CHAPTER VIII

SUSTAINABLE AGRICULTURE

Sustainable agriculture is a system of agriculture that continues for ever. It is an agriculture that maintains its productivity over a long period. Sustainable agriculture is both a philosophy and a system of farming. It has its roots in a set of values that reflects an awareness of both ecological and social realities. It involves design and management procedures that work with natural processes to conserve all resources, minimise waste and environment damage while maintaining or improving farm profitability. Working with natural soil processes is of particular importance. Sustainable agricultural systems are designed to take maximum advantage of existing soil nutrient and water cycles, energy flows and soil organisms for food production. Such systems aim to produce food that is nutritious, without being contaminated with products that might harm human health.
In practice such systems have tended to avoid the use of synthetically compounded ferlisers, pesticides, growth regulators and livestock additives. These substances are rejected on the basis of their dependence on non-renewable resources, disruption potential within the environment and their potential impacts on wildlife, livestock and human health. Synthetically compounded fertilisers and pesticides generally suppress biological activity in the soil. Some growth regulators and feed additives are implicated in retarding the decomposition of manure and are potential human health hazards. Sustainable agriculture systems rely on rotation of crops, crop residues, animal manures, legumes, green manures, off-farm organic wastes, appropriate mechanical cultivation and mineral bearing rocks to maximize social biological activity and to maintain soil fertility and productivity. Natural biological and cultural controls are used to manage pests, weeds and diseases.

**Basic Elements of Sustainable Agriculture**

The idea of sustainable agriculture was in vogue for a long time. Since the very first crop was sown, farmers have tried to
ensure that their land produces increasing yield year after year. Recent attempts for sustainable agriculture have been based on earlier attempts of farmers through tradition. Sustainable agriculture's benefit to farm and community economics is based on four well established economic development principles and a fifth, concern for the community.

**Input optimization, Diversification, Conservation of natural capital, capturing value added marketing and community.**

**Input Optimization** : Sustainable production practises maximum on farm resources. Internally family labour, intensive glazing systems, recycled nutrients, legume nitrogen, rotation of crops, use of renewable solar energy, improved management of pests, soils and woodlands are substituted resources. These substitutions can be made while maintaining yields and often result in increased net farm earnings. These earnings can benefit the community by increasing local retail sales.
**Diversification**: To develop healthy soils sustainable agriculture can be maintained through diverse cropping and live stock systems. Diversification would lead to continuous farm income by lowering economic risk from climate, pests and fluctuating agricultural markets. This helps the farmers and helps the local economy from the shock of a decline in a single commodity or industry.

**Conservation of Natural Capital**: It is a standard accounting practice to depreciate capital assets. It has not been a standard practice for farmers to depreciate natural capital that is depleted by farming methods that do not conserve resources. The loss is real, affecting yields, farm profitability and sustainability. In sustainable agriculture economic value is created by maintaining the productivity of land our water resource while enhancing human health and environment.

**Capturing Value Added Marketing**:

The Marketing of crops and products grown is by far the weakest link in the farmer's role in the field to table food system.
To create and maintain a truly sustainable agriculture, the farmer will have to develop ways of retaining a higher percentage of value added on the farm. While individual farmers can and do design, process acid directly marketing their own products, many other value added strategies will require more resources than one farmer can handle financially. Therefore these value added strategies will require the formation of local farmers and relationship with the local Community.

**Community**: The elements of sustainable agriculture are integral to all communities. If we are to support sustainable agriculture we must recognize the rural and urban interconnection, the conflicts and the tremendous opportunities. The positives of a sustainable farming system include shared commitment to profitability, food security, food safety, open space for water recharge, natural habitats of flora, fauna and recreation and co-operative and supportive social and economic community infrastructure. Currently our urban communities are separated from farming communities not only in philosophy but also in their martial understanding particularly in
their knowledge of the complete food production and distribution system. Recognition of the role farming has played in stabilizing the community is critical or we shall continue to disintegrate our rural fabric and prefer standard of living. We must rekindle a sense of caring about the welfare of our neighbours in order for viable rural and urban communities to survive.

**Steps towards sustainable agriculture**

Agriculture is the main profession of more than 70% of the population in India. Yet due to the increased inputs and investments, small and marginal farmers struggle for their survival. Many are being alienated from their lands and most of them have become landless labourers and migrate to urban centres for seeking potential employment.

It is in this context the Tirunelveli Social Service Society took efforts to prevent migration and support farmers. The Tirunelveli Social service Society animates and organizes farmers into groups and federations. There are 300 groups with a
membership of 5000 farmers in the District\textsuperscript{1}. The Tirunelveli Social Service Society offers technical and financial support to small and marginal farmers to carry out cultivation, animal husbandry and allied activities. It promotes organic farming, vermi compost making and other sustainable farming practices with the support of a demonstration farm.

**Promotion of Organic Farming:**

Organic agriculture is a production system that sustains the health of soil, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions rather than the use of inputs with adverse effects. Organic agriculture combiners the addition, innovation, and science to benefit the shared environment and promote fair relationship and a good quality of life for all involved.

The Tirunelveli Social Service Society with the support Episcopal Conferenza Italiana promoted organic farming among

\textsuperscript{1} TSSS. India. Handout. P. 9.
small farmers of Tirunvelveli District since 2008. Imparting knowledge and skills in organic farming practices is the key element of the programme. 20 model villages have been organized. Empirical knowledge enhances the conference and trust of the people in any field. The farmers are trained in bio fertilizer production and bio-pesticide production for pest control. Each field has to be well protected. For that purpose trees are grown along the borders of the plots and this type of fencing has been made to protect one's our land from the trespassers and from the cattle. Organic products fetch high prices and are drought resistant. Organic farming requires less consumption of water. Hence organic farming can be practised even in drought prone areas. Organic farming requires less investment. If organic farming is practised more output can be drawn through less investment. The Tirunelveli Social Service Society has been practising organic farming in the villages in Tirunvelveli District.
Organic Market:

The farming community has to be encouraged and for that purpose organic markets have to be organized. The Tirunelveli Social Service Society has organized one organic outlet (market) in Palayamkottai. The cost of the organic products should be fixed at 10% over the other products. Women are given assistance to cultivate greens, vegetables and fruits which are brought to the organic market. Vegetables like bitter guards, Snake guards, Onions, Tomatoes bringals and Green Chillies are produced and marketed. Such organic products and organic market earn a better livelihood for the farmers and at the same time the fertility of the soil has been sustained.

Enhancement of soil fertility.

Soil testing helps to identify the nutrients and quality of soil which in turn will help to select suitable crops in accordance with the soil quality. Application of nutrients and fertilizers can be selective and relevant to the requirement of the soil. This will
enhance the soil condition and fertility. Hence soil testing has become indispensable and unavoidable. The Tirunelveli Social Service Society, a prominent Non-Governmental Organization has been organizing orientation programmes to the farmers on how to carry out soil testing. Farmers are properly instructed to dig the soil at suitable depth and do mixing while collecting the soil for testing. Officials test the soil and present a detailed report on the soil type, quality, nutrients present and the deficiency found in the particular area. After testing they inform the farmers what type of crops can be raised in that particular ground.

In order to enrich the soil fertility the farmers are taught to apply bio-fertilizers and organic manures. All the farmers who are given training in this enrichment of the soil by the organizers, are carrying out enrichment of the soil programmes in their respective cultivable land. The programme of enrichment of the soil rests on three major involvement. The first involvement is the preparation of Panchakaviya. Panchakavia\(^2\) means components of five items.

\(^2\) Panchakavia Stands for fine.
A plant nutrient is prepared with mixture of 5kgs of cow dung 5 litres of animal urine. 2 litres of milk, 2 litres of butter milk, ½ litre of ghee and ½ litre of jaggery. This mixture when applied increases the fertility of the soil and at the sametime serves as a pest control\(^3\).

The second involvement is the enrichment of the soil through land based activities such as mulching, building, application of green manure, mixed cropping, rotation of cropping and ploughing. The third involvement is the preparation and application of vermi compost. In this regard farmers are given financial assistance to establish vermi bed made of concrete structure.

**Construction of Vermi Beds**

The members of National Farmers Association are given financial assistance to construct vermi beds in their own land or backyard of their kitchen. The construction of vermi beds depends on the availability of land and accessibility to the women farmers. Some have their lands very close to their residence. The bed is

\(^3\) TSSS, India op. cit. P.12.
filled with farm wastes and cow dung layer by layer and it is mixed daily. One kilogram of vermi worms suitable to the area is purchased from organic farmers in the nearby area of the District and is laid in the bed. Water is sprayed daily and the worms used to feed on the farm wastes and cow dung produce finer quality of manure with necessary potentials to enrich soil fertility and productivity. Gradually the wastes in the bed become mulched and turned into black and the whole waste is converted into rich manures. Such manures are applied to the soil and the sustainable agriculture continues.

Application of natural manures no doubt maintains the fertility of the soil. But at the same time soil erosion should also be prevented. In order to prevent soil erosion terracing, and strip cropping should be practised along with the reporting of the gullies. As much as possible use of chemical should be reduced. If chemicals are added indiscriminately it will tell upon the future fertility of the soil.
In Tirunelveli the Tirunelveli Social Service Society has organized an agricultural demonstration farm at Bharathi Nagar. It serves as a demonstration plot to the trainees. In order to promote organic cultivation, vermi compost beds have been set up in the training centre to give training to the people. The vermi compost produced in the training centre are being supplied to the farmers who are practising organic farming.

Vegetables like ribbed gourd, tomato, brinjal, ladies finger, drum stick, lettuce and fruits like plantain, lime, jasmine flower and coconuts are brought to the Tirunelveli Social Service Society marketing centre for sale. As the vegetables are grown using organic fertilizers and pesticides the demand for the organic vegetables have increased considerably. At Manur in Tirunelveli a farm has been selected to grow medicinal herbs. This farm in Manur is known as St. Mary's Farm\(^4\). In this farm medicinal herbs, vegetables, and gooseberry and groundnuts are cultivated. The

\(^4\) TSSS India op. cit p.12
vegetables and fruits harvested from the farm are sold at the marketing outlet at the head office of the TSSS in Palayamkottai.

Global warming remains one of the major concerns of the globe. Tree planting is one of the key strategies to reduce global warming. In order to enhance the green cover in rural areas, the TSSS with the partnership and support of Maria Basker, a member of the Resource Support Organization promoted by the TSSS distributed 3000 saplings free of cost to the farmers. Neem, guava, mango and other horticulture tree saplings are distributed through farmers' organizations. The Non-Governmental Organizations in Tirunelveli are performing excellent services in enhancing the fertility of the soil and at the same time are trying to increase the yield from the land.

Through the introduction of natural predators, pathogens, sterile insects, and then biological control agents, insects which cause damage to the plants can be controlled. Traps are to be used to catch rats which eat away the produce. Selective insecticides or botanical insecticides which are less toxic should be used so as to
maintain the sustainable tendency of the soil. Cultivating a single crop should be avoided. If single crop is cultivated the fertility of the soil would be lost. Hence rotation of crops, inter cropping and strip cropping have to be adopted. Soil based diseases should be avoided through the best means of soil testing. Planting of trees or plants without sufficient space should be avoided. If plants or trees are planted in congested position it would be a stress on the plants which would lead to the stunted growth of the plants which would ultimately reduce the yield from the plants.

Crops should be selected according to the capacity of the land. For example paddy can be cultivated in alluvial soil with sufficient water whereas cotton can be grown in black soil with less amount of water. If crops are selected according to the capacity of the soil, better yield can be ascertained. Accordingly livestock should also be brought up suitable to the land scape. Wollen sheep can be reared in cold countries along the mountain areas. Cow and sheep can be reared in plain lands in tropical regions. Sufficient grass lands should be earmarked for rearing cows and sheep. Only
then milk, the produce from the cattle would be to the expected level.

To maintain the fertility of the soil solar powered fences and machines are to be utilized. Chemicals are to be avoided. When the produce are being marketed as much as possible middle men should be avoided and the produce should be brought to the market by the producer himself. When middle men are involved they earn enormous income whereas the marginal income alone has to be earned by the producers themselves.

More significant advances in sustainable agriculture can be expected as a result of the developments in science and art of agro-ecosystem design and management. Efforts to substitute safe products and practices such as botanical pesticides, bio control agents' imported manures, rock powers and mechanical weed control are also gaining popularity. Botanical pesticides also kill beneficial organisms, the release of bio-controls does not address the question of why pest outbreaks occur and dependence on importer fertilizer materials makes the system unalterable to supply
disruptions and excessive cultivation to control weeds is detrimental to the soil.

The systems that focus on redesign of the farm are the most sophisticated, generally the most environmentally and economically sustainable over the long term. These farm systems recycle resources to the greatest extent possible that little is wasted. Few pollutions are generated and input costs are reduced substantially. For example chicken and orchard operations have been successfully integrated\(^5\). The manure is used as fertilizer, the chickens eat pests that attack the fruits, the feed bill for the chicken is greatly reduced and the eggs and meat can be consumed or sold. Eggs and meat would fetch high prices. Three to seven year crop rotations can be designed that minimize tillage, use legumes and green manures to maintain soil fertility, prevent pest and disease outbreaks and provide a diverse diet for live stock.

Pigs and goats can be used to renovate wooded lands in preparation for sheep pasture. The pigs and sheep replace the petro

\(^5\) TSSS hand out 2010, p.17
chemical energy that would be consumed in machines, herbicides and fertilizers.

All these practices would involve redesigning the farm. As in conventional agricultural systems, the success of sustainable approaches is very dependent on the skills and altitudes of the producers. The degree to which different models of such farms are sustainable is very variable and is dependent on the physical resources of the farmer and the degree of deficiency is made good by, the talents and commitment of the support available. The present expectation of the government, universities and agricultural professional mean that farmers must often rely on their own talents and commitments.

With these areas and suggestions the Non-Governmental Organizations in Tirunelveli on the whole have been trying their best to encourage agriculture and through their processes the fertility of the soil also.
As a consequence of the sustainable practices on farms by the Non-Governmental Organisations throughout India, the state governments and the central government agricultural produce has considerably increased. The total number of operational holdings in the country has increased from 120 million in 2000-1 to 129 million in 2005-6.

The number of female operational holdings has increased from 1.8% in 2000 to 11.70% in 2005 with corresponding figures of 8.39% and 9.33% in the operated area. Small and marginal holdings below 2 hectares taken together constituted 83.29% of the total number of holdings in 2005 against 81.80% in 2001 with operated area 41.14% in 2005 as against 38.86% in 2000.

Semi-medium and medium operational holdings between 2 hectares 10 hectares in 2005 were 15.86% of the total number of holdings with operated area 47.04%. Large holdings between 10 hectares and above were 85% of the total number of holdings in

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7 ibid, p.148
2005 with share of 11.82% in the operated area as against 1.03% and 13.2% respectively in 2001 agricultural census.

The Government of India also took efforts for the development of sustainable agriculture. The economy of India is based in part on planning through its five year plans which were developed, executed and monitored by the planning commission. Jawaharlal Nehru presented the First Five Year in the Parliament on December 8, 1951. The plan was based mainly on agriculture sector including investments in dams and irrigation. This clearly exhibits the fact that at the threshold of freedom India was very particular about sustainable agricultural activities. The agricultural sector was hit by the partition of India and needed urgent attention. The total planned budget was centered round the sustainable development of agriculture. An amount of Rs.2069 crores was allotted for agriculture, irrigation and land rehabilitation. The monsoon was good and there were relatively high crop yields, boosting exchange resources and the per capita income was increased by 8%. In 1909 the Meteorological Survey in Tamil Nadu exhibits a good
percentage of rainfall. In June 2009 Tirunelveli had an average rainfall of 25.7%. In July 2009, 23.1% and in August 2009 the average rainfall in Tirunelveli was 17.2%. With this rainfall and the flow of Tamiraparani it was possible for the people of Tirunelveli to have the development in the agricultural yield.

The Non-Governmental Organization throughout India also came forward for the enhancement of agriculture throughout India. The role of the Non-Governmental Organization in Tirunelveli in the conservation of agriculture has also been considerably high. Many irrigation projects were initiated during this period.

The Government of India and the Planning Commission have been making efforts through launching several developmental programmes to improve agricultural sector and the people belonging to agricultural base. The objective behind launching and implementing various rural development programmes was to improve the agricultural products and provide the Indian farmers

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8 Meteorological Survey in Tamil Nadu in 1909.
9 ibid Aug. 2009.
economic reliefs. These schemes also aimed at making improvement in irrigation system and supplying the Indian farmers new technology and improved quality of seeds and manures.

In order to maintain the sustainability of agriculture farmers must be supplied with modern scientific agricultural equipment, based quality of seeds, fertilizers on cheap rate, lasar centres for sale of foodgrains and plant protecting machines. The government wants to utilize local resources and potentialities for local development\textsuperscript{10}. It is possible only when the local people are encouraged to come forward and help the planners to design the plants for rural development\textsuperscript{11}. The State Governments set up the District Rural Development Agencies in each District which became the guiding and controlling agencies of all the Rural Development Programmes.

There was a high recommendation from the government that systematic, scientific and integrated use of all natural resources

\textsuperscript{10} Ram Sakal Singh, 'Rural Poverty' New Delhi, 2008, P.86.
\textsuperscript{11} Ibid, P.87.
should be made available for sustainable agriculture. In 1981 the Ministry of Rural Development had set up a council for advancement of Rural Development which acted as the central rural point for development and transmission of appropriate technology for the development in the rural areas. There is a clear cut cleavage between the marketing system and the rural producers. In order to bring in a close link between the rural producers and the markets a marketing Division was set up by both the Central and State Governments. The marketing Divisions were manned by experts. The main function of the marketing division is to draw up strategy on marketing and creation of links between groups of rural producers and marketing outlets. The Council for Advancement of people's Action and Rural Technology sanctioned a lot of schemes. In 1988-89 the Council sanctioned 1072 Projects involving a total assistance of 82.02 crores\(^{12}\). The projects sanctioned by the council

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\(^{12}\) Ram Sakal Singh. op. cit, P. 99.
covered various steps of rural life such as agriculture, Dairy Development, Village industries, irrigation and fodder production\textsuperscript{13}.

Gradually the government had begun to feel that the villagers must be given opportunity to take direct participation in the development of the villages for the enhancement of agricultural development. The villagers must be included in the formulation of plans. In other words the plans which are intended to develop the village economy and change the structure of the villages should be prepared by the government officials\textsuperscript{14}. To preserve the sustainable agricultural system soil and water conservation works should be carried out continuously. Water harvesting systems should also be adopted. Construction of community irrigation wells construction of intermediary and main drains and fields should be carried out. Food protection, drainage and water lodging works to be carried out. Construction and renovation of village tanks for providing water for human use, cattle and for irrigation should be performed

\textsuperscript{13} German Vikes News letter, Vol 5 No 8-9, August – September 1989, Department of Rural Development, Ministry of Agriculture, P.22.

\textsuperscript{14} RomSakal Singh, op. cit. P.124.
by the government to enhance agriculture. The Non-Governmental Organizations which are already performing these activities are willing to co-operative with the government to maintain agricultural sustenance.

Still the condition of rural India has been suffering for long. There are a number of villages which have no approach road or connected with the main road with the result that the villages have to face a lot of problems specially during rainy season. Owing to lack of proper drainage system the people suffer from various kinds of diseases and their lives are miserable.

The waste lands in the Rural areas have to the utilized and various kinds of plants have to be planted which would beautify rural areas on one head and would help to maintain ecological balance on the other.

Though all kinds of scientific approaches have been initiated by the farmers, Non-Governmental Organizations and by the government yet at times the sustainability of the soil is lost because
of certain conditions. In many drought prone areas borewells have been dug up to irrigate fields. But it so happens that after the water in the well gets spoiled and salinity becomes a predominant compound in the water of these wells. Hence agriculture becomes a failure on such conditions. At times alkalinity pervades over the soil earmarked for irrigation. In such conditions also the sustainable nature of the agricultural land becomes lost.

When water becomes saline content and soil acquires alkaline tendency the farmers have to take earnest measures with the help of the Non-Governmental Organization and the government. But the agricultural farmers are indigiant to take active participation in enhancing the lost fertility of the soil or maintaining water free from salinity.

In addition to these, political parties also play a major role in the deterioration of the fertility of the soil through the transfer of agricultural administrative officials. When agricultural officers have made plans to regain the strength of the arable soil they are in no time transferred from one centre to the other. The plans for
development become still. In this way the sustainability of the soil is lost.

Irrigation system too has now become costlier which the poor farmers are unable to afford, with the result the plants become dried up due to lack of water. Sustainability of the soil is questioned at times of natural calamities. Earthquakes, volcanoes and at times Tsunami have been highly responsible for the degradation of the fertility of the soil which ultimately tells upon the sustainability of agriculture.

In order to increase the produce, the Government should take efforts to increase the essential commodities and food grains by giving incentives to the best farmers and producers. The system of irrigation should be improved and it should be ensured whether the farmers are getting continuous electricity supply or not. Only through such measures the sustainability of agriculture can be assured.