uprooting the plant from nursery 59%, crop watching 59%, nursery bed preparation 31%, top dressing 28%, seed arrangement 13%, irrigation 13%, field preparation for transplanting 12%, plant protection measures 10% and foliar application 4%. While majority of rural women (65%) actively carried out harvesting, 18% supervised operations, and 17% did both.
- The result of the gender issue and agricultural activity shows that majority of women participated in agricultural activities like raising nursery for the seedlings (99.0%), sowing (98.0%), weeding (98.0%), thinning (86.0%), gap filling (80.0%), cutting (98.0%), picking (76.0%), shifting produce to threshing floor (80.0%), winnowing

(90.0%), drying (97.0%), cleaning (98.0%), storage (86.0%) and processing (96.0%). Regarding time spent, it was reported that women spent fifty four minutes to six hours in different agricultural activities.

The women farmers lack access to technology and credit, in addition to illiteracy. These are particularly recognized as crucial elements in the strategy for overall empowerment of poor women. On the whole, it emerged that women often initiated decisions in consultation with male family members, and most final decisions were taken along with them. This analysis indicates a great potential for empowering women both in agriculture and animal husbandry. In the long run, the men could move to the rural service sector or become self employed, leaving both these sectors under the care of the women.

FARMERS OF CHHOTA UDEPUR

Introduction

Chhota Udepur is a remote tribal taluka in Vadodara District. The terrain is undulating and rocky. Although not very far from Sardar Sarovar Dam, it is not part of its command area. However, water harvesting has changed the economic scene in this taluka, through a partnership of farmers, the Shroff Foundation Trust (SFT), a voluntary organization the District Rural Development Agency (DRDA)

Chhota Udepur

1. There is chronic water shortage despite about 800 mm rainfall per year.
2. Poor soil conservation has lead to soil erosion due to massive deforestation.
3. Main source of income is only marginal farming and raw forest produce selling.
4. Majority of families are below poverty line leading to migration to nearby cities in search of work as manual labourers

Watershed Projects from DRDA

In 1995, DRDA offered Watershed Projects under Government Scheme for development of tribal region of Chhota Udepur to SFT. SFT was selected as the Project Implementing Agency for Watershed Project in 20 villages in this area.

Project Implementation: SFT's Vision

Not content with watershed project alone, Mrs Shruti A Shroff, Managing Trustee of SFT envisioned an Integrated Development Plan that included health, education, community development and income generating activities; it focused on capacity building for the whole cluster of 20 villages.

Integrated Approach

1. To bring awareness among and build capacity of community for their development with their own active participation.
2. To create adequate income generation opportunities through agriculture along with alternative employment to prevent distress migration.
3. To improve overall quality of the life of people, with better health and education.

4. To develop and implement methods of timely conservation and effective utilization of natural resources.
5. To organize women and make them self-sufficient.
6. Components for integrated development

Entry-Point and Trust-Building Activities

- 1) Community organization and empowerment
- 2) Water resources development and related activities
 - a) Soil and water conservation
 - b) Agricultural development
 - c) Integrated crop management
 - d) Horticulture and afforestation
 - e) Livestock management.
- 3) Income Generation/Enhancement
 - a) Dairy development
 - b) Handicraft and other alternatives
- 4) Health, hygiene and sanitation.
- 5) Child development

In order to build trust and rapport, SFT provided:

- ü About 10 medical camps, treating more than 2000 patients per camp
- ü Mobile medical service in 20 villages
- ü Supplementary nutrition to children below 5 years of age in 6 villages
- ü Mandaps and Faraskhana equipments and cooking utensils for use in social programmes in 28 villages
- ü Sanitary latrines to 50 families in one village
- ü Support to schools in 10 villages
- ü Crematoriums in 3 villages
- ü Hand pumps in 2 villages

Entry point and Trust Building - Further efforts

Focus was maintained on meeting individuals, organizing groups meetings, understanding their problems according to their perceptions and facilitating solutions.

- Ø Motivating people for active participation
- Ø Empowering them for planning, implementation and monitoring in a systematic way
- Ø Income generation activities for groups and providing credit for such activities.

Community Organization and Empowerment

Community participation plays an important role in successful implementation of a development project. If people are encouraged to participate in the project from right from its conceptualisation, and motivated to make decisions, they feel that they own the project. Their co-operation comes forth voluntarily.

The overall approval included following:

1	Leadership/communication
2	Roles and responsibility
3	Problem-solving and conflict resolution
4	Technical aspects of watershed
5	Financial management including banking, accounting, documentation and reporting
6	Operation and maintenance of assets
7	Savings and importance of savings habits
8	Concepts of entrepreneurship

Water resource management

1. Water, one of the most important resources, is now being managed scientifically.
2. Seasonal availability of water through rains is not wasted since it is properly harnessed.
3. Most of the farmers who were able to harvest only one crop during rainy season are now taking winter crops also.
4. Developing watersheds helped conserve rainwater and raised the water table.

Integrated Development – Scope & Expenditure

Sr. No.	Period	Villages covered	Watershed Built	Area covered [ha]	Expenditure Budget vs. Actual [Rs]
I	1996-2001	20	14	7000	2,80,00,000 2,71,00,000
II	2001-2006	15	12 [Under Progress]	6090	3,66,72,000 1,69,00,000
Total	1996-2006	35	26	11090	6,46,72,000 4,40,00,000

Watershed Development

Watershed	Application	Completed	Under progress
Check dams	Water harvesting, storage & recharge	133	42
Lift Irrigation		2	4
Gully Plugging	Soil conservation	7000	600
Nala Bunds	Soil conservation	2100	150
Farm Bunds	Soil conservation	1900 ha	400 ha
Water Dams	Harvesting & soil Conservation	14	33
Earthen Dams		13	26

Impact of Water Resource Development

	Before	Current Status	Future Plan	% Increase from [a] to [b]	% increase from [a] to [b]
Kharif Crop [ha]	7123	7782	8026	9.25	12.68
Rabi Crop [ha]	832	1038	1310	24.76	57.45
Summer Crop [ha]	133	159	259	19.55	94.74
Crop Prod. [Qt.]	62047	81960	101618	32.09	63.78
Yield [Qt./ha]	7.99 Qt.	10.28	11.20	28.66	40.18
Income Gen. [Rs lakh] [Annual]	426	671	824	57.51	93.43

Check Dams

- ∅ 133 check dams and 2 Lift Irrigation Schemes were constructed in two phases.
- ∅ These helped creating a storage capacity of 2,78,000 Cu. M. of water.
- ∅ 183 wells have received the benefit of recharging.
- ∅ There is an increase in level of water in wells between 3 and 6 ft.

Increase in Level of Water in Wells

	Before	After	Rise
Level in Wells	18 – 38 Ft. Below Ground level	15 – 32 ft. Below Ground Level	3 – 6 Ft.

Soil Conservation Activity

Soil conservation activity was carried out by preventing soil erosion through gully plugging, nala bunding and farm bunding.

- Phase I : 3485 ha completed.
- Phase II : 1513 ha completed.
- Phase III : 1500 ha [work in progress]

This has also helped increasing the moisture contents of the treated land.

Afforestation

Phase-I[on going]

	[2001]	[2004]	[2006]
= Total trees Planted [nos.]	2,45,000	2,74,000	2,26,000
= Total plants survived [Nos.]	74,000	90,000	77,800
= Total Area covered: [About 3000 trees per ha]	25 ha	30 ha	26 ha
= Likely Value per ha [Rs] [@ Rs500 per tree with a survival rate of 67% after 20 years]	10,00,000	10,00,000	10,00,000
= Total PV [Rs] [@ 9%]	57, 00,000	52, 80,000	38, 50,000
= Total expenditure	3, 78,000	8,36,000	6,00,000

Farmers of Dahod

Sr.	Particulars	Current Status	Ongoing
1.	Total Area covered	29 ha	20 ha
2.	Total Trees Planted	2900	2000
3.	Likely Net Income per Year per ha [Rs]	25,000	25,000
4.	Total PV [Rs] [@ 9%]	38,00,000	22,06,000
5.	Total Expenditure [Rs]	11,38,000	12,37,000
6.	Incremental Land Value per ha [Rs]	1,00,000	1,00,000

Dairy Co-operative

7 dairies were promoted during 2002-2003.

- ∅ Milk collection per day started at the rate of 100 litres, and has gradually increased to 1200 litres per day over last 2 years
- ∅ Average milk collection during 2 years is 765 litres per day.
- ∅ Number of beneficiaries are 354.
- ∅ Total income is Rs 55,84,000 in 2 years
- ∅ Expenses @ 40% is Rs 22,34,000 in 2 years
- ∅ Profit is Rs 33,50,000 in 2 years

Handicrafts

- ∅ 120 women were given intensive skill training in handicraft work.
- ∅ They work in small groups in their villages during their spare time.
- ∅ In 4 years since 2000, they have earned job work of Rs 9,36,305.
- ∅ Thus, they have earned an additional income of Rs 1,950/- per beneficiary per year.
- ∅ Nearly 1,900 farmer families are residing in the area of 20 villages have been covered under completed part watershed development.
- ∅ Their annual income on an average which used to be Rs12,500 per year before development of watersheds has increased to more than Rs25,000 per year after watersheds.
- ∅ Considering an expense of 35%, their net earning per beneficiary is Rs16,250.

Self Help Groups

- ∅ In 35 villages, 92 Self Help Groups comprising a total number of 986 members have been formed.
- ∅ Objective of a SHG is to promote saving habits. The savings can be used to finance their own requirement of funds for micro enterprise.
- ∅ Over last 5 years, they have saved a sum of Rs 4,98,000 in SHGs.
- ∅ Along with a bank loan of Rs 7,46,000, a sum of Rs 10,66,496 have been loaned to members
- ∅ Recovery rate is nearly 100%, even though it is with delays.

Asset Acquisition

Type of Asset	Cost in Rs (1000s)
34 Tractors	136.00
4 Tempos	18.00
6 Jeeps	21.00
2 Auto Rickshaws	0.90
1500 Bicycles	15.00
Digging 230 wells	115.00
340 Houses constructed	136.00
40 Televisions	2.80
15 VCDs	0.45
100 telephones	
TOTAL	445.15

After implementation of projects, the community has acquired assets as indicated in the Table. This is a contribution of the community to the GDP of the country.

Comparison of Important Parameters

Some important parameters in the cluster area as compared to the entire country:

Sr. No.	Parameter	All India	Cluster
1.	Agriculture Production Growth	19.3% [1993-2002]	50% [1995-2002]
2.	Per Capita Agro Prod.	205 Kg/annum	328 Kg/annum
3.	Per capita availability for consumption	454 gm/day	898 gm/day

Integrated Development: Economics

Employment

- ∅ Employment generation during project execution: 3,86,500 man days
- ∅ Labour charges paid: Rs 116.00 lakh.

Watershed Committees Funds for Maintenance of Structures

- ∅ Funds contributed [labour]: Rs 29.30 lakh.
- ∅ Interest earned: Rs 9.22 lakh.

Cluster's Contribution to GDP

Cluster is contributing to Nation's GDP as under:

- ∅ Direct contribution of Rs 803 lakh annually.
- ∅ Indirect contribution of Rs 445 lakh [one time] by acquisition of assets out of income generated. Contribution of cluster to GDP is much more than the expenditure incurred on integrated development.

Says Atul Shroff, Trustee of Shroff Foundation "All this has been achieved under existing programmes with cooperation of Government officials, village community and active participation by beneficiaries themselves. In fact they were eager to work hard and adopt new technologies. The results obtained seem to be unbelievable."

This is a remarkable green story and it depicts what farmers are capable of achieving under guidance and assistance of a voluntary organization.

FARMERS OF DAHOD

The magazine, India Today described Dahod as one of the country's most backward districts. Here, a quiet revolution is taking place here a joint partnership of tribal farmers including women, a voluntary organization called Sadguru Trust and the Tribal and Horticulture

Departments of the Government. The initial approach was water conservation through a watershed programme, along with check-dams and village pond and lift irrigation. Water users' societies were formed and guided for the proper use of available water, based on a suggested cropping pattern. This was followed by a special scheme of horticulture development known as the 'Vadi Scheme', under which 90% subsidy was made available for horticulture crops. More than 15,000 Vadis have come into existence in the last five years. Some of the success stories in which women farmers are involved are mentioned below.

Village – Dagawada

Kaliben, a small farmer from Dagawada, has a plot of 0.2 ha took up cultivation under the Vadi Programme. She earned Rs.15,000 from Mango, Rs.5,000 from Aonla and Rs.4,000 from Lemon, a total of Rs.24,000 from her 6-year-old orchard. In addition, she earns Rs 6000 per year by selling worms from her vermicompost pits, earning her a total of Rs.30,000 per annum from 0.2 ha area of land.

Village – Zikli [Kusalghadh]

Premilaben Maljibhai Ravat is earning Rs.20,000 per year by selling Papaya, Mango, Aonla and Lemon. In the first year, she had an income of Rs.5,000 from 500 Kg. Papaya; in the second year, she earned Rs.7,500 by selling 750 Kg. Papayas; in the third year, she earned Rs.10,000 by selling 1,000 Kg. of Papaya; in the fourth year, she sold Rs.12,500 worth Papaya and in the fifth year of horticulture, she earned Rs.20,000 from 0.20 ha of land.

Village – Dageriya

Ramilaben Parmar is a small farmer having 0.2 ha of land under horticulture. She earns an income of Rs.42,000 by selling 127 Kg. of Mangoes, Roses worth Rs.29,200, cut roses worth Rs.1000, earnings from vermicompost of Rs.2,000, Rs.1,500 by selling garlic in her plot and Rs.1000 by selling vegetables. She also sold papaya worth Rs.6,500.

Village – Mandor

Sakuben Kochara is from village Mandor. From an area of 0.2 ha, she earns Rs.1,000 from mango [third year] and Rs.17,280 from vegetables. Her total income is around Rs.18,280.

Village – Kakarkhila

Vaediben Bhabhor is from village Kakarkhila. She is getting an income of Rs.3,525 from Mango, Rs.795 from lemon, Rs.2,100 from Aonla, Rs.1,500 from vermiculture, Rs 10,000 from vegetables and Rs 5,650 from selling of seasonal flowers. Thus, the total income comes to Rs 23,000.

Village – Kakarkhila

Sumiben Solanki is also from Kakarkhila. She earns an income of Rs.2,000 from Mango, Rs.1,200 from Lemon, and Rs.11,000 from selling vegetables. She has a total income of Rs.14,200.

Village – Mandor

Gendiben Bhabhor belongs to village Mandor. From an area of 0.35 ha, her income is Rs.7,000 from fruits, Rs.10,000 from flowers, Rs.15,000 from Rose and Lemon Plants and Rs.11,500 from vegetable selling. She has a total income of Rs. 42,500.

Rozam, a village of roses

Rozam is located along Dahod-Godhra Road. There are 56 farmers who have perennial flower crops including Rose, Mogra and Lily, and 27 farmers have regular links with the Dahod shopkeeper. About 13 women visit Dahod and market flowers by preparing garlands and selling loose flowers. They earn about Rs.120-Rs.150 daily.

There are 16 young boys are selling flowers at Hanumanji temple on the highway, earning a daily income of Rs 70-Rs 90. On an average, Rs 30,000 to Rs 36,000 from a plot of 0.10 ha is earned by each farmer of this village.

There are 52 women farmers cultivating Marigold and 22 women farmers cultivating Galyadiya - i.e. a total of 74 farmers, earning on an average Rs.7,000 to Rs.10,000 from 0.05 to 0.15 ha area, and Rs.15,000 to Rs.20,000 from 0.30 to 0.40 ha area.

Says S. Sharmistha Jagavat of Sadguru Trust (who works there with her husband Harinath Jagavat), “Farmers’ awareness and efforts to link market mechanism by joint efforts is key to this success.”

Farmers of Dolvan of Vyara – Surat District

- Dolvan region of Vyara taluka covers approximately 30 villages populated by tribal farmers growing **Nagli**- Hill millet or rice. Their income from these crops was average.
- With the initiative of the district administration, they began growing okra (lady’s finger) in 2004-05 at the village Pati. This was followed up in other villages like Panchol, Pithadara, Kandha, Karanjkhed, Besania, Kakadva, Vadjakhan, Padamdungari, Chunavadi, Kumbhia, Vankla, Antapur, Palasia, Pipalvada, Dhangdhar, Takiamba, Bardipada, etc. This led to a gradual improvement in their living standards.
- This area is non-irrigated. Land is rocky with low fertility. The construction of community well in Pati provided irrigation facilities. This resulted in increased agricultural activities during winter. Because okra was successfully grown by a few farmers, the others were encouraged to cultivate the same crop with better technology and inputs.

- The community well, built at a cost of Rs 29.74 lakh, triggered this revolution leading to more such facilities being created for irrigation over 532 hectares for 600 farmers, at a total cost of Rs 176 lakh over the past last three years.
- The increased irrigation facility helped them to get the micro credit from Bank of Baroda, Dolvan branch, which was used to form about 120 women's Self Help Groups, that grow and market the vegetables.
- The benefit of the different scheme besides community well and lift irrigation are supported by the District Panchayat. Individual wells, electric motors, engine oil, check-dams, seed-kits, and kits of pesticides were provided under existing schemes to help farmers grow this crop. The seed farm of the District Panchayat organised a demonstration plot on how to grow okra and also developed improved seeds, and guided farmers under the National Horticulture Mission scheme. Seed farms also grow improved varieties of paddy, sugarcane, gram and maize seeds that are sold through primary agriculture societies. This results in increased profit for all seed farms.
- Market facilities need to match increased production. The Dolvan market yard provided adequate support to okra cultivators, resulting in increased production and good prices. 'Gramhaat' was set up at Dolvan village to help farmers in grading and sorting the okra crop. Better price and good quality led to Desai Cold Storage and contract farming deals with three dealers from Nasik covering approximately 500 hectares. This has given extra boost to the farmers. The vermicompost production for organic farming and better yield is practiced and to support this District Panchayat has come out with vermicompost bed to BPL families in different villages and is also canvassing for use of vermicompost for growing organic products.
- Usually okra is grown as a Kharif crop, but farmers in the Dolvan region grow it in winter as a second crop.
- The Farmers' Training Centre, Vyara and Krushi Vigyan Kendra train farmers to grow okra and use modern agricultural technology.

As of November 2006, the okra revolution covers 2000 hectares of area with Myhco-10/hy.okra-152 seeds are sown. According to an estimate of the District Development Officer, Surat, income from sale is expected to touch Rs 30 crore with net profits amounting to around 20 crore. This revolution took two years to come about, and already, one farmer has his own 'pucca' house, while 11 others own motorcycles in the village where the revolution started – Pati.

- Since the demand of good quality vegetables like okra is ever increasing, the initiative makes good economic sense, and is sustainable as well.
- The above change has been triggered by initiative of District Development Officer-Surat, Shri. Sonwane. He initiated this project and followed up on its extension and

market network. He says, “This is a most satisfying experience in my career. This has direct impact on poor small and marginal farmers whose income has been more than doubled in a short span of two years”

This is yet another example of “reaching out to poor tribal farmers at their doorstep”. This involved changing of cropping pattern to high yield and better value horticulture crop. All the three stories confirm that farmers are willing to change, adapt and grow. What they need is attention and support by integration of existing net-work of Institution and schemes and a determined will to help them.

CONCLUSION

Observations on farmers are divided into two parts: one, which are based on NSSO report, and the other based on success stories of farmers of backward areas of Gujarat. The following observations are on the summary of NSSO report: (based year 2000)

- Even after 50 years of development, the extension administration supported by network of Agriculture Universities and its Research Centers and its extension network, there are gaps in providing basic information to farmers. This is reflected in the data on state of Gujarat and national level figures. In case of Gujarat, there is a low rate of literacy in women, low use of bio-fertilizers, **poor access to modern technology and high ratio of farmers who are in debt. There has been a significant improvement in few areas like male literacy, registration with cooperative organizations, use of fertilizer, seeds and pesticides and information about modern technology.** However, even in this there are serious gaps - i.e. 30% – 40% farmers are yet to be covered.
- This reflects very poorly on development administration and in particular the agriculture administration, for not reaching out to farmers at their doorstep. In fact, for providing these services, no extra budget is required.
- There is a need to have a major debate on findings of NSSO and pose this as a challenge of development. Each state **has geared up** its administrative network for who is required to work for allocated tasks. The management for integrated agriculture development with focus on poor farmers by introduction of “Krishi Mahotsav” to meet this challenge has been successful. Even Gujarat will have to maintain the tempo of Krishi Mahotsav on a long-term basis.

The second part of chapter deals with success stories of farmers in three backward and remote tribal areas, namely Dahod, Chhota Udepur and Vyara. What it reveals is very significant and highly satisfying.

- With cooperation of voluntary agencies, district administrations, farmers have gained significantly. Their income levels have almost doubled in a short time. It also shows

how integration exists between NGO, Government and farmers. It must be realized that the examples has been taken a comprehensive approach at village level with focus on individual families. They have conducted baseline survey of such farmers before the programme was launched and have later monitored the progress.

- The women farmers have been major beneficiaries.
- An integrated approach in agriculture with supply of quality inputs and scientific, soil and water management has led to rapid growth and has changed the scene.
- Dahod is in process of becoming one of the prosperous horticulture areas in the years to come - it will be like Kheda and Anand which most prosperous district of State.
- This proves that farmers are receptive to new ideas and are willing to adopt new crop practices in a scientific manner. Even illiterate farmers can achieve remarkable achievements. What is needed is the determination to do this and, coordination with voluntary agencies and focused approach at the farmers' doorstep.
- These examples are of poor farmers of backward regions. The progressive farmers are doing much better. They have taken a business approach. The farmers led by Shri Narsi Patel of Chandrola village of Gandhinagar have managed their farms, with seven farmers together clubbing 50 hectares of land by high tech agriculture. Their profit is Rs 1.0 crore per annum. There are many other such examples, all over Gujarat.

The fact to be recognized is that even after 50 years in our country, the administration has not reached out to all farmers. There are farmers who are left out of gains of development not due to lack of schemes or budget. It is equally true, that whenever administration has made efforts – taken cooperation of voluntary agencies - even the poorest of farmers' families have grown. Noteworthy initiatives are taken up by District Officers like Collectors and district Development Officers, who have begun pushing for development under new management approaches. Collectors like Shri Rasik Varsani (at Kheda) Shri Dharagay Dwivedi (at Surendranagar), Mamata & Sanjeev Varma at – Dahod and others like them have played a remarkable role.

Voluntary agencies in Gujarat are also playing a remarkable role. There are number of other organizations like SEWA (Self Employed Women Association), Aga Khan Trust, BAIF (Bhartia Agro Industry Foundation) and like. But ultimately, the challenge lies with the State and the district administration and Agricultural Universities.

6. MICRO LEVEL PLANNING

Agriculture is the main economic activity in rural areas of our country. So, a continuous growth in agriculture is essential to maintaining a sustainable and rapid economic growth. The individual farmer has a key role to play. He makes his own decisions about what crop to grow, what kind of seed to use, and what and how much fertilizer to use. He also decides which pesticides to use, its quantity and frequency. However, the individual farmer is by and large not highly educated nor is he knowledgeable about modern developments, including the market price of his produce. Many a times, there is a wide disparity between two neighboring farmers in the same village in terms of crop productivity - one gets higher income due to proper planning and the other is left out as he has no access to information. Agriculture extension is therefore important to remove this anomaly.

The National Extension Programme was introduced in the early '50s, with the objective of leading farmers towards better productivity, using the latest technology. This was followed by 'Benor System', which was introduced in the latter part of '60s, involving the training of village level workers [VLWs]. A VLW was required to visit farmers in their villages and help them gain access to new methods and technology. Even after their training, VLWs received updated information at regular intervals. Generally, a progressive person was identified as a contact farmer, who was trained by the VLW, and an important link under this system. He was then expected to transfer his knowledge to the other farmers. This programme was followed by the Integrated Rural Development Programme (IRDP), wherein small and marginal farmers were identified and provided subsidies to obtain modern inputs.

Initially, this was a success, but from the '90s, its benefits decreased due to the following reasons:

1. The Directorates of Agriculture lost command over VLWs who were placed under Taluka Development Officer.
2. The VLW became multi-functional under the IRDP.
3. IRDP was initially focused on small and marginal farmers, but over a period of time, it moved away from farmers and agriculture activity.

Against this backdrop, it was realized that the extension system to farmers, although very crucial, had lost its grip. The disparity among farmers, is growing in terms of returns from the development process, with those having some access to technology doing better. This is the outcome of the developmental process, where a segment of population or area is often left out while others move ahead.

In Gujarat, a series of measures were taken for strengthening agricultural activity, beginning 2001. These included making agriculture sustainable with the objective of doubling farmers' incomes farmers within a five-year period.

1. **Water Conservation:** The State Government undertook the task of constructing more than 60,000 check-dams. In addition, it also instituted a village pond programme and another aimed at cleaning canals. This was backed by individual farm ponds and the propagation of drip irrigation. The objective was to conserve as much water as possible, providing assured irrigation for sustainable agriculture.
2. **Soil Health Card:** The introduction of Soil Health Card was a significant step, since it provides details about fertility and how to supplement it with an appropriate use of fertilizer. The farmer requires these details on a continuous basis. He should also be given proper advice about the kind and quantity of fertilizer he needs, as well as alternative crops, based on the soil analysis of his land. This is discussed in greater detail later. So far, 10,00,000 farmers have been given these cards. They will be given to each individual farmer.
3. **Credit:** The third important step was to mobilize bank credit to enhance investment in agriculture under Kisan Credit Card system.
4. **Micro Level Planning:** The last and most important step was the introduction of micro level planning for farmers. This has been introduced in a systematic manner, beginning with reorganization in Directorate of Agriculture and Agricultural University. The activities of Agricultural Universities' Extension Team and Research Team and those of the Directorate of Agriculture were integrated. This led to District level Senior Scientists being appointed, for the first time, to assist the District level Agricultural Committee in preparing a District Plan. While Taluka level Scientists were assigned to prepare Taluka Plans, District Agriculture Officers and VLWs are responsible for village level plans. They are also to prepare plans for individual farmers. This was the beginning of a new extension approach which envisaged the preparation of a micro-level plan for both seasons for individual farmers based on scientific analysis.

Manual: A detailed guiding manual was also prepared and distributed. Junior Scientists and Agriculture Officers came together to prepare the Taluka Plan, Village Plan and finally Individual Farmer's Plan. These were linked with the soil health card. It provided a broad agricultural status of the taluka/village, along with data pertaining to soil, average prices of agriculture production over the last five years and rainfall data based on last 20 years. The detailed manual provides guidelines on how to prepare local level plans and make them available to farmers. Apart from providing general details, it also included detailed taluka and village centric information, dealing specifically with:

- [a] Which are the crops which can be taken based on soil, rainfall and water analysis.
- [b] Out of this which crop has better yield and/or higher price to enable farmers to take proper decision.
- [c] The market price data average prices of last five years are incorporated to understand which crop has what market price.

The plan is general, but specific for Kharif and Rabi season. It is to be prepared locally.

This new extension approach in Gujarat is different from the conventional approach, in that it is based on strong, direct village level contacts with the farmer. It was implemented in all the 18,000 villages under the Krishi Mahotsav.

The effective implementation of the micro-level plan will lead agriculture to greater stability, higher yields, better market prices and a continuous increase in farm income. But this needs strong administrative will and actual monitoring on a day-to-day basis – otherwise such schemes remain on paper. The most significant part of the plan is the use of science in analyzing soil health and providing prescription to individual farmer. This is described in greater detail below:

SOIL HEALTH CARD PROJECT

Government of Gujarat decided to take up the Rs 10 subsidy available under the Central Sector Scheme to fund the issuing of soil health cards to farmers. In December 2003, it was decided to provide 5 lakh soil health cards to farmers every year, thus covering all farmers within five years. Initial results were as under:

- Ø Soil health analysis provided clue to health of farm and its strength and weakness in terms of different chemical ingredients.
- Ø It enabled one to prescribe the required dose of chemical and organic fertilizer to bring about maximum productivity, as opposed to the ad hoc method previously used. Most often, this led to fertilizers being recommended in excess, or not as required. Scientific analysis helped farmers make balanced use of fertilizer, bringing about reduction in costs. The farmer became aware of what was lacking in his soil and how to make it more productive.
- Ø The same data helped in deciding an alternative cropping pattern, based on the fertility of the land.
- Ø The farmer was given a printed card, bearing details of his soil analysis and recommended dose of fertilizer.

The initiative showed tremendous results the following year – farmers who followed this advice benefited in terms of cost reduction and could choose better value crops. Farmers who had not been using fertilizers, started using it. Low value crops like jowar and bajra got replaced by cotton as soil was capable of growing it. Farmers welcomed this, and demanded that this programme be implemented quickly. Fertilizer companies joined hands with the Agriculture Department, in these efforts and took up testing of soil samples in laboratories.

Encouraged by this, it was decided to use more scientific methods as well as E-governance to complete the preparation of cards rapidly. It also decided to make them more comprehensive by adding data on average rainfall, soil moisture, and average price of important crops to help farmers decide which crops to grow. The strategy adopted is summarized below.

The New Perspective

It was perceived that the farmers could benefit economically by having access to agricultural related information and latest technological innovations. Experts in the field would guide them

at their own villages/gram panchayats, without their having to travel to the district. It was felt that IT could help provide a more intimate scientist–extension workers–farmers’ linkage, in addition to traditional extension services.

It was decided to launch a unique IT enabled initiative, the main objectives of which were:

- Better crop production
- Direct and timely advice/guidance to the individual farmers regarding fertilizer usage and alternate cropping pattern he could take up
- Direct involvement of agricultural scientists to bridge the gap between actual and potential production
- Better utilization of knowledge and research through the dissemination of information using various avenues of Information Technology
- Providing Soil Health Card to each farmer about his land’s condition and cropping practices to be followed through the year
- Double farmers’ income

Consulting Engineering Services (I) Pvt. Ltd. (CES), which was awarded the tender, was entrusted with the task of developing an IT Model to deliver this, through Gujarat State Wide Area Network (GSWAN).

Approval

The project aimed at scientifically creating, developing and generating a database on various aspects of farming practices for each crop grown. This involved analyzing and studying the soil of the farmers’ land and coupling it with the Moisture Availability Index (MAI). This information was to be disseminated to each farmer in the state, through the printed Soil Health Card.

To achieve the goal of linking farmers with scientific research, CES was asked to develop and design a web-based bilingual system in English and Gujarati. The software would collate, store, and analyze the data from farmers/villages, and also secondary sources. The information would be provided on optimal cropping pattern along with farm practices for all the cropping seasons.

The information is to flow from farmers/villages to Central Data Centre/ information technology centers and vice versa. These are located at the Anand Agriculture University with sub data centres at Junagadh, Navsari and Sardar Krishinagar Dantiwada Agriculture University. Information is to be made available to the farmers by using a variety of media:

- a) One time printed cards
- b) On a continuous basis through websites of the four Agricultural universities and the Agriculture Department’s website.
- c) On a help-line and through videoconference

Methodology

The primary aim of the SHC Project is to raise the economic standard of farmers, which is directly linked to the increase in crop production. Production can be increased by proper selection of crops, using hybrid seeds, judicious use of chemical and organic fertilizers, weed control, water management, crop conservation, post harvest technology, agro-processing and marketing. Factors such as Hybrid seeds, fertilizers, etc. require extensive scientific study and can only be determined by a long term study based on inputs of:

- Soil analysis
- Water analysis
- Soil profile
- Rainfall data of various districts and regions of Gujarat






Important factors for planning ideal crop production and increasing profitability in agriculture:

- Soil health analysis of land in all villages with at least 10 samples from each village
- Collection and archiving of rainfall data for all villages/ talukas / districts of past 30 years
- Accurate scientific recommendations based on MAI (Moisture Availability Index)
- Crop based recommendation on fertilizer use and pesticide applications (computerized and ready for use)
- Use of pesticide and fertilizer based on soil analysis and agricultural pest/ infection history of the respective area
- Economic analysis of wholesale market price(s) and cost of cultivation of last 10 years and modelling them for current market conditions.

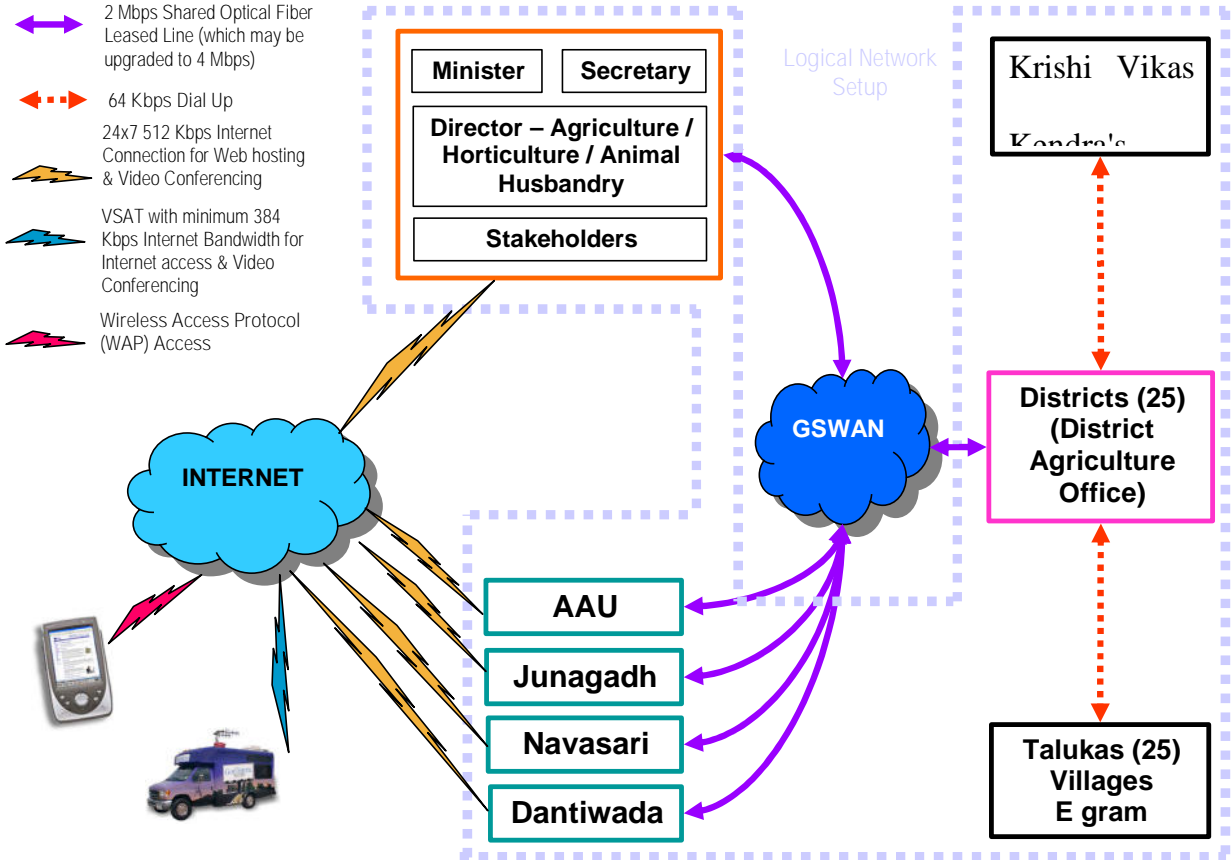
A bilingual web-based software solution in English and Gujarati is the most appropriate medium for disseminating the information to the end user - i.e. the farmer to achieve the objectives of the project. The solution has the capability to

- Capture and record the farmer's detailed information along with the analysis of soil from his farms
- Capture and record rainfall data for the state for past 15 years
- Compute Moisture Availability Index (MAI) status
- Generate recommendation to the farmer on cropping patterns
- Provide scientific recommendations for optimum crop production to increase profitability.

LEGENDS

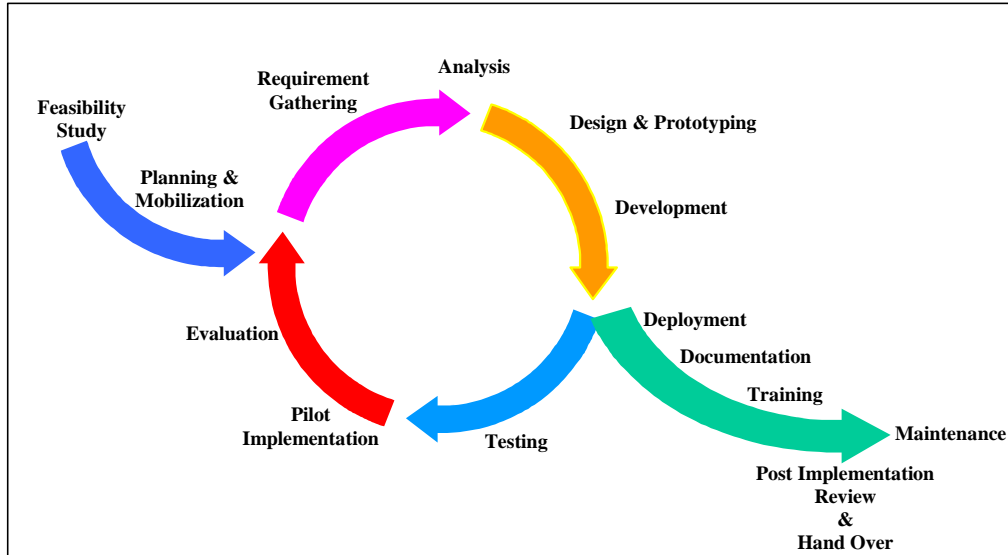
-  2 Mbps Shared Optical Fiber Leased Line (which may be upgraded to 4 Mbps)
-  64 Kbps Dial Up
-  24x7 512 Kbps Internet Connection for Web hosting & Video Conferencing
-  VSAT with minimum 384 Kbps Internet Bandwidth for Internet access & Video Conferencing
-  Wireless Access Protocol (WAP) Access

How information will flow



Software Development Methodology

For developing and delivering a robust solution, CES team is following the 'Iterative Model' or 'Unified Software Development Process framework'. This SDLC model, repeats over a series of cycles making up the life of a system, as depicted in the Figure below:



The advantages of Iterative Life Cycle are:

- It is planned and managed
- It is predictable
- It accommodates changes in requirements with less disruption
- It is based on evolving executable prototypes, not on documents
- It involves the user/customer throughout the process
- It is risk driven

For developing the web-based bilingual system, CES adopted the latest development platforms available at the time they were awarded the project, obliterating the need to upgrade the product for the next 5-6 years.

Operating System	: Microsoft Windows 2003
Database Platform	: Microsoft SQL Server 2000
Development Technology	: Microsoft .NET Framework 1.2
Development Suite	: Microsoft Visual Studio 2003
3 rd Party Software	: CDAC – GIST technology with Unicode character sets.
Mail Server	: Microsoft Exchange Server 2000
Web Server	: Microsoft IIS 6.0

Limitations

What initially, began with Soil Health Cards based on soil analysis, with more than 10 lakh cards being distributed between 2003-05, is now turning into a scientific system to analyze all data related to land, climate and market. Web-related development is underway to make it quickly and regularly available. Gujarat is the only state to have adopted this approach, and farmers have benefited immensely, a key factor to preventing crop failure and more farmers picking up value based cropping pattern.

The system would need an alert monitoring and coordination on regular basis by Secretary of Agriculture, State Government with Director of Agriculture, Agricultural Universities, their entire field network and labs. If lethargy creeps in at any level, the system may fail to deliver desired results.

The data is available in Gujarati. The VLW is now responsible to individual farmers to provide them the printed cards. The farmers have access free call service for queries or guidance they want on this analysis. The call Centre is connected with Director of Agriculture, Director of Animal Husbandry and for individual region for agriculture universities. It is envisaged that the data will be updated from time to time. It is available to all farmers – both in printed form of a card and also on the website of the Agriculture Department.

NGOs like Shroff Foundation Trust & Vivekand Research Training Institute have set up their own Kisan Mitra Centre where this service is available, in addition to Government efforts. This use of science and technology for selection of crops, is a very bold step taken by Gujarat.

A farmer can access details of his land through the IT network. This is leading to an increased computer literacy. With it being available in Gujarati, there will be more desire to learn it. This change in crop management will make agriculture sustainable for all farmers and will become a stable platform for rapid growth.

7. KRISHI MAHOTSAV – 2005

A new approach to eradicate poverty in rural area and double the income of farmers

INTEGRATED APPROACH TO AGRICULTURE DEVELOPMENT

The Krishi Mahotsav–2005 was an intensive and unique month-long programme organized by the State Government to facilitate agricultural planning and overall rural development with the objective of doubling state agricultural income in the next five years in a sustainable manner. The event spanned the whole of rural Gujarat, covering 18,600 villages.

The Krishi Mahotsav, the mega agricultural festival, was conducted between the months of May and June, just before the onset of the monsoon. Its primary aim was to promote a scientific approach to farming and thus increase income. The programme was conceived such that it could provide immediate benefits to the individual farmer, as he began preparations for the Kharif season.

The ‘Kisan Rath’, a mobile agricultural exhibition, was used to launch the event and to reach out to farmers through personal contact in their own villages. The rath was a mobile unit, usually a tractor or a trailer truck, was mounted with display panels, audio-video systems, loud speakers, agriculture-related material, and demonstration units. A team of agriculture, horticulture, animal husbandry and co-operation department’s officers as well as agricultural scientists travelled with this unit to every village. The rath was flagged off from different locations, and coursed through each village in the state over a period of one month.

The Krishi Mahotsav provided guidance and demonstration of the best farming practices directly to the farmers and also encouraged organic farming. As the Mahotsav created a forum for the convergence of all major stakeholders, it facilitated availability of critical agricultural inputs such as fertilizers, seeds, pesticides and credit at the farmers’ doorstep. Above all, it was a new approach in agricultural extension.

WHY THE CAMPAIGN WAS SPECIAL

Convergence of Efforts

There are already several programmes and schemes initiated by the government and the private sector that are targeted at farmers and the rural population. While efforts and activities for improving the farming sector have been ongoing, these have been carried out by different agencies independently. With the departmental and private efforts operating in isolation, there was a distinct need for a synergistic approach, with a convergence of activities, making the programmes more accessible to farmers, thus maximizing impact.

As agricultural activities are seasonal, coordinated efforts are imperative. The absence of timely delivery of services and efforts translate into loss of investments, resources and opportunities for farmers. Examples of the need for coordination of efforts include availability of timely credit for the next cropping season; creating linkages between production and marketing of agricultural yield; and the facilitation of transferring lab research to field level implementation.

The Krishi Mahotsav pioneered an unprecedented convergence of activities from different departments and agencies. All the key stakeholders, including government personnel, credit and input agencies, agricultural scientists, NGOs, and people's representatives such as MLAs, MPs and cooperatives were brought together at the village level.

Highlights

- Approximately one lakh government employees, from Secretaries to the Talati level worked together continually for the planning, implementation and monitoring of the program.
- There was an active involvement of diverse stakeholders such as elected representatives, elected bodies, people's organizations, NGOs, government officers, agricultural scientists, and successful farmers and the communities, women and children in the program.
- For the synergistic implementation and coordination of activities, as many as 18 Government Departments joined forces. The nodal Department responsible for Krishi Mahotsav was Agriculture and Cooperation Department. The other Departments involved in the program were:
 - Water Resources Department
 - Panchayat and Rural Housing Department
 - Rural Development Department
 - Cottage Industries Department
 - Revenue Department
 - Finance Department
 - Information Department
 - Forest Department
 - Health Department
 - Science and Technology
 - Education Department
 - Tribal Development Department
 - Water Supplies Department
 - Roads and Buildings Department and Petrochemicals

- Energy Department
- Sardar Sarovar Narmada Nigam Limited

Micro Level Planning

The planning and recommendations for agriculture were hitherto done on the basis of the eight agro-climatic zones that the State has been divided into. There had been no attempt to promote agricultural planning on a scientific basis at the farmer and village level. Aspects such as soil type, market forces, rainfall pattern were not given their due importance by the farmers while determining their cropping patterns.

“However, with the Krishi Mahotsav,” says Dr. Snerashia, Director of Agriculture, “micro level planning was done for every block and village. Village level plans were prepared on a scientific basis by expert teams and were handed over to the village for future reference during the month-long activities.”

The micro plan that was prepared was based on:

- Soil Health Cards
- Average market price of crops for the last five years
- Average rainfall pattern in the last 20 years

The employees and officials of various departments associated with the activities were assigned village-wise duty well in advance.

The village-wise individual beneficiaries for the distribution of kit in respect of agriculture, horticulture and animal husbandry as well Shram yogi were selected in Gram Sabha and the village-wise details thereof were made available on intranet.

Transfer of Knowledge from Lab to Land

Krishi Mahotsav, for the first time in Gujarat, brought the agricultural scientists together and sent them to transfer their findings in the lab to farmland itself. Since the time of the country’s Independence, there had been little attempt to promote a dialogue between the scientists and the farmers. This initiative was a direct effort to make scientific practices and techniques available to the farmers. It also ensured that agricultural research and findings did not remain unimplemented and confined to the lab, limited to a handful of people.

Agricultural scientists affiliated to the four Agricultural Universities in the state, were allocated different districts, and traveled along with the Krishi Rath to interact with the farmers. Since they personally visited the villages, they could directly answer the queries of the farmers.

Information and guidance on topics such as soil health, crop rotation, organic farming, use of fertilizers and pesticides; irrigation; and marketing were imparted directly to as many as 6.5 lakh farmers, while more than 27 lakh farmers participated at the village level Kisan Shibirs.

“The agricultural scientists provided a lot of information on the use of fertilizers and pesticides to the people of Bhurkhiya village, Amreli. The district farmers especially were eager to learn more about farming practices for cotton and groundnut crops,” Shri [Bhupendrasinhji Chudasanma, Minister for Agriculture](#).

Dr. B. K. Kikani, Vice Chancellor, Junagadh Agricultural University, said, “The Agricultural University and the scientists accepted the challenge posed by the massive Krishi Mahotsav as ‘Dharmkarya’ (religious responsibility). The scientists worked relentlessly day and night for bringing agricultural technology and innovations to the door step of the farmers.”

Professor Ahlawat, Vice Chancellor, Navsari Agricultural University, said, “I was surprised to know that young farmers were aware of the new varieties of seeds but had not accepted them since they did not meet local conditions. Such interactions provided important feedback for our research work.”

“The advice on agriculture that was provided by the agricultural scientists revealed to us the superior quality of organic fertilizers over chemical fertilizers. With the knowledge that was shared with us, it looks like our income is poised to increase within only two years instead of the estimated five years,” says Mittaldas Narbhoi Maharaj, a farmer in Sisodra village, Bharuch district.

KISAN SABHAS

Once the raths arrived at the village, a 3-4 hour halt was organized at a village common ground and a Kisan Sabha was organized. Mandap and other facilities were set up in advance to facilitate interactions between the people and the rath team.

During the halt, the rath was used as a mobile exhibition van with posters and pamphlets on display. Region-specific panels on farming were displayed and the halt was also used to impart information on better farming practices based on the observations made by the scientists and the rath team for each village. A drip irrigation system was mounted on each rath and its benefits were demonstrated and explained at each village. A screening of film was also done and this generated a lot of interest at the local level.

Highlights

- 229 raths covered the entire state and visited each village in Gujarat.
- A multi-disciplinary team of scientists, horticulturists, agriculturists and veterinary doctors was present along with each rath.

- The raths were a major vehicle for directly promoting scientific farming and improved agricultural practices to the individual farmers within their own villages.

Bharatbhai Doshi and Mukeshbhai Gathani visited Adaas village with the Kisan Rath. In their interaction with the farmers, they encouraged the people to grow other varieties of plants instead of the conventional crops. They particularly focused on cultivating herbal plants and explained their medicinal value in the market. The duo had even brought with them seeds of black isabgol that had been imported from Brazil to emphasize the benefits of growing herbal varieties.

ACTIVITIES UNDERTAKEN DURING THE CAMPAIGN

Soil Sampling and Soil Health Cards

Under the Krishi Mahotsav, the concept of crop planning with the help of the knowledge of soil health was promoted extensively to encourage scientific farming practices. An expert group was formed for undertaking soil sample collection and analysis. A scientist was allotted to each block and senior scientists were responsible at the district level.

Soil samples from individual farm were collected by village level workers. They were tested in Soil Testing Laboratories of Director of Agriculture, Gujarat State Fertilizer & Chemicals limited, Gujarat Narmada Valley Fertilizers Company Limited, IFFECO and KRIBHCO.

Soil Health Cards giving a summary of soil type, appropriate soil nutrients, land productivity, soil salinity, etc were issued to individual farmers. These provided vital information for increasing soil productivity at lower costs. Plans on the basis of soil health at the levels of blocks, villages and farmers were prepared by a team of agricultural scientists, agricultural officers, horticultural officers and village extension staff.

The Soil Health Cards facilitated crop planning in a significant way. Farmers introduced new and more lucrative crop and horticultural plant varieties to replace and complement traditionally grown varieties such as Mango, Chikoo and Banana.

New Crops Introduced on the basis of Soil Health

- Agricultural crops such as castor, soybean, tuber and sunflower
- Horticultural varieties such as cashew, grape, and fig
- Spices such as fennel, mint, ajwain and turmeric
- Medicinal and aromatic crops such as palmers, patchouli, aloe vera, ashwagandha, mentha, white oats and lemon grass.

Highlights

- In the last three years, 2.05 lakh farmers had been issued Soil Health Cards.
- During the Krishi Mahotsav, 9.52 lakh farmers were issued Soil Health Cards, while the Cards for a further 5.45 lakh farmers are being processed.

Kisan Credit Cards

Kisan Credit Cards were issued for providing quick and timely credit to farmers for agriculture, horticulture and animal husbandry. While commercial and co-operative banks issue credit cards to farmers, this government intervention has expedited the process to a large extent for availing credit facility up to Rs.50,000 under the scheme.

Highlights

- This process was expedited with the support of NABARD and about 1.57 lakh credit cards were issued within a span of one month.

Kisan Shibirs

Kisan Shibirs, supported by APMC, were held at the block level in every district and each shibir was typically attended by around 1000-2000 farmers. Agricultural scientists conducted the camps and used them as a forum to generate awareness and information on agricultural techniques and related information.

Highlights

- 27,97,157 people participated in the Kisan Shibirs.
- 700 agricultural scientists from Agricultural Universities were involved in Krishi Mahotsav and imparted guidance to the farmers.

Distribution of Kits

The Krishi Mahotsav provided for the distribution of agricultural, horticultural and animal husbandry kits worth up to Rs.1500 each to the 15 poorest families in every village. The kits contained inputs such as seeds, saplings, fertilizers, pesticides and sprayers. Prior to the event, several meetings and consultations with the communities were held in the Gram Sambas for identifying the beneficiaries. By the time the Mahotsav was launched, the list of beneficiaries in each village was finalized and the distribution of kits was subsequently done. The monitoring system that was designed for the event enabled the government to keep track not only of the number of kits that were being distributed, but also enabled it to know the names and details of the beneficiaries who had received the kits.

Highlights

- Agricultural Kits: 90,770 kits distributed
- Horticultural Kits: 90,592 kits distributed
- Animal Husbandry Kits: 90,533 kits distributed

Water Conservation Works

The planning for the construction of water conservation structures and their location was done prior to the month of May during the village Gram Sabha meetings. According to the program, it was planned that at least one water harvesting structure would be erected in every village. The construction of boribandhs, check dams and village ponds was done by dovetailing with the existing schemes of Rural Development Department.

Muktaben Vekariya, a woman from Navagam village, Junagadh, said, “All the women were present when the Kisan Rath arrived. We received a lot of scientific information about farming practices, especially related to the use of chemical fertilizers and seeds. The Krishi Mahotsav also brought with it measures water conservation and as a result farm ponds, check dams and boribandhs have been constructed in our village.”

Highlights

- Khet Talavadi 31,036 constructed
- Boribandhs 21,316 constructed
- Check Dams 8506 constructed
- Village Ponds 2976 constructed

Promotion of Drip Irrigation Systems

The demonstration of the drip irrigation systems evoked considerable interest in certain villages. The farmers became convinced about its merits and many even filed their applications for drip irrigation systems during the Rath itself. While addressing a Video Conference, a task which the Chief Minister, Shri Narendra Modi performed daily for the duration of a month to maintain direct contact with the farmers and follow the progress of the program, he said, “Drip irrigation is crucial for assured agriculture and will benefit more than one crop when our water resources are limited. You must realize that water is a scarce commodity which should be used with care and only as per requirements.”

Highlights

- 22,374 applications were received for the drip irrigation scheme.

The Gujarat Green Revolution Company with investment of Rs. 1500 crore has been setup for Drip and Sprinkler Irrigation. Subsidy up to Rs. 50,000 per ha. is given to farmers.

E-gram project

The E-Gram Project was made operational in selected villages during the Krishi Mahotsav. Under the Project, the villages are to receive computer facilities. Prior to the event, the wiring and other preparatory works were undertaken and during the campaign month, computers were installed in the selected villages. There is a plan in the pipeline to educate all young farmers under 40 years of age in the use and application of computers.

Principal Secretary, Panchayat Department, Shri Varesh Sinha said, "The farmers in the E-gram villages have expressed their desire to have access to Internet facilities and want to send e-mails for their queries."

Highlights

- 5574 villages received computer facilities and became E-gram.

Scientific Basis for Location Identification of Small-Scale Water Harvesting Structures

The Bhaskaracharya Institute for Space Applications and Geo-Informatics (BISAG) is a state-level nodal agency that facilitates the use of spatial and geo-spatial technologies for developmental and planning activities pertaining to agriculture, land and water resource management, wasteland/watershed development, forestry, disaster management, infrastructure and education. It provides a host of services in the fields of satellite communication, remote sensing, geographic information system, software development, education, research and training.

In the existing scenario, the prioritisation, planning and identification of locations for water harvesting structures in the villages is largely done without the use of scientific data. BISAG, under Krishi Mahotsav, has developed a CD, 'Khetarhi Upagrah Sudhi' (from soil to satellite), for providing village-wise satellite images to identify the probable locations for water harvesting structures such as check dams, nala plugs and boribandhs. The villages have been classified according to their blocks and districts, and once a particular village is selected, data on the existing situation of the village; the extent of irrigation; the availability of water resources; the water situation and the land utilization pattern, etc is provided to the user. The CD has been intended to serve as a planning tool for implementing agencies.

Highlights

- The Khetarathi Upagraha Sudhi (soil to satellite) CD prepared by BISAG was distributed to all E-Gram villages for facilitating the planning of the construction of water harvesting structures.

Animal Vaccination

Since animal husbandry is essential to the farming system and ensures the survival of families during the lean agricultural periods, this activity cannot be neglected. An intensive animal vaccination program was launched at the Krishi Mahotsav in all the villages, so as to focus on disease management and the rearing of healthy livestock. In addition to vaccinating the livestock, animal health camps were also held.

Highlights

- 43.86 lakh animals were vaccinated in the State.

Milk Cooperative Societies

Gujarat has a wide network of village milk cooperatives for the collection and marketing of milk. In areas where there are no such facilities, the communities are unable to use dairying activities effectively as an income generating activity. During the Mahotsav, support and assistance was provided for setting up of milk cooperatives in those villages where none existed.

Highlights

- 678 milk co-operative societies were established, of which 305 were exclusively run by women.

The people of Jhalapur village did not have a milk cooperative society and routinely had to visit the neighboring village to deposit the collected milk. With the Krishi Mahotsav, a women's milk cooperative society was set up. Manjulaben, a resident of this village says, "We save a lot of time since we are not compelled to travel to sell our milk. Establishing this cooperative society means a great deal to us, because it now allows our women to self reliant and earn additional income. It has provided us an opportunity to manage business by ourselves and has also given us scope to invest in more productive livestock."

Changing of Land Tenures and Entry Certification

In order to enable the farmers to freely transfer and sell their land, the process for converting the land tenure from the new tenure to the old tenure was expedited as the old

tenure system permits for easy transfer of land. The process for changing the land tenures was initiated during the Gram Sabha meetings that preceded the event, and a premium as fixed by the government was charged for the change in tenures.

Entry certification by the Revenue Department was also expedited for updating land records pertaining to loans, transfers and mortgages.

Highlights

- 51,977 applications processed for changing land tenures from the new tenure to the old tenure.
- 20,849 farmers covered for entry certification by the Revenue Department.

Other Individual and Community-Oriented Schemes

There are already a large number of programs and schemes available for the farmers and the rural communities from the different government Departments. Some of the major Departments that cater to the rural population include the Rural Development Department, Tribal Development Department, Cottage Industries Department and the Regional Electricity Boards. During the Krishi Mahotsav, efforts to make these schemes accessible to the people were intensified. Consultations and awareness generation programs were conducted during the Gram Sabhas and interactions prior to the event. The Jyotigram Yojana of Regional Electricity Boards received considerable thrust and a large number of villages received three-phase power supply for all the 24 hours every day. The provision of electricity will play a significant role in boosting agricultural productivity and income as irrigation, food processing and other income generating activities become possible.

Highlights

- Jyotigram Yojana: 593 villages covered and received 24-hours, three-phase power supply.
- Gokul Gram Yojana: 3540 works were undertaken for village benefits across the state.
- Tirth Gram: 324 villages were declared as 'Tirth Gram' and received Rs. 1 lakh, as no police cases were reported and these villages were free from internal conflict.
- Panchvati Scheme: 718 villages were covered for the planting of trees and installing of benches.
- Bankable Yojana: 23,138 applications were received under this scheme of the Cottage Industries Department.

- Vadi Yojana: Applications from 15,172 tribal members were received for this Scheme, floated by the Tribal Development Department. Under the scheme, beneficiaries will receive saplings of horticultural varieties and subsidies for fertilizers and pesticides for horticultural plants.
- Self Help Groups: 7842 Self Help Groups were formed in the villages.
- Credit Co-Operative Societies: 478 new credit cooperative societies were established.
- Drinking Water Supply: Kits for the repair of hand pumps along with training were provided to sarpanches of villages to keep drinking water safe and clean in every village.
- Bio-Fuel: Social Forestry officials distributed seeds of Jatropha, a bio-fuel plant, to farmers.

While speaking of bio-fuel, Virambhai Bariya of Morjar village in Porbandar says, “The distribution of Jatropha seeds and its use by the farmers will help solve the fuel problem of the state.” The Jatropha seeds are utilized for the extraction of oil, which can then be used as a substitute for diesel.

Sarojben Mahida is a widow with two children from Mogar village. She works as a wage laborer. Her face lights up when asked about the Krishi Mahotsav. She says, “Because of the efforts and the interest that went into reaching out to us, it has been possible for me to get loans and subsidies from the bank and government. I needed this money to procure a house and a buffalo, so that my life becomes better.”

Planning, Implementation and Monitoring of the Programme Preparatory Activities

- Ø Creation of implementation committees
- Ø Establishing Intranet-Based Computerized Monitoring System
- Ø Holding of Gram Sabhas
- Ø Identification of locations where activities would be conducted
- Ø Meetings with different organizations such as NGOs, finance institutions and other private stakeholders
- Ø Allocation and arrangement of financial resources
- Ø Collection of application forms from the beneficiaries
- Ø Organizing of the Kisan Rath

- Ø Publication of IEC material
- Ø Encouragement of people's participation

Implementation Arrangements

Four major committees were set up for planning, implementation and monitoring purposes.

1. **District level Management Committee:** The chairman of this committee was the minister in charge for the district. Each Secretary of the different government departments was assigned one district for overseeing the activities in that district and was member of this committee. The basic functions of the committee were to formulate an outline of the programme; ensure the participation of NGOs and other allied agencies; plan and review the program, its implementation and achievements.
2. **District Implementation Committee:** The District Collector and District Development Officer (DDO) were the chairperson and the co-chairperson, respectively. This committee was responsible for the implementation of the program; allocation of personnel and responsibilities; coordination of the program; ensuring people's participation; obtaining administrative and technical approval of the government schemes; allotment of funds; and detailed planning of the Kisan Rath. The members of this committee met on a weekly basis.
3. **Block Level Management Committee:** The Deputy Collector or the Deputy DDO was the chairperson. This committee was directly responsible for the implementation of the event. The members had to meet every week and had to make preliminary arrangements in consultation with the sarpanch, talatis, gram sevaks and NGOs.
4. **Village Implementation Committee:** The talati or the gram sevak was in charge of this committee. The members of the committee comprised the key members of the village including the primary school principal, health workers, sarpanch, and representatives from the milk cooperatives, farmers and NGOs.
5. Chief Minister Shri Narendra Modi who has motivating force behind this held a series of cabinet level meeting to firm up the programme. He also held daily village-level meetings via video conferencing covering two villages at a time, for the duration of the programme.

Intranet-Based Computerized Monitoring System

Online and daily monitoring of the activities was instrumental in allowing for quick corrective action, as a result unnecessary deviations and delays were avoided. An intranet-based computerized system was established by the National Informatics Center

(NIC) for the regular monitoring of the range of activities that were being conducted before and during the event.

There were 36 physical activities for which targets had been set and their monitoring was done at three levels – state, district and block. The district and block level reports were entered online and their comparative performance was available on the website. At the state level, progress was monitored on a day-to-day basis by the Chief Minister, Secretaries of Departments, Heads of Departments and Ministers.

IMPACT OF KRISHI MAHOTSAV

A study was conducted after Krishi Mahotsav - 2005 by Junagadh Agriculture University to assess the impact of direct involvement of scientists at village level with farmers. Dr. Kuchadia, Director, Research and Extension, Junagadh Agriculture University Junagadh, says “As per this study, as per the results of the study show new awareness among farmers. Due to direct counselling by agricultural scientists, a number of farmers increased their crop production by adopting new agricultural technologies and minimizing production cost by balancing the use of agricultural inputs like seeds, chemical fertilizers, etc. They also understood the importance of value addition in agriculture through grading, packaging and marketing. The sample survey was conducted in the districts of Saurashtra. Further details are given below.

Crop variety

Majority (46%) of the farmers were growing GG-2 groundnut variety before, but they started cultivation of improved variety GG-20 and GG-7 after guidance by scientists. In case of cotton, most of the farmers (88%) began to grow BT cotton. 53% farmers stated that they adopted recommended varieties of castor, bajra and sesame.

Mix cropping/Inter culturing

Majority of the farmers (60%) did not adopt mixed cropping/intercropping. They understood the importance of this during interaction with scientists and started the cultivation of mixed cropping/intercropping such as Groundnut + Cotton, Cotton + Sesame, Cotton + Green gram, Sesame + Green gram, Groundnut + Castor, Groundnut + Sesame, etc. They got better returns as compared to the traditional system.

Soil analysis

Most farmers (70%) became aware of the benefits of soil testing. From among those who had their soil analyzed, about 70% applied chemical fertilizers as per recommendations. This decreased the production cost. Moreover, majority of the farmers confessed that haphazard use of chemical fertilizers decreased by 50%, whereas 20% of them said that it was decreased by 25%.

Organic & bio-fertilizer

Only 20% of the farmers were using organic and bio-fertilizers. Based on guidance during the Krishi Mahotsav, the use of organic and bio-fertilizers increased considerably. They understood the importance of these inputs in preserving and improving the soil quality

and enhancing productivity.

Irrigation

Most farmers did not know the critical stages of irrigation for different crops. About 91% of them gained an understanding of this, after contact with the scientists. Moreover, 48% of the farmers were giving excess irrigation to cotton, castor, bajra and onion. They realized the value of water and irrigated the crops as required, further reducing costs.

Plant protection measures

74% of the farmers used pesticides as per their own knowledge and did not follow proper dosage and methods. They learned the right dosage and method of application at appropriate stages of crop and as many as 80% of the farmers agreed that the correct information had brought down the usage of pesticides by 75%.

Bio-control

Most of the farmers (75%) were not aware of bio-control technologies and they stated that due to use of bio-control method, 25-50% cost on plant protection was reduced. Most of the farmers (90%) agreed that they became aware of bio-control technologies and started using these technologies at the right stage of the crop.

Grading, packing and marketing of agricultural commodities

Most of the farmers (68%) were not aware about value addition practices like grading and packing; they realized the importance of value addition practices in agricultural commodities and started grading, packing and proper marketing.

On the whole, the approach of involving scientists at grass root level was beneficial. It was also realized that district and taluka level agricultural functionaries were not updated with latest information. Their interaction with farmers was limited. And this has confined them to only subsidy schemes. Their knowledge about latest technologies that were available was very poor. These functionaries also benefited due to the presence of scientists. The experience was revealing. They came to know practical difficulties which farmers face in the field and followed their recommendation. They came to know reasons for gaps between optimum production and actual production. This became a learning process for scientists also. It also increased inter departmental relation between university and field staff. It was also realized that farmers of Gujarat are alert and willing to learn and experiment, but they need to be given correct knowledge at village level.

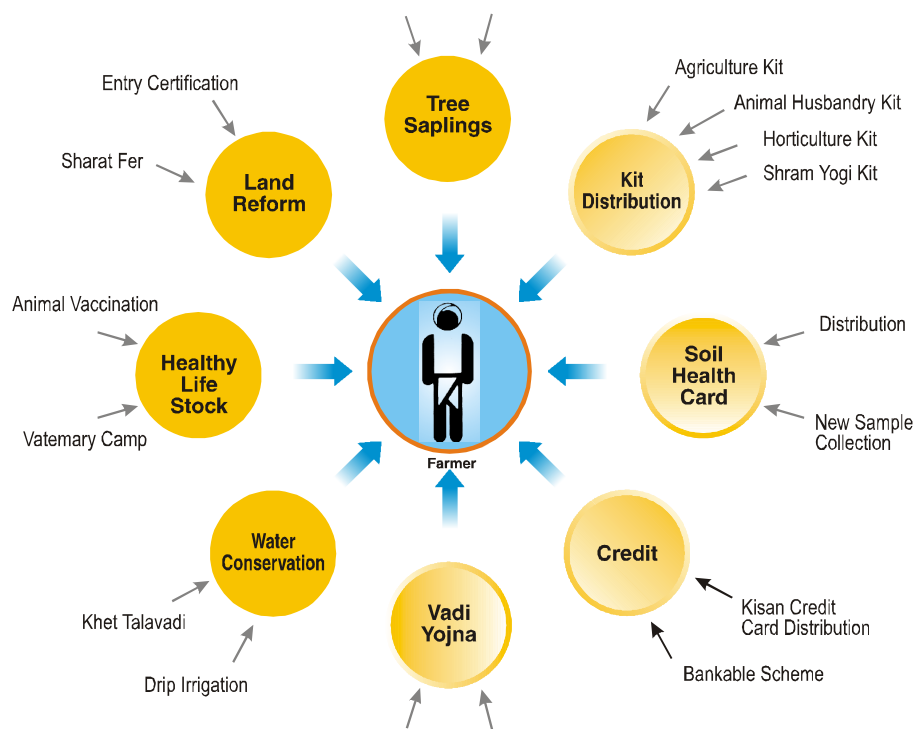
CONCLUSION

In conclusion, Gujarat extension approach with integrated agricultural development, paves way for rapid economic development in rural areas with focus on the farmer. In fact, the focus of farmer was lost in last several years and it had its impact in productivity of agriculture. The Gujarat approach is based on pragmatic realization that sustainable agriculture is key to economic stability and rapid growth. It has multi-dimensional and multiplier effect on creation of new jobs and demand for goods. It provides varied

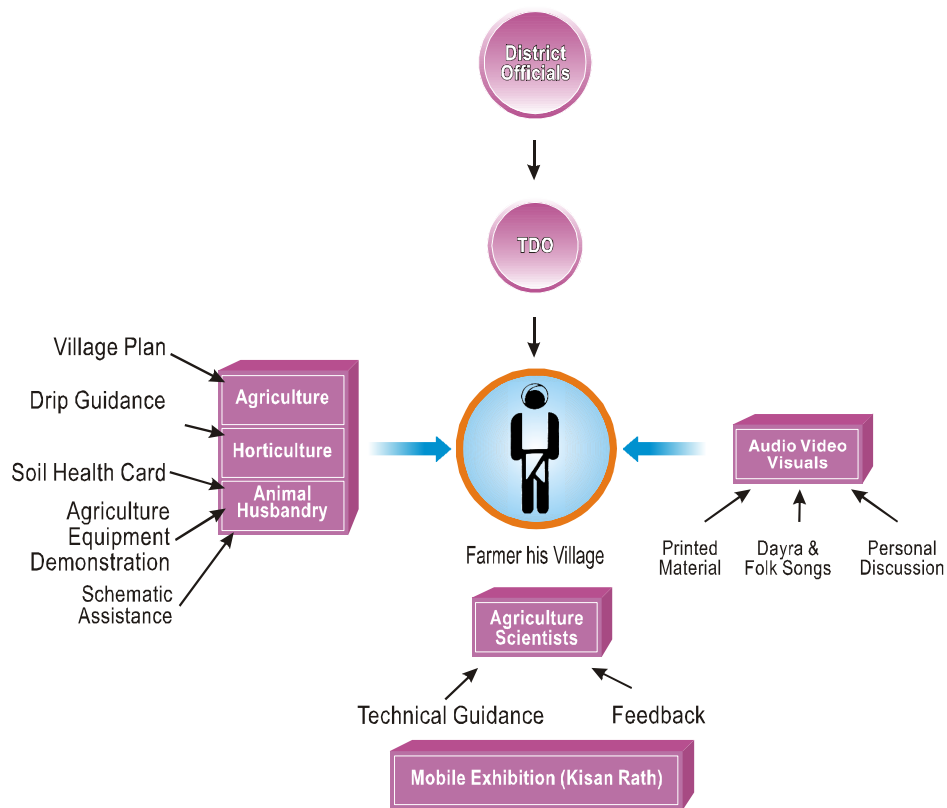
opportunities to rural youth for seizing self and wage employment. The vision of doubling the income of farmer has, therefore, in reality, a wider ramification for rapid economic growth of Gujarat as a whole. This is collaborated by study of Unpaged Agriculture University, which shows tangible results and gain to farmers at end of Kharif Season. That is the real management objective behind this new pattern of management in agriculture.

NEW EXTENSION APPROACH - 1

FARMERS AS CENTRE POINT

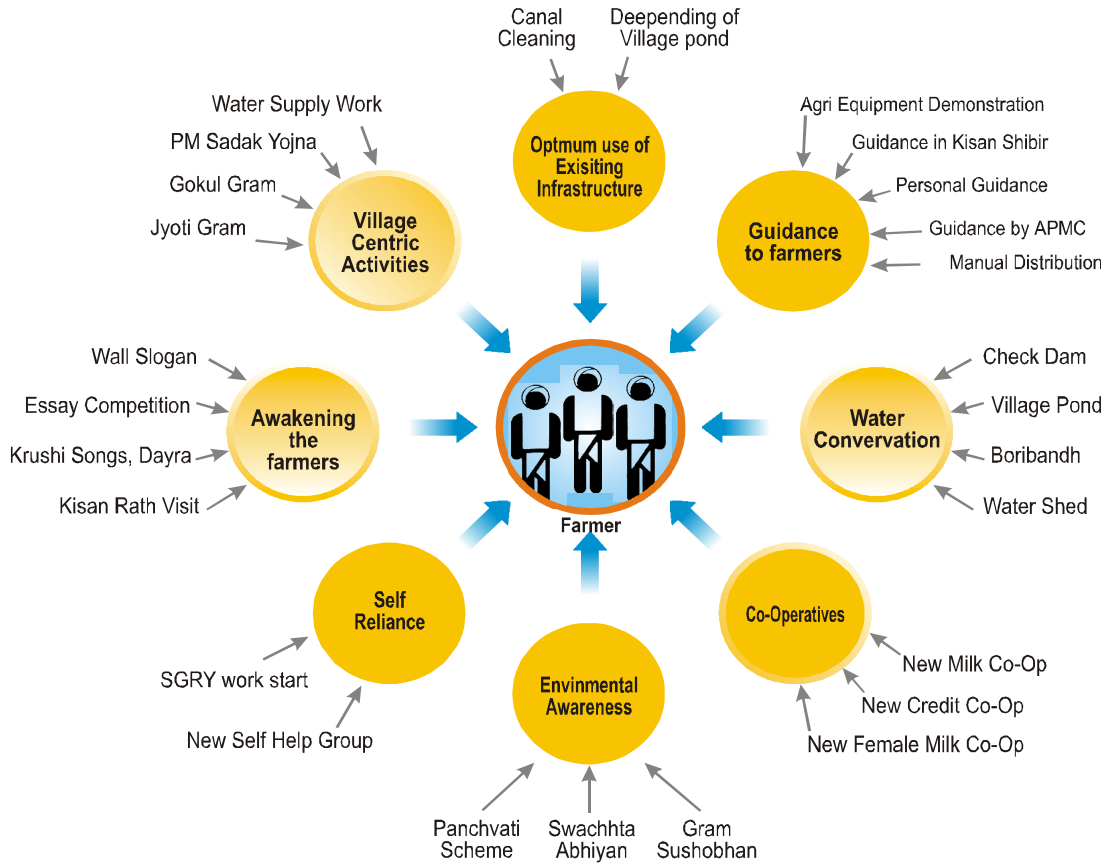


NEW EXTENSION APPROACH - 2 EXTENSION



NEW EXTENSION APPROACH - 3

FARMERS IN CENTRE



CHAPTER 8: WHAT AILS OUR AGRICULTURE?

On July 2, 2006, Prime Minister of India, Dr Manmohan Singh, along with Minister of Agriculture of Union of India, Shri Sharad Pawar, visited the Vidarbha region of Maharashtra. The purpose of the visit was to meet farmers and to see their condition at the village level. Reason? Farmers' suicides. More than 800 farmers committed suicide in three districts. In many cases, villagers had put up banners outside their villages proclaimed- "This village's entire land is for sale". Suicides continue despite the special assistance packages announced by the Union Government.

The situation is somewhat similar in other states like Andhra Pradesh, Karnataka and Kerala, with more than 8000 farmers having committed suicide between 2001-2006.

The problem is not that there is no growth in agriculture – the country has attained self-sufficiency on the food front. Agricultural produce to the tune of Rs 30,000 crore has been exported. The average growth of GDP of last three years was 7% to 8%. The economy seemed to be booming and India began to be recognized internationally as a strong economy. Poverty in rural areas declined from 36% in 1993-94 to 20% year 2000-01. The total production of food grains reached 204.6 million tonnes in 2004-05.

All these were significant achievements, yet farmers continue to commit suicide in the new millennium.

In the later part of '70s, Government of India announced a special programme for small and marginal farmers and agricultural labourers. Initially, this was called SFDA programme. Later on, in the beginning of '80s, it was called Integrated Rural Development Programme. This aimed at reducing poverty in rural areas by assisting a minimum of 600 BPL families in a block per year. It provided a range of subsidies on income generation assets for farmers and agricultural labourers. It had a strong link with nationalized bank, which provided 70% credit while balance came by way of subsidy. No margin money investment was required as poor farmers did not have any. This was based on analyses done by Reserve Bank of India on debt profile of small and marginal farmers. It was also increasingly realized that the benefits of the green revolutions had not reached small and marginal farmers who are the majority among farm holders. In fact, there were riots in a number of places in the country by peasants in rural areas of Andhra Pradesh, Maharashtra and Gujarat. Against that backdrop, SFDA and IRDP came into existence to reach out to small and marginal farmers in a focused manner. This programme worked effectively. The farmers started receiving individual attention. Their needs were identified and fulfilled and a number of small and marginal farmers rose above the poverty line. In the latter part of '90s, the focus of Rural Development Department of Government of India shifted from farmers to non-farmers, constituting Self Help Groups for individual credit needs for assets to group schemes. So, when development continued, a number of poor farmers who had been awaiting assistance got left out .

In my earlier book, *Mapping Development* (May, 2003), I have described in detail, how a country/province moves from one phase of development to another while moving upwards, and had analysed people/areas who are left out of this process despite overall growth. What I had mentioned was an analysis of people/areas who are left out of development process despite over all growth. There I have used the disabled, a group that has been left out, despite accounting for 5% of our population, as an illustration. I had suggested continuing to identify those being sidelined and focus especially on bringing the individual up.

Today, agriculture is facing a similar situation, with focus on small and marginal poor farmers being lost. While the country has progressed and is almost self-sufficient, there are still farmers who are poor and debt-ridden. They have not been provided guidance by Extension Administration on the viability of their crops. Neither do they have access to expensive new technology. Many try imitating successful farmers who have resources, knowledge and capacity to acquire modern inputs on capacity and fertility of their land and available water resources – both rain and underground resources. Since conditions differ, some of them fail and frustrated about their heavy debts, commit suicide.

The profile of Gujarat's and India's farmers provided in the earlier chapters and the abstract of the NSSO findings substantiates what I have said. It confirms the huge debt burden, the lack of knowledge, non-use of certified seeds, etc., bringing out the huge gap that exists within the agriculture sector. So, in the same village with similar soil conditions, with the same crop, one farmer succeeds and the other fails and commits suicide.

In fact, after years of development, there can be 100% achievement in at least some parameters of NSSO where extension administration has a role to play. Somehow, the administration has fallen short of expectations, despite the wide variety of modern communication techniques at its disposal. This should not have happened, but it has – the agriculture administration in our country has failed miserably when it comes to assisting of poor farmers.

It is against this background that experiences of Gujarat of last four years need to be seen.

Gujarat has achieved sustainable agricultural growth at an average of 11% per annum. Despite arid and semi-arid climatic conditions and uncertain monsoons the state has taken the lead in the country's agricultural sector, leaving behind states like Punjab. Gujarat's farmers do not commit suicide on account of crop failure, neither do they join group like Naxalites, after initial efforts to spread it in certain district like Dangs failed.

It is important to note that prior to year 2000, Gujarat's agricultural growth had been slow, with a number of years recording negative growth. Since then, however, the situation has changed with agriculture becoming stable and picking up momentum.

Some of the initiatives taken by Gujarat are mentioned below.

Water conservation

- § A massive programme of construction of check dams was taken up across the state with 60% subsidy – which has increased to 80%, later on. More than 60,000 check dams were constructed. In last 50 years, the number was less than 6000.
- § A programme of village ponds has taken up in villages where check dams were not feasible.
- § Narmada Canal and Mahi Canal were connected with Sabarmati River to make irrigation available.
- § A programme of construction of farm ponds on farmers' land was initiated.
- § In areas, where Narmada Canal was not feasible special scheme of irrigation – called Sujlam Suflam was launched.
- § All these water conservation measures are backed by drip irrigation scheme with 50% subsidy up to Rs.50000 per ha. and loan of 45%.

All of these put together had a good impact; agriculture became assured at least for one season and the added moisture was useful for growing grass or vegetable thereafter. Despite long dry spell in 2004-05 and heavy floods in 2005-06, agriculture continued to grow at a rapid rate.

New Extension Approach for Integrated Agriculture Development for removal of Poverty:

A series of measures were taken to bring farmers in the centre of his village for all activities related to them:

- § Scientists were moved to villages and farmers were to be assisted and guided at their doorstep.
- § Micro level agriculture production plan came into existence at the village level.
- § More than 12 lakh farmers were provided soil health cards with guidance on balanced use of fertilizer and possible alternative crops they can grow, based on scientific analysis and guidance by experts.
- § V.L.W moved back to agriculture extension from rural development work and were made responsible for village level plan and Soil Health Card Programme.
- § All departments that had anything to do with agriculture were brought together with a focus on farmers.
- § All functionaries of agriculture, horticulture, animal husbandry, irrigation, revenue, cooperation and scientists were brought together to work at village level with the objective of providing and meeting needs of farmers at door steps in an 18,000 villages, where the latest methods in pre-Kharif preparation were demonstrated to the farmers under Krishi Mahotsav in 2005-2006.
- § 15 poorest farmers in every village were provided with free kits consisting of certified seeds, fertilizer, pesticides and tool kit, covering 27,0000 poor farmers in all each year. Since this is to be repeated annually, all the poor farmers in the state will be covered under this scheme in five . In five years, it will cover all poor farmers below poverty line.

- § Each village has been provided a guide book on agriculture and horticulture crop-related issues. For issues not covered in the guide book, a toll free phone number has been popularised.
- § Market information is made available to farmers in the form of average price of important crops provided at taluka and village level under micro-level planning.
- § Agro infrastructure, including education, marketing and storage, credit and Agro-processing has been strengthened, and focus has sharpened on Animal Husbandry activities to provide additional income through all categories of animals and strengthen milk marketing through district co-operative unions and NDDB.

The poor tribal farmers of Dahod under Vadi scheme and of Chhota Udepur under watershed programme increased their income manifold and were not behind rich farmers. Women farmers did very well on the milk front. The example of Dhud Sagar Dairy in Mehsana region is worth noting. On average, the dairy here buys milk worth Rs. 3 crore per annum. There are villages with annual turnover of Rs.2-5 crore.

The impact has been phenomenal as described in earlier chapters, where even farmers of remote backward talukas got assistance.

All this became possible because there was political will and administrative desire and joint teamwork to reach out to all under new management concept of 'Krishi Mahostav'

Some of other areas, which need attention, are as under:

Wasteland: Managing natural resources to optimize their use can lead to expansion of agriculture. For instance, Gujarat has more than 25 lakh hectares of non-cultivable saline wasteland. The underground water in these regions is also saline. Though this land has been uncultivable for many years, modern technology could hold the key to this problem. Salinity resistant crops like date palm, Jatropha etc can be developed. Micro irrigation is for efficient and economical use of every drop of rainwater. So, the challenge is to develop these land resources. At approximately Rs 2 lakh per hectare, this technology is out of the reach of the average farmer. This is an area where participation by industry is essential. Private and public relationship can go a long way in utilizing such land resources and providing more employment and income.

Solar and wind energy: The other freely available resources that can be harnessed towards developing agriculture are solar and wind energy. Properly used, these can reduce cost of production thereby increasing income of farmers. Considerable work has been done but field application is limited. A massive effort is needed to reverse this trend.

Bio tech crops

Biotech crops are part of new technological innovations in agriculture. They reduce cost and/or add value, and/or increase productivity. USA, China, Brazil and a number of other countries have gone ahead and availed of the benefits of these crops. India should not lag behind. One reason is that they provide better productivity and reduction in cost and

therefore increase income of farmers. This is also illustrated by adoption of Bt cotton in Gujarat and increase in cotton production and productivity. At present, the mechanism of introducing such Bt crop is a long drawn out process. It is important to come out boldly and move with great speed. If this is not done, one major danger is that, other countries may start exporting to India at lower prices than what it produces. This can be detrimental for small and marginal farmers. This threat is a genuine one and policy makers should not take it lightly.

Agro processing and service sector

Another area that needs attention is the expansion of agro processing. Only 2-3% of fruits and vegetable produce are being processed now. Agro processing adds life and value to agriculture produce. Massive efforts are needed here. The industrial extension team should give it priority. It can develop young entrepreneurs from among farmers. These projects also require low investment. With proper bank-credit linkages, the rural scene can change rapidly. Along with this, there is a need to pay attention to the growing demand of services in rural wasteland.

Market infrastructure

Israel has shown a way to the world that even on a desert land, with low rainfall, prosperous agriculture and agro processing industry can be built up. In fact, geographical and agro-climatic situation in Gujarat, Rajasthan and Israel are the same. State like Gujarat can provide 100% requirement of country in crops like oil seeds and pulses, where today major imports are taking place. 'Israel technique', as it is known, is high-tech. It is based on soil and moisture conservation and continuous soil analyses to apply required nutrients. But crucial to success is the market strategy. Daily planeloads of products are sent to important capitals of Europe from Israel. The Israeli government provided great support in developing common brand for export of agricultural products and helped market efforts by setting up link centers. This is not difficult to replicate. India can develop its own market identity for range of goods. This has been done for milk and milk products under AMUL brand, but it did not extend to other agriculture produce. At present, there is under-cutting between the producers themselves, which is taken advantage of by importers.

There is a contradiction in agriculture marketing price. The Government of India provides price support in time of surplus production so that the price doesn't fall below cost of production. This is a negative measure. What is needed is an arrangement for marketing surplus produce within and outside country and setting up a strong mechanism in this regard.

Agriculture research institutes

Scientists of premier institute, the Indian Council of Agriculture Research (ICAR) must come out from their ivory tower. They must move to the village to understand real problems, understand why they the scientists have failed. ICAR has been mute spectator when Bt cottonseeds were sold at an exorbitant price by an MNC. It did not do anything

to develop Bt variety on its own despite culture-gel made available by Rockefeller Foundation, USA. ICAR needs to be hauled up and made accountable to farmers.

These are some areas where attention is needed.

For instance, in a Parliament statement on June 28 2006, Union Agriculture Minister Shri Sharad Pawar, acknowledged the rising number of farmers' suicides. He further mentioned that more than 800 farmers had committed suicide in the current year, a number that has been rising since 1995, with more than 10000 farmers committing suicide, in states like Andhra Pradesh, Karnataka, Kerala, Maharashtra and Punjab.

The NSSO report reveals that more than 40% farmers wish to give up farming and 48% of them are in debt. The debt ratio is very high in States like Andhra Pradesh – 82%, Tamil Nadu – 72%, Punjab – 65%, Kerala – 64% and Karnataka – 61%. The report does not have data on how many of them have taken loans from unauthorized private moneylenders, and have had to mortgage their land to them. However unofficial, that number would be very large.

The report further reveals that only 42% of the country's land under cultivation has assured irrigation facilities, leaving the remaining 58% dependent on a timely monsoon. These factors give rise to crop failure and subsequent helplessness of poor farmers to meet his debts and requirements of day-to-day living.

Perhaps, though, better suggestions and solutions are offered by our Hon. President Dr. A.P.J. Abdul Kalam in his book *India 2020 – A Vision for the New Millennium*, and Dr. M.S. Swaminathan in his reports on Farmers' Commission, *Serving Farmers – Saving Farmers*.

But I want to come back to Gujarat experience

The approach taken by Gujarat, the new extension approach for integrated agricultural development with focus on removal of poverty, is replicable. It does not involve extra budget or more resources, only a bold political initiative followed by solid efforts for implementation, as well as an institutional framework within the same apparatus of the Government. Farmer is brought to center stage and, approached in his own village.

This raises certain basic questions. Why could this not take place naturally? While the NSSO report was an eye opener, there was no debate at National or State level on it? Even now, 20% of the country's rural families fall below the poverty line, a majority of them, farmers.

This throws up other questions. Why was the Integrated Rural Development Programme (IRDP) allowed to lose sight of the individual approach and focus on small and marginal farmers? Why did the Ministry of Agriculture not protest? Why did it become a silent spectator and not evolve its own policy when the Rural Development Department abandoned the small and marginal farmers?

These questions need to be answered, otherwise there will be growth without equity, which is a dangerous phenomenon. Why? Because poverty and helplessness drive the youth and farmers to join groups like the Naxalites or Maoists.

“Naxalism”, explains Dr. K. L. Mahendra (Mainstream 21/05/05), “is not a new movement. Its ideological roots are in the Chinese revolution”. He says the Maoist movement of class, work and liberation came to India as well, but the spread of Naxalism in India is different. With roots in the tribal belt among economically backward families, Naxalism is a violent movement. People who turn to the movement, are often frustrated with the existing administrative system that does not reach out to them or provide equal assistance. They have also lost faith in agencies like the police and seek out alternative administrations.

There are also foreign interests that provide arms, money to encourage such un-rest, thus spreading terrorism by proxy.

There is a historical perspective also as mentioned earlier. In early seventies, after the Green Revolution started, agriculture grew rapidly but small and marginal farmers were left behind, resulting in social unrest and there were riots by peasants in several places. This in turn led to the initiation of Small Farmers’ Development Programme followed by the Integrated Rural Development Programme to focus on individual poor farmer and families of agricultural labourers. The same scenario of early seventies has is being repeated even after tremendous growth in the new millennium, but now, the poor farmers, do not believe in mere agitation or protest marches, adding to violent movements like Naxalism.

Therefore, it is on the rise in a large number of states. From Andhra Pradesh to Maharashtra from UP to Chattisgarh, Assam to Bihar and Jarkhand, Naxalism has covered a large part of our nation. Naxalites work in strong internal networks against national interest.

Is our political and administrative system aware of this? One side of the coin is suicide by farmers but the other side is revolt against the system and its destruction. Our democracy is at stake – this is the writing on the wall. Despite tremendous progress, we have serious problem. It is a ticking time-bomb, not merely a Law and Order problem. Having more to do with the economic front, it requires total involvement of district and block level administration to meet this challenge.

Coming back to the illustration of Gujarat Krishi Mahostav and its success story of even small farmers of tribal areas, it is the same administration - the talatis, V.L.Ws, Extension Officer, Irrigation engineer, the veterinary officer, the Taluka Development Officer, the Mamlatdar, the District Development Officer, Collector, departmental secretaries - which is delivering results, when they came out together from their barracks to work at village level. No extraordinary budget but solid support and extra efforts, more preciously joint efforts with detailed plan and its precise execution with strong result-oriented monitoring system. In fact, all these are part of normal administrative mechanism but

most often get lost once a scheme or programme is implemented. But the question is why have such experiences become only illustrative stories?

In *Mapping Development*, I had mentioned that the Chief of political executive, the Chief Minister and the Chief of Administration the Chief Secretary – if they work shoulder to shoulder, the goal of rapid growth is feasible. But when we look at the frustration of poor farmers – either suicide or wedded to Naxalism – there is something more to be analyzed – why the administration consistently rises to the occasion only to fall down when it comes to implementing routine tasks? It requires a great strength in leadership to understand this and tackle it.

The Chief Minister and Chief Secretary must ensure that development-related departments like Agriculture, Rural Development, Social Welfare etc are headed at the state level by Secretaries to Government with qualities like leadership, commitment to progress, geniality, sympathy for the down-trodden. They must also be able to take work from voluntary agencies and elected leaders and of course their own departments. Further, these posts are tenured, with officers being changed every three years, hence succession has to be carefully planned.

The Chief Minister and Chief Secretary must also ensure that negative, destructive or dumb officers are not made to lead such departments. Negative officers are most dangerous. They encourage corruption under disguise. They end up preventing or disrupting and blocking the development process, and instead of correcting and improving the system and nurturing joint efforts, they blame everybody and enjoy issuing notices. They think they are great. Sometime such officers are themselves highly corrupt and cover themselves with negative traits. Some politicians use such officers to settle individual scores, or when they want everybody to come to them to settle grievances or at their demand. The role of Chief Secretary is therefore crucial. And, since such negative officers are well known, they must be exposed rather than encouraged. Chief Secretary must rise to the occasion and not merely act as post-master, shuffling files and conducting meetings.

In recent times, Chief Secretaries in many states are not acting as Chief Executives or Chief Operative Officers but merely as paper pushers behind tables. They have lost dynamism to guide the District Collector, District Development Officers or District Superintendents of Police to recognize the problem of farmers' suicides. They do not visit districts nor ask their departmental secretaries to do so, leading to a complete lack of attention to remote districts with many poor families. They do not even bother to select carefully the officers to be posted as Collector or DSP, with such places becoming posts of punishment where departments dump their garbage (of officers) there. These places are easy prey for Naxalites movement, which is now well coordinated and carefully planned and executed.

Can Government of India not formulate broad guidelines for who should be fit to become Chief Secretary? Is there any way to make Chief Secretary accountable for suicide by farmers or spread of Naxalism? Seshan, the erstwhile Chief Election Commissioner (see *Mapping Development* chapter) did it. He made both Director General of Police and Chief Secretary accountable for upholding Law and Law and Order situation, making the election process clean and smooth, reversing a situation wherein the elections across the country was in the midst of being hijacked by goons.

This was only 15 years ago and the same environment continues today. Why cannot this be repeated for small farmers in agriculture development? It may be useful to know how many Chief Secretaries have visited villages where farmers have committed suicide.

Although very important, industrial development does not always require competent officers. The industry, their associations and PROs have skills needed to get their work done from any official team whether negative, positive or dumb. Farmers and those involved in animal husbandry, however, have neither skills nor PROs. They even do not have means to visit taluka head quarter, leave aside state capital. Hence they must be assisted at their doorstep at village level. This is actually the task of the State administration. If the district taluka and village administration do only those jobs laid down in their chart, poor families would automatically be taken of, and perhaps they would be included in the development process.

In our overall experience of development, we have achieved many results that we can be proud of – that has to be continued. The success of IRDP programme is an illustration. It is the administration which can push growth with equity. New packages are not needed each time, only a bold will for effective programme implementation.

In summary, it can be stated that agriculture is still the primary, most important sector in the Indian Economy, providing employment to a majority of the population even fifty years on. While majority of farmers were poor, the poverty ratio has come down to 25% in 2000 and is on the decline. Yet, there are many poor families who are left out, with some states still registering negative growth in this sector. This results in farmers' suicides and rapidly expanding Naxalism, which are both challenges to the basic democracy and guiding principles of our Constitution.

A new dimension and overall reconstruction of policies at national level and state level is needed with focused approach on poor farmers and scientific agriculture. This can be briefly summed up as under:

- § There is need to have focused approach and assistance to individual farmers below poverty line. The SFDA approach needs to be revived.
- § There is need to have integrated agriculture development approach:
First integrate all departments within this sector instead of current compartmentalization with focus on scientific agriculture and poor families.
This is to be followed by coordinating work related to farmers of all other departments, about 18 of which have anything and everything to do with agriculture sector development.
Finally bring all private players connected with servicing to agriculture and farmers to join hands along with both public and cooperative institutions.
- § Move scientists from their barracks to become part of village level approach to understand the varied problems facing farmers and guide them at their doorsteps.
- § Make state level agricultural universities and Indian Council of Agriculture accountable to farmers. Re-structure ICAR and make it modern and make it understand grassroots issues.

- § Introduce scientific farming based on Soil Health analysis backed by soil moisture analysis and market price information of crop with quality input of seeds to guide farmers at door step so that they grow crops which they can sustain, depending on their individual farm condition.
- § Introduce to micro-level planning for agriculture for every village backed by micro-finance from Banks. Take drastic action against moneylenders disguised as grocers and the like, who are grabbing land from poor farmers.
- § Make collector and district development officers, leaders of village level team to carry out Kharif and Rabi campaign every year with entire district team of all other departments related to agriculture and farmers.
- § Increase awareness of water conservation. Construct as many as possible check dams, boribands, farm ponds and village ponds based on micro plan based on satellite imagery of Indian Space Application - do not allow a drop of water wasted whether it is in dry land of drought prone area, or flood prone areas. Water conservation and its economical use will make agriculture assured at least for one season.
- § Increase public investment in strengthening agriculture infrastructure of Research and Education, Marketing, Agro-processing, Storage and Dairy and Fisheries development, irrigation and like. Attract private investment by modifying old laws and by introducing contract production (known as contract farms).
- § Pay attention to development of B.T. crops and obtain technology before farmers get wiped out in global competition.
- § Make the Chief Secretary of State personally accountable for poor farmers and for all poor families. He must become conscious that he is responsible for death of every farmer due to suicide or for that matter expansion of Naxalism in any area of his state.
- § Select a dynamic person to head agriculture sector as Agriculture Secretary at state level in overall charge of all areas related agriculture to include Agriculture, Animal husbandry, Fisheries, Cooperation and Irrigation (minor). He must be held responsible for advancement scientific agriculture based on soil health analysis and focused assistance to individual poor farmer family.
- § Similarly districts, which are backward and have higher poverty ratio may be allocated highly competent and motivated Officers as District Collector, District Development Officer and District Superintendent of Police. In fact, instead of such districts becoming a place for punishment postings, they should be declared as places for stepping up for better placement for categories of District Officers.
- § In the guiding principles of Constitution of India, the underlying current has and as it remains today, is welfare of all its people with particular attention to people who are downtrodden, economically weak and poor.

Development is an ongoing process. India has made tremendous progress and has achieved many heights. The country has met many expectations of guiding principles of the Constitution. It is on a high platform today than from the day it started its journey in 1950. Agriculture has been today and in years to come will be key to removal of poverty in rural areas and overall rural development and it will produce enough food to meet the requirement of people of our country in the new millennium. It was and will be playing a

very significant role in years to come in pushing overall development progress, rapid growth and making India a super power in economic development.

Annexure 1: Changes and advantages in farming system

Sr. No	Practices	Use of Inputs Before Krishi Mahotsav	Use of Inputs After Krishi Mahotsav	Per cent	Benefits in Rs./ha	Average benefit in different districts of Saurashtra in Rs. (crore)
1	2	3	4	5	6	7
1	Ariety	A.1 G'nut GG-2 A 2 Seed rate 210 to 230/ha B Hybrid cotton C Castor, Bajri, Til Local Varieties.	G'nut GG-20 & GG-7 Seed rate 100 to 120 Kg/ha Bt cotton As per recommendations of Agri. Uni.	46 50 88 53	630 3500 1000 670 Til Bajri Others	94.5 262.0 100.0 9.5 16.8 4.0 <hr/> 029.8
	Mixed and inter crop	Sowing of mixed and inter crop according to their own knowledge	As per recommendations G'nut + Cotton, Cotton + Til, Cotton + Green gram , Pegion pea + Green Gram, + Castor, Groundnut + Pegion pea etc were adopted as inter and relay become crop	60	460	9.20
3	Soil testing	They did not know about the advantages of soil testing	They aware about the soil testing, tested their soil samples and applied fertilizers as per recommendation	70	350	42.00
	Total					537.50

Source: Director, Research and Extension, Junagadh Agricultural University, Gujarat.

Annexure- 2: Changes and advantages in fertilizer use

Sr. No.	Practices	Before Krishi Mahotsav	After Krishi Mahotsav	per cent	Benefits in Rs./ha.	Average benefit in different districts of Saurashtra in Rs. (crore)
1	2	3	4	5	6	7
1	Fertilizers application and efficient use of fertilizers	As per their own knowledge.	They used fertilizers as per recommendation. Decreased in cost of cultivation, it will be beneficial	70	850	238.00
2	Use of manure and bio fertilizers	Limited use of manures and fertilizers	as long time effect. They are aware about the benefits of manures and biofertilisers, so they are using more manures and biofertilisers	80	800	85.00

Source: Director, Research and Extension, Junagadh Agricultural University, Gujarat.

Annexure 3: Changes in irrigation system

Sr. No.	Practices	Before Krishi Mahotsav	After Krishi Mahostav	per cent	Benefits in Rs./ha.	Average benefit in different districts of Saurashtra in Rs. (crore)
1	2	3	4	5	6	7
1	Knowledge about Irrigation	No irrigation at critical stage of crops due to lack of knowledge	Followed irrigation at critical stage of crops	91	690	2.80
2	No.of Irrigation	More irrigation to cotton, castor, bajra, onion etc.	Provided irrigations to the crops according to their requirements	48	410	<u>0.40</u> <u>32</u>

Source: Director, Research and Extension, Junagadh Agricultural University, Gujarat.

Annexure 4: Changes in plant protection methods

Sr. No.	Practices	Before Krishi Mahostav	After Krishi Mahostav	per cent	Benefits in Rs./ha.	Average benefit in different districts of Saurashtra in Rs. (crore)			
1	2	3	4	5	6	7			
1	Pl. protection	Used plant protection methods as per their own knowledge.	Followed plant protection methods according to recommendation.	74	760	60.8			
2	Change in use of plant protection chemicals	As per their knowledge.	A 75 per cent reduction in use of pesticides.	80	300	30.0			
			B 50 per cent reduction in use of pesticide	8	800	16.00			
			C 25 per cent reduction in use of pesticides.	12	1000	50.00			
3	Bio-control system	Lacking in knowledge regarding bio-control	Followed bio-control system after gaining knowledge	90	3200	<table border="0"> <tr> <td>64.00</td> </tr> <tr> <td><hr/></td> </tr> <tr> <td>160.00</td> </tr> </table>	64.00	<hr/>	160.00
64.00									
<hr/>									
160.00									

Source: Director, Research and Extension, Junagadh Agricultural University, Gujarat.

Annexure 5: Changes in value addition

Sr. No.	Practices	Before Krishi Mahostav	After Krishi Mahostav	per cent	Benefits in Rs./ha.	Average benefit in different districts of Saurashtra in Rs. (crore)
1	2	3	4	5	6	7
1	Grading, Packing & Marketing of Agro-Commodities	Not following value addition practices like processing, grading, packaging etc.	Started processing, grading, packing, marketing practices.	68	300	3.00
Total						Rs. 1026.70

Source: Director, Research and Extension, Junagadh Agricultural University, Gujarat.

Annexure 6: Details regarding season wise and year wise premium & claim amount

Year	Season	Premium Amount	Claim Amount (Rs.)
1999	Rabi/Summer Total	4946121	24977069.54
1999 Total		4946121	24977069.54
2000	Kharif Total	627049180	7688478258
2000	Rabi/Summer Total	7802158	27052839.44
2000 Total		634851338	7715531098
2001	Kharif Total	734735950.5	1485536796
2001	Rabi/Summer Total	6254896	5150229.13
2001 Total		740990846.5	1490687026
2002	Kharif Total	875686238.1	7259579196
2002	Rabi/Summer Total	8440848.03	23863855.27
2002 Total		884127086.1	7283443051
2003	Kharif Total	985287081.3	56855812.08
2003	Rabi/Summer Total	8455974.93	206729.26
2003 Total		993743056.2	57062541.34
2004	Kharif Total	1084569155	30598759.98
2004 Total		1084569155	30598759.98
	Grand Total	434,32,27602	1660,22,99,546

Annexure 7: Statement showing import of agricultural products during 2002-03, 2003-04 and 2004-05 (till Sept. 04)

Qty. '000' tonnes, Value Rs. in Thousand.

Item	200-2003		2003-04		April 04 – Sep.04(p)	
	Qty	Value	Qty	Value	Qty	Value
Wheat	0	0	0.45	2400	0	
Rice	0.87	10900	0.04	1700	0.02	200
Other Cereals	1.12	6700	1.59	19400	0.66	5900
Cereal Preparation	51.74	1167900	32.62	857600	24.94	558000
Pulses	1992.85	27370900	1701.16	22511500	600.72	8278000
Milk & Cream	1.14	95500	11.43	894700	1.35	67300
Cashew Nuts	402.98	12362400	442.59	13718000	309.56	10323000
Fruits & Nuts (Excl. cashew nuts)	0	6417600	0	8155000	0	3244800
Spices	121.28	5864400	147.69	5819200	49.39	2539200
Sugar	41.43	328300	50.65	428300	211.20	2555100
Oil seeds	0	114900	0	138900	0	117500
Vegetable oils fixed edible	4365.03	87796400	5294.56	116744100	2221.1	56254300
Vegetable & Animal fats	1.45	116100	1.76	126800	0.72	66000
Cotton raw & waste	233.85	12376100	252.98	15700100	84.06	4872600
Jute, raw	143.22	1347700	48.5	496200	0	0
Tea	23.64	1253000	10.76	645200	17.05	779000
Wood & wood products	0	19459900	0	32684500	0	19575900
Total agricultural imports		176088700		218943600		109236800
Country's total imports		297205870		3539756100		217421970
% share in total import		0		0		0
		5.92		6.19		5.02

Source: DGCI & S

P : Provisional

**Annexure 8: Statement showing export of agricultural products during 2002-03,
2003-04 and 2004-05 (till Sept. 04)**

Qty. '000' tonnes, Value Rs. in Thousand.

Item	200-2003		2003-04		April 04 – Sep.04(p)	
	Qty	Value	Qty	Value	Qty	Value
Pulses	148.08	3450200	150.99	3225700	118.86	2611900
Rice Basmati	708.79	20584700	770.76	19909200	487.01	11653900
Rice (other than Basmati)	4259.08	37727700	2601.47	21421600	872.09	9121700
Wheat	3671.25	17598700	4022.70	23493700	1403.2	10047500
Other Cereals	106.08	910600	570.30	3759100	846.98	5630700
Tea	182.86	16520700	184.30	15945500	88.01	8979800
Coffee	184.87	9939800	180.44	10822200	87.74	5051400
Tobacco unmgd.	100.47	7335200	121.71	8015000	65.03	4589600
Tobacco mgd.	0	2893700		2893100		1405500
Dairy and poultry products	0	3585200		4073700		2316900
Floriculture products	0	1807700		2207900		998900
Spices	277.01	16554900	246.98	15256000	168.98	10113300
Cashewnut shell liquid	6.14	85600	2.53	31900	0.86	4100
Cashew	129.43	20529400	100.30	16969900	54.12	10896400
Sesame & Niger seed	154.44	4508800	208.33	7432200	54.74	2142700
Ground nut	67.89	178300	176.93	5440900	66.75	1945300
Guargum Meal	111.94	4866400	119.33	50 3720 0	50.52	2321600
Oil meals	1776.13	14873500	3172.31	32716300	1369.7	13586600
Castor oil	177.68	6098100	157.75	6355600	116.95	4578000
Shellac	5.72	898500	9.95	1631200	3.11	619700
Sugar	1662.37	17694900	1184.64	12014300	60.73	667000
Molasses	207.86	450500	98.26	191200	1.26	8800
Fruits/Veg seeds	8.92	979600	5.33	523000	1.48	221800
Fresh fruits	0	4473200		7606500		3399800
Fresh Veg.	0	6427800		9397000		4182100
Processed Veg	0	2567300		2962400		1323200
Processed fruit juicie	0	5741300		4113000		1748300
Misc. processed items	0	9100800		10834000		4205000
Meat & Preparations	0	13771800		16024400		7757000
Marine Products	527.87	69280500	405.26	60678400	147.78	25015000
Cotton Raw incl.waste	11.74	502800	167.05	8114700	39.83	2137000
Jute Hessain	0	3493100		3965300		2070800
Paper/wood products	0	19503300		25876700		21092400
Total Agricultural Exports		346539300		368938800		182480400
Country's total exports		2551372800		2915819300		1649698600
% share of agricultural export in country's export		13.58		12.65		11.06

Source: DGCI & S P: Provisional

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