GREENHOUSE FARMING IN GUJARAT: A MARCH TOWARDS SUSTAINABLE AGRICULTURE

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Abstract: Climate change has become one of the greatest challenges which mankind ever faced. The glorious journey of Gujarat right from 1960 to till this date is full of landmark achievements but this continued prosperity with continued environmental damage has forced us to think that are we heading towards prosperity or heading towards disaster. Of late, a growing movement has started towards sustainable agriculture not only to solve environmental crisis, but it offers innovative opportunities for both the farmers as well as consumers. A number of initiatives have been taken to push Gujarat towards sustainable agriculture but among all the initiatives Greenhouse farming technology is the most revolutionary that has ushered a golden era in the history of Gujarat's agriculture. The main advantage of Greenhouse farming is that it provides maximum yields while utilizing minimum area. In fact, Greenhouses are framed structures covered with transparent materials large enough to grow plants under fully controlled environmental condition. Greenhouse farming has four dimensions i.e. ecological dimension, economic dimension, social dimension as well as cultural dimension. Ecological dimension basically focuses on soil fertility and increases bio-diversity. Economic dimension encompasses both income security as well as food security. Social dimension involves betterment of quality of life for those who work and live on the farm as well as those in the local community. The cultural dimension explains that without breaking their cultural heritage farmers could enjoy cultivation in Greenhouse farming. In Gujarat, Greenhouse farming technology has made farming a complete business opportunity. As it has become a profitable venture lot of investments are coming from individuals, entrepreneurs and companies. The reason is that there is an increase in demand for high quality exotic vegetables and flowers throughout the world. With less water and less labour high yield is noticed compared to traditional agriculture. Another major advantage is that Gujarat has got good infrastructure facilities like roadways, railways and electricity etc. Not only this Gujarat gets 25% subsidy of the project cost from Central Government and additional subsidy of 50% from Gujarat State Government for greenhouse structure , interest subsidy i.e., 6% for five years and electric subsidy i.e., 25% for five years.

Because of the additional subsidies Gujarat has become No. 1 rank in greenhouse cultivation in India. In a span of just five years, exotic flowers like hybrid tea roses and gerbera have emerged as big money spinners for farmers in Gujarat. Currently cultivators from Navsari to Surat both grow flowers worth crores in climate controlled greenhouses and have been exporting them in countries like Japan, New Zealand, Germany and U.K. Since the last three years more and more farmers have ventured into the floriculture business and today the turnover is 50 crores. At present Gujarat has 650 operational greenhouses and will have more than 80 operational greenhouses in the years to come. It is true that there is no magic formula for sustainable agriculture and at the same time this is no easy solution to the dilemma of environmental degradation and poverty. Culture, society, economy and environment interact in complex and dynamic ways, sometimes slow and sometimes dramatically very fast. But if we want to bring sustainable agriculture then Gujarat has to think in terms of food security, livelihood security, environmental security and health security. Greenhouse farming is the golden thread which connects all the securities together but to promote it we need a proactive Government intervention and higher budgetary allocation. With it, we can move towards intergenerational and intra-generational equity and the march towards sustainable agriculture which will finally push Gujarat towards sustainable development.

This research paper will be based on primary survey.

Keywords: Environment Security, Food Security, Greenhouse Farming, Sustainable Agriculture, Sustainable

INTRODUCTION

Climate change has become one of the greatest challenges which mankind ever faced. The glorious journey of Gujarat right from 1960 to till this date is full of landmark achievements but this continued prosperity with continued environmental damage has forced us to think that we are heading towards prosperity or heading towards disaster. Of late, a growing movement has started towards sustainable agriculture not only to solve environmental crisis, but it offers innovative opportunities for both the farmers as well as consumers. A number of initiatives have been taken up to push Gujarat towards sustainable agriculture but among all the initiatives Greenhouse farming technology is the most revolutionary that has ushered a golden era in the history of Gujarat's agriculture. The main advantage of Greenhouse farming is that it provides maximum yields while utilizing minimum area. In fact, Greenhouses are framed structures covered with transparent materials large enough to grow plants under fully controlled environmental condition. Greenhouse farming has four dimensions i.e. ecological dimension, economic dimension, social dimension as well as cultural dimension. Ecological dimension basically focuses on soil fertility and increases bio-diversity. Economic dimension encompasses both income security as well as food security. Social dimension involves betterment of quality of life for those who work and live on the farm as well as those in the local community. The cultural dimension explains that without breaking their cultural heritage farmers could enjoy cultivation in Greenhouse farming. In Gujarat, Greenhouse farming technology has made farming a complete business opportunity. As it has become a profitable venture lot of investments are coming from individuals, entrepreneurs and companies. The reason is that there is an increase in demand for high quality exotic vegetables and flowers throughout the world. With less water and less labour high yield is noticed compared to traditional agriculture.

History of Greenhouse Farming

The idea of greenhouse has existed since Roman times. The Roman emperor Tiberius used to eat cucumber like vegetable daily. For him the Roman gardens used artificial methods quite similar to greenhouse system. They used to plant cucumber on wheeled cart which were put in sun daily and then taken inside to keep them warm at night. The cucumbers were stored under frames known as speculation. In 13th century greenhouse were built in Italy to house the exotic plants. It was known as giardini botanici. In Korea in one of the earliest records of the Annals of the Joseon dynasty is 1438 confirm that mandarin trees were grown in Korea traditional greenhouse. During 17th century in Netherland and England the concept of greenhouse agriculture was also noticed. The French botanist Charles Lucien Bonaparte built the first practical modern greenhouse in Leiden, Holland during the 1800s to grow medicinal tropical plants. The French called their first greenhouse orangeries and pinsies. In England, during the Victorian era, we noticed a golden era of the greenhouse. The kew gardens and the crystal palace are the praiseworthy greenhouses. Other large greenhouse built in the 19th century are the New york crystal palace, Munich's Glasplant and the Royal greenhouse of Lacken (1874-1896) for king Leopold II of Belgium.

Greenhouse Global Scenario

Greenhouse farming is prevalent in many parts of the world. In USA, 4000 ha is under greenhouses which are mostly need for floriculture. In Spain, 25000 ha, in Italy it is 18500 ha is under greenhouse farming and farmers are growing mostly vegetables like watermelon, capsicum, strawberries, beans, cucumber and tomato too. In Canada, the greenhouse industry caters both to off season vegetables in the market and flowers. In Netherlands, 89600 ha is in greenhouse farming. The Dutch greenhouse industry however heavily relies on glass framed greenhouse and it is probably the most advanced in the world. The development of greenhouse is also prevalent in Gulf countries primarily due to warm climate conditions. In Egypt, there are about1000 ha greenhouse consisting mainly of plastic covered tents type structure. In Asia, China and Japan are the largest users of greenhouse farming. In India it started in 1980's. Greenhouse in Israel is mainly used for growing flowers, vegetables, ornamental plants and spices. Recently, the greenhouse is growing nectarines, peaches, loquats, grapes and banana for commercialized purpose mainly for export. In India the major states under cultivation are Maharashtra, Karnataka, Gujarat, Himachal Pradesh and Uttaranchal.

Greenhouse Ecology and Agribusiness in Gujarat

With greenhouse technology it has been noticed that there is increasing demand for high quality exotic vegetables and flowers throughout the world. With less water and less labors high yield is noticed compared to traditional agriculture. Gujarat has got another advantage in the form of both infrastructures like roads and electricity. Best connectivity to major cities in India via roads and trains are available in Gujarat. Not only had this Gujarat has got 25 percent

subsidy of the project cost from central government. The additional subsidy from Gujarat state government is for greenhouse structure 50 percent, interest subsidy i.e. 6 percent for five years and electricity subsidy i.e. 25 percent for five years and because of these additional subsidies Gujarat has got No. 1 rank in greenhouse cultivation in India. For all these, it is a bed of roses for the floriculture in South Gujarat. In a span of just five years, exotic flowers from South Europe like the hybrid Tea roses, gerbera and carnations have emerged as big money spinners for farmers in Gujarat. Currently growers from Navsari and Surat districts grow flowers worth crores in climate controlled greenhouse and have begun exporting them to countries like, Japan, New Zealand, Germany and UK. Since the last three years more and more farmers have ventured with the floriculture business and today the farmers are earning huge income from it. As the local black soil is not suitable for the growth of these flowers, these farmers have creaked mounts of red soil or Coco Peat which is the byproduct of extracting fibers from the husk of coconut to grow these flowers in the specially erected greenhouses.

Greenhouse farming and sustainable agriculture

Greenhouses are framed or inflated structures covered with transparent materials large enough to grow plants under partial or fully controlled environmental condition to get optimum growth and productivity. Greenhouse farming technology is the most revolutionary technology through which we could march towards sustainable agriculture. The major advantage of greenhouse technology is that it gives high quality of agricultural products and production increases at least ten times than natural production. Not only this with the help of greenhouse farming crops are grown throughout the year and the chances of disease and paste attack remain minimum. The life span of the plants remains very high and it is very cost effective. Another big advantage is that it provides maximum yields with minimum area. In these days horticulture and floriculture both are increasing very fast. The demand for ornamental flowers as well as fruits and vegetables are in great demand. Greenhouse farming is the only solution to meet these changing demands.

When we talk about sustainable agriculture it basically means a set of farming practices that produce food in such a way that is both ecologically and economically sustainable. It produces crops without relying on toxic chemical pesticide, synthetic fertilizers genetically modified seeds or practices that degrade soil water or other natural resources. By growing variety of plants and using techniques crop rotation conservation tillage sustainable agriculture protects bio-diversity and fosters the development and promotes the maintenance of healthy ecosystem.

At the 1992 Earth Summit in Rio de Janeiro, the UN Food and Agriculture Organization (FAO) defined "sustainable agriculture and rural development" as follows:"Sustainable development is the management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in the agriculture, forestry and fisheries sectors) conserves land, water, plant, and animal genetic resources, is environmentally non degrading, technically appropriate, economically viable and socially acceptable."

Agriculture generally relies on five types of capital that is natural capital, social capital, human capital, physical capital and financial capital. All these capitals are interrelated. In fact there are strong links between changes in natural social and human capital. Natural capital produces environmental goods and services and is a source of food, social capital includes norms values and attitudes that helps to cooperate in which they are connected in networks and groups(Pretty 2003). Human capital explains the total capability of a person based on knowledge health and nutrition. Physical capital is the material resources which make laborers more productive and financial capital serves as a supporting role to make agriculture more sustainable. When we look towards greenhouse farming it takes into account of all the capitals which finally opens the door for sustainable agriculture by reducing negative externalities and improves efficiency over a long period of time. With greenhouse farming we could enhance food security, rural development, sustainable livelihood and environmental integrity.

Now we will discuss two case studies of greenhouse farming in Gujarat

CASE STUDY 1

Jagdish Bhai, a proud owner of greenhouse in Kishanpura Kampa Village in Sabarkantha district has greenhouse area which is sprawling out one area of land with cucumber as his principal crop. His cultivation of red flowers and vegetables are for both export and domestic production. With an annual income of 8 lakhs coming from greenhouse farming, the traditional methods of growing flowers and bajra has been altered. The task of upgrading the agricultural system in Sabarkantha has taken by the agricultural department, Himmatnagar and they are facilitating farmers to adopt greenhouse farming techniques. The variety of crops grown in greenhouse

is mostly peppers, carbra flowers, Dutch roses and other herbal plants.

Along with government support, farmers and greenhouse manufactures in Sabarkantha have set up a greenhouse association. They provide all sort of informational support regarding setting up of greenhouse conducting training and session on operating practices. Government is also conducting visit to Israel and Germany for both seeds and farming techniques. This association has brought greenhouse revolution in Sabarkantha district. It has been noticed that the quality of life and average income both have improved for many farmers in their district. Of late, grapes, cashew, medicinal and aromatic crops like alovera, palmarosa are emerging as potential new crops in suitable areas of the state.

CASE STUDY 2

The mother and daughter combination of Kailashben Shah and Ms. Bejalben Haria of Gandhinagr have 500 square meter in greenhouse near Gandhinagar. It is exclusively for the red roses. Recently they have taken up three acres farming venture to develop an exotic vegetable basket which will soon get extended into a cold mart where the products would be on sale. Among the vegetables grown there are broccoli, Brussels sprouts, cherry, tomatoes red and Chinese cabbage.

INITIATIVES OF GUJARAT GOVERNMENT

In Gujarat small farmers are taking up biotechnology projects as add on to their existing farming activities. It is true that the farmers have taken the greenhouse culture with little ease because the Gujarat State Finance Corporation has provided the initiatives by identifying biotechnology as business segment of the future and has decide to provide necessary fillip by making available the seed capital to the farmers. The main aim is to take biotechnology to grassroot level farmers instead of getting stuck with the stereo type image of the greenhouses being a corporate venture. A wide variety of vegetables can be grown in small greenhouses including root crops such as carrots, turnips, and leafy vegetables such as lettuce. Other popular choice is such as cucumber, eggplants and pole beans while strawberry and tomatoes are the most common types of fruits to grow in a greenhouse. Herbs can also be grown in greenhouses which include chives, lavender and marjoram.

In a bid to encourage flowers, fruits and vegetables in Gujarat the State has taken a number of initiatives to increase greenhouses crops from 150 to 1000 in the next couple of years. The Government of India offers 25% subsidy for the greenhouse development and Gujarat Government is providing 50% subsidy for greenhouse structure. Cultivators can also avail interest subsidy of 6% for 5 year and 25% electrical subsidy for 5 years.

Companies Promoting Greenhouse Farming in Gujarat

When we talk about the companies promoting greenhouse farming in Gujarat there are more than 800 operational companies in 2013. The following are the famous companies of greenhouse manufacturing.

Krisi Disha Agrotech Manufacturers

Krishi Disha Agrotech manufacturer is known as one of the leading greenhouse manufacturer in Gujarat. It has a wide range of greenhouses suitable for every type of crop and geographic location. This Ahmedabad based firm aspires to be the most admired, socially responsible innovative, progressive and vibrant company in the field of greenhouse agriculture. The major activities are end to end solution from soil testing, bank finance and subsidy application to bed preparation and plantation. All these are under the supervision of specialist and in-house agronomist. They are providing specialized services in flowers like orchids, carnation and roses etc; vegetables like capsicum, cucumber etc., fruits as well as herbs. It has specialized in debt palms, oil palms and brittle-nut. Pomegranate and seedless Guava are also available. The company takes land on long term lease, invest and create partnership with farmers. Krishi Disha Agrotech has completed ten projects in Ahmedabad, 13 in Sabarkantha, 26 in Mehasana, 18 in Panchmahal and 10 in Anand from May 2011 to December 2012.

Ethics Agro Pvt Limited

Ethics agro Pvt Limited is one of the leading greenhouse manufactures and has a wide range of greenhouses suitable for every type of crop and geographic location. The firm is based at Surat and it is expanding its business in international market. It handles key projects of greenhouse and contract farming too. It is leading company in agriculture and horticulture sector. The basic function of this company is the development of protected cultivation of various horticultural and floricultural crops in India. This company is trying its level best to join its hand in the development of marketing chains of fruits, vegetables, flowers, spices and oil. Throughout Asia and Europe, Ethics Agro Pvt Limited is involved in cultivating, importing, trading and supplying various ranges of agro products. Hygienically processed and packed the products are in high demand amongst the clients.

Champion Agro Limited

This company deals with varied agricultural areas and have recently joined hands with Top Greenhouse

Limited for the sale of greenhouses and related technology in India. Top greenhouse Ltd is one of the leading company in Israel providing a wide range of turnkey agricultural projects and solution for growers and retail chains and investors around the globe. Top Greenhouse Ltd has invested a great deal of thoughts and planning into each project to ensure that it gives maximum yield both agriculturally and economically.

Champion Greenhouses will be equipped with arched tropical roof with natural ventilation and opening and closing curtains. It also keeps 180-200 micron thick ultraviolet polithin seat for effective protection against radiation. This structure has shade-net which can be opened whenever required for better ventilation and covering on sidewalls to prevent weed control. The structure is designed where in the crops are grown under a favorable artificially controlled environment and other conditions viz; temperature humidity, light intensity, photo period, ventilation, soil protection, controlled irrigation, fertigation and other agronomical practices throughout the season irrespective of natural condition outside.

Aviskar Agri Viz Pvt Ltd.

Aiskar Agri Viz Pvt Ltd is a Rajkot based company which is offering a wide range of greenhouse services to their valued customers. The motto of this company is the best in the category and cheap in cost. This company gives complete fabrication and installation of greenhouses. Available in various models and styles the structure is suitable for small nurseries, indoor and nursery plants and vegetable cultivation in controlled environment where condition viz temperature, humidity light intensity and photoperiod is maintained. This company is famous for specialization in naturally ventilated greenhouses, agriculture net houses, agriculture greenhouses, agriculture poly houses, tunnel type and box type shed net house. The naturally ventilated greenhouses are suitable for cultivating several medicinal ornamental flowering and rare plant species.

Greenhouse farming and Food security

FAO identifies four main elements of food security: Food availability, Food access, Utilization and Stability. Food availability means the availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports, including food aid. Food access indicates access by individuals to adequate resources – entitlements -- for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command, given the legal, political, economic and social arrangements of the community in which she/he lives, including traditional rights such as access to common resources. Utilization explains utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met. Stability indicates to be food secure, a population, household or individual must have access to adequate food at all times. They should not take risk losing access as a consequence of sudden shocks, such as economic or climatic crises, or cyclical events such as agricultural seasons. Stability is thus needed in both availability and access.

Greenhouse farming holds the key to food security. Concern for present and future food security has emerged as a big debate in the 21st century in Gujarat. To assure a sustainable, equitable, secure and sufficient stable flow of food it is a necessity that to develop methods of sustainable food production. For that we have to introduce conducive environment for farmers to produce and at the same time keeping food prices affordable to promote food security. It is true that during last one decade in Gujarat agriculture has made a historical change but in many parts of rural Gujarat but food insecurity still persists.FAO identifies four elements of food security. These are food availability, food access, food utilization and stability. Although greenhouse agriculture often produces lower yields on land compared to conventional farming but it has a very positive long term effect. Conventional farming practices often degrade the environment both in the short run and long run through soil erosion excessive water extraction and bio-diversity loss whereas greenhouse farming has the potential to contribute to sustainable food security by improving nutritional value and sustaining livelihood in the rural areas. It stabilizes soil, improves water retention and thus reduces vulnerability to harsh weather patterns. The products of greenhouse are red capsicum, brinjal, cucumber etc. The red capsicum has got good nutritional value. It is very low in kilojoules, three times vitamin C of an orange, excellent source of beta carotene and one of the best sources of other carotenoids.

Food security is an economic, environmental and social issue. Every individual should have physical, economic and environmental access to a balanced diet that includes nutrients, drinking water, sanitation, environmental hygiene, primary health care and education so as to lead a healthy and productive life. Food security means diversified food basket which is finally linked to human health and sustainable economic development." Food Security exists when all people at all times have physical or economic access to sufficient, safe drinking water and nutritious food to meet their dietary needs and food preference for an active and healthy life"FAO

Farming households in Gujarat have faced huge changes and challenges during the 1st decade of 21st

century including high population growth, rise in food prices, declining soil fertility, poor market access and lot more. It is true that climate change impacts food availability, access & utilization Amartya.K.Sen, the Nobel Laureate has explained food access refers to the ability of an individual to acquire food either through production or through purchase. Through greenhouse farming a farmer can acquire food through production or if he gets a decent income from greenhouse farming he can have access to the nutritional diet also. The products of greenhouse have high nutritional value.

CONCLUSION

It is true that sustainable agriculture in Gujarat is not an easy task but greenhouse farming in Gujarat has paved the way for sustainable agriculture. It takes care of health of soils, ecosystem and people and is much different from conventional farming. By improving the nutritional value and sustainable livelihood in the rural areas greenhouse farming has tried to make a historic leap towards sustainable agriculture. It has pushed Gujarat towards true ecological green revolution and for that not only the present generation will enjoy but the future generation will also enjoy.

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