

## **SUSTAINABLE DEVELOPMENT IN AGRICULTURE: WITH SPECIAL REFERENCE TO NORTH EAST REGION OF INDIA**

Anuj Kumar Das

Assistant Teacher (Social Science), Alami Senior Basic School, Golaghat Nabajyoti Nagar, Assam, India

### **ABSTRACT**

The North East of India constitutes the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura, flanked by hills and with the mighty Brahmaputra River slashing a central path between its north and south. The region is bounded by China, Bhutan, Bangladesh and Myanmar. Tropical rain forest, rich in flora and fauna, spread their arms across Arunachal Pradesh into Assam. The economy of North East India has got its definite identity due to its peculiar physical, economic and socio-cultural characteristics. ‘Sustainability’ is one of the buzzwords of our times. It has been attached to any number of social and economic pursuits. We want sustainable economic growth, sustainable population and so on. We also talk about the need for “sustainable agriculture”. This paper makes an attempt to explore the status of sustainable agriculture in North East Region (NER) of India, and the problem faced in the way of maintaining sustainable agriculture in NER, and the various strategies to achieve sustainable agriculture in NER of India.

*Key Words:* Sustainable, Economy, Productivity and Environment.

### **INTRODUCTION:**

The concept of sustainable development is of recent origin. It is closely linked to economic development. Due to rapid increase in population growth and along with the maintaining economic development, nature and natural resources get threats. Therefore the conservation of nature and natural resources, the term “Sustainable development” was first used by the “World conservation strategy” Presented by the International Union in 1980. Since then its importance is growing rapidly.

### **OBJECTIVES:**

1. To know the concept of “ Sustainable development”
2. To know the meaning of “Sustainable agriculture”
3. To discuss briefly about the tripod of sustainable agriculture.

4. To highlight the various components of sustainable agriculture.
5. To highlight a rough idea about the status of sustainable agriculture in NER and its consequences.
6. To highlight the problems faced in the way of maintaining sustainable agriculture in NER.
7. To know various strategies, , alternatives to achieve sustainable agriculture in NER.

#### Sustainable Development-

Sustainable development means that development should “Keep going”. It emphasis the creation of sustainable improvement in the quality of life of all people through increase in real income per-capita, improvement in education, health and general quality of life and improvement in quality of natural environment resources. In other words, it is a situation in which economic development does not decrease over time rather over lasting to future and improves the quality of life. According to Brundt Land Report, Sustainable development means meeting the needs of the present generation without compromising with the needs of the future generation.

#### Meaning of sustainable agriculture-

Sustainable as it pertains to agriculture describes the use of farming systems and practices, which maintain or enhance the economic viability of agricultural production, the natural resources base and other ecosystem, which are influenced by agricultural activities. This definition can be supplemented by some fundamental principles of sustainable agriculture:

- (a) That farm productivity is enhanced over the long term.
- (b) That adverse impact on natural resources base and associated ecosystems are ameliorated minimized or avoided.
- (c) That resulting from the use of chemicals in agriculture is minimized.
- (d) That net social benefit (in both monetary and non-monetary terms) from agriculture is maximized and
- (e) That farming system is sufficiently flexible to manage risks associated with the vagaries of climate and markets.

Sustainable agriculture is a way of practicing agriculture which seeks to optimize skills and technology to achieve long term stability of the agriculture enterprise, environmental protecting and consume safety. It is achieved through management strategies which help the producer to select hybrids and varieties, soil conserving, cultural practice, soil fertility programmes and pest management programmes. The goal of sustainable agriculture is to minimize adverse impacts to the immediate and off farming environments while providing a sustained level of production and profit. Sound resources conservation is a part of the means to achieve sustainable agriculture.

Tripod of sustainable agriculture-

- (a) Environment: While we often associate environment problems agriculture is in fact itself a major contributor to a whole range of environmental problems. The list of agriculture based environmental problems is a long one; loss of biodiversity and destruction of natural habitats, over consumption of surface water and ground water, contamination of soil and water by organic biocides, nutrient includes eutrophication of water bodies, microbial and nitrate contamination of drinking water supplies, and release of excessive quantities of the green house gases such carbon dioxide, methane and nitrous oxide associates with special agricultural practices.
- (b) Economy: The economic element of agriculture relates to individuals as well as the local community and the broader national society. In being a producer of food each farmer carries out agriculture, first of all in order to be able to provide for the physical needs of his/her own family and paramount among these in the need for food. Agriculture sustainability then demands that farmers continue to make a good living and that the population as a whole be supplied with an abundance of high quality food at reasonable cost.
- (c) Society: More than in most other occupations, agriculture is a way of life. Agriculture is also a time and labour intensive occupation. Where the resources base is deficient the demands for long hours and heavy physical work can be especially severe. It is therefore an essential requirement for human well being that requirements for being a successful

farmer not be so harsh as to preclude opportunities for education, recreation and relaxation. Therefore, sustaining rural life must then provide the basic services related to education, health, recreation etc. that all humans have a right to expect.

As is the case for sustainability in any setting, sustainable agriculture must consider and bring together sound practices in the environmental, economic and social spheres, the three legs of the sustainability tripod.

#### Components of sustainable agriculture-

Using our definition and description of agricultural sustainability, we have set our six components to be considered in order to make a comprehensive assessment of any agrological system. We have labeled these as productivity, stability, efficiency, durability, compatibility and equity.

- a) **Productivity:** Productivity is of course the immediate and primary goal of any agricultural enterprise. There are two essential reasons why it is important to ensure that abundant crops are produced on land around the world. One is the necessity to grow sufficient food for the individual, firm, family, community and for the world at large. Gain in food production must therefore largely form an increase in already existing farms. The other reason why high productivity is an essential feature of sustainable agriculture is to provide a good living for those involved in agriculture. Besides providing sufficient food for an adequate diet, agriculture as an occupation should also make available some measures of comfort, access to relaxation, recreation and cultural participation.
- b) **Stability:** Stability in crop production describes the ability to maintain a good level of productivity over an extended period of time. In terms of time, we must keep a long-term view in mind, ranging from decades to centuries- in this respect, we should take seriously the intergenerational aspect of sustainable development. With this definition, the only true measure of agricultural stability is to observe production systematically over many years in a location where a single set of agricultural practices has been followed during that time.

- c) Efficiency: The process of crop production requires a range of inputs and efficiency is the measure of the extent to which those inputs enhance the crop yield. An efficient operation is one where a small level of inputs results in excellent productivity. Inefficient operations are wasteful of resources or other inputs and are in this respect not sustainable. Efficiency in general sense can be measured as a ratio of out (crop yield, or yield of some portion of the crop, expressed in physical units of various types or in monetary value) over input of the particular type selected. One basic efficiency relationship is:

$$\text{Agricultural efficiency} = \frac{\text{Output (Crop)}}{\text{Inputs (Various)}}$$

- d) Durability: Durability often referred to as resilience is fundamentally defined as the ability of the agricultural system to resist stress and maintain a good level of productivity. After a crop is planted it is subject to whatever environmental conditions obtain, and these conditions are not always ideal. The ability of the crop to thrive despite less than ideal conditions is characteristic of a durable system. Durability depends on the specific crop being grown, but more than that it depends on the agricultural system in its totality.
- e) Compatibility: In a broad sense, compatibility refers to the ability of an agricultural system to fit in with the bio-geophysical, human and socio-cultural surrounding in which the system is placed. One thing is certain that human and nature are always intertwined and each influence the other in ways that are sometimes, but not always recognized. So the destruction of any species of natural living or create a threat to the existence of human life in the earth.
- f) Equity: Yet another essential component of a sustainable agricultural system, beyond production of crops in an ecologically favourable manner, is the provision of a good measure of social welfare to individuals of sexes, all ages and all social classes within the agro-ecological setting. All the aspects of agricultural activities must come together to support an adequate and comfortable standard of living. In essence measuring equity is a means of assessing the state of human and social capital in the agro-ecosystem. The term

equity is used here to signify a balanced distribution of the benefits of agriculture to all the members of the community.

#### Status of Sustainable Agriculture in NER and Its Consequences-

The NER states have total geographical area of 2, 55, 090 sq. km out of which 13, 6, 785 sq. km or 54.4% under forest cover. About 3, 7220 sq. km. area or 14.5% of the total area is under cultivation in the region. The region can broadly be divided into three physiographic zones.

These are:

- (i) Hills and mountains of folded topography.
- (ii) Peninsular Plateau and
- (iii) The Plain.

The following table shows the land utilization of NER During the year 2005-06. (All figures are in percentage)

Table-I Land utilization of NER During the year 2005-06

States	Land Under Forest	Land available for cultivation	Net sown area
Assam	24.62	32.28	35.34
Manipur	86.82	1.38	11.44
Meghalaya	42.29	10.21	9.50
Mizoram	82.25	6.92	4.29
Nagaland	54.55	4.77	19.53
Sikkim	43.82	34.34	26.69
Tripura	57.77	12.27	39.16
Arunachal Pradesh	92.92	0.58	15.38

(Source CMIE Report, January 2009)

From the above table it is clear that Arunachal Pradesh having 92.92% is the largest area Assam having smallest area, i.e. 24.62% only land under forest. Similarly regarding land not available for cultivation, Sikkim having 34.34% is the largest area, at the same time Arunachal Pradesh

having 0.58% is the smallest area of the region. Again, in case of net sown area, we have found Assam having 35.34% is the largest area while Mizoram having 4.29% is the smallest area of the NER.

Shifting cultivation, the predominantly form of agricultural prevalence in the regions practiced in about 3869 sq. km. of area annually. As shifting cultivation play predominancy in NER, the region is under severe threat of soil erosion. Appropriate estimated soil loss from shifting cultivation in NER is shown below: (Area in Million/Tonnes)

Table-II Soil Loss from Shifting Cultivation in NER

State	Jhum Area	Total Soil Loss
A.P.	35000.0	15.2
Assam	22819.0	9.9
Manipur	37113.4	16.3
Meghalaya	49074.1	21.3
Mizoram	35660.4	15.5
Nagaland	81153.8	35.5
Tripura	16641.8	7.3
Total	277462.5	121.0

(Source Mishra, 1999)

Apart from shifting cultivation, minor and major land slips and landslides, agriculture on the slopes and another major contribution to the process of soil erosion and land degradation.

On the other hand so far as food security is concerned it is a matter of suspect whether food security can be maintained along with sustainable agriculture. Regarding this, if we look out food production of NER, then we found that in 2000-2001 total food grains production in the NER was 5875 million tonnes, about 3 percent of all India level. The share of the region's population in India is higher at about 4 percent than its 3 percent share of food grain production; the NER has a regional level deficit in food production and is dependent upon food grain from outside in India and abroad. Therefore if we concern sustainable agriculture, then it is evident that sustainable agriculture is to some extent achieved by NER in the comparison of the other states

of the country. Because the agricultural pattern of NER is mechanized very much partially. But on the other side natural calamities, shifting cultivation, faulty type of cultivation are also giving threat to sustainable agriculture in NER. Hence it is comprehensive matter to saying how much sustainable agriculture exists in the region.

Thus, the feasibility of prevailing of environmental degradation as well as ensuring food security, without compromising the natural resources will require efficient and proper management strategies.

#### Problems that are faced in the Way of Maintaining Sustainable Agriculture in NER-

1. Rapid Increase in Population Growth: With the rapid increase in population and to meet the growing demand for food, more and more fertilizer and pesticides are applied in agriculture fields. This gives a threat to sustainable agriculture.
2. Shifting Cultivation: Due to predominance of shifting cultivation in NER, it is under severe threat of soil erosion which gives a threat to sustainable agriculture.
3. Frequent Flood: Flood that occurs frequently, especially in Assam increase salutation of the soil through water logging which is another responsible factor for soil degradation.
4. Traditional Land Use System: The traditional land use system practiced by the small and marginal farmers degrades the soil quality to a large extent, which also gives a threat to sustainable agriculture.
5. Lack of Awareness among the Farmers: Because of narrow outlook and unconsciousness of the farmers, they are not aware about the severe evil effects of environmental degradation.

#### Strategies and Alternatives for Sustainable Agricultural in NER-

Maintenance of sustainability in agricultural is a great challenge not only for NER, but also for the country as a whole. If serious efforts are made to adopt effective and adequate strategies and some remunerative alternatives, the goal can be achieved to a large extent. A variety of philosophies, strategies and practices have contributed to this goal. Few of them can be enumerated as below:



1. **Soil Management Strategy:** For improving soil fertility following practices can be applied in agriculture fields:
  - i) Use of farm composting, mulches and green manure
  - ii) Use of intercropping, strip cropping and crop rotation.
  - iii) Application of physical method such as contour bunds to minimize erosion especially on sloping lands.
2. **Water Management Strategy:** An extensive water storage and transfer system should be established which helps crop production to expand to very arid region. In drought areas limited surface water supplies should be prompted over draft of ground water.
3. **Energy Management Strategy:** Modern agriculture is heavily dependent on nonrenewable energy sources, especially petroleum. The continued use of these energy sources cannot be sustained indefinitely, yet to abruptly abandon our reliance on them would be economically catastrophic. However, a sudden cut in energy would be equally disruptive. In a sustainable agriculture system, there is reduced reliance on non-renewable energy sources and a substitution of renewable sources on labour to the extent, i.e. economically feasible.
4. **Inputs Management Strategy:** Many inputs and practices used by conventional farmers are threatening to sustainability. Inputs should be used in such a manner that it does not need high level material inputs. To be more sustainable over the long term, labour must be acknowledged and supported by Govt. policies, recognized as important constituents of Land Grant University and carefully considered when assessing the impact of new technologies and practices.

Since agriculture related activities are highly desired and cannot be checked overnight, therefore, along with the above strategies we may adopt some remunerative alternatives as soon as possible with the help and support of Govt. agencies. Small scale industries, animal based farming system, agricultural are some other alternative that should be practised in order to improve social economic status of farming community by preserving the national treasure of soil and nutrients. Few workable suggestions are made in this regard as follows.

- a) Tea Plantation and Tea Industry: NER is the world largest tea growing region having 16% share and is the largest producer and exporter of tea in India (share 55%). Tea plants being perennial in nature that can withstand high intensity rainfall and provide the cover to the exposed land surface in turn helping to check the soil erosion to a large extent. Tea growing is being expanded to nontraditional areas of NE region. Tea growing areas needed a boost in the region for resource sustainability and profitability.
- b) Horticultural Crops: Tropical and temperate horticulture in high hills and plain area of the NER offers excellent conditions for development of tropical and temperate horticultural crops.
- c) Dairy Farming: Though dairy farming practiced in NER it is on a minor scale especially by the migrated labourers from the neighbouring states. Sheep and goats are also seen but due to high humidity probably they are not able to withstand the climate pressures. The region due to high rainfall offers great potentials for fodder product around the year for dairy cattle.
- d) Poultry and Duckery: Poultry and duckery are two primary ventures that have vast potential in the region, Tripura, Assam and playing regions of Manipur and Meghalaya can be converted to the poultry production area in the region. Duck can also be promoted for egg and meat purposes. Scientific studies are needed for adopt ducker and poultry.
- e) Cultivation of Medical and Aromatic Plants: North Eastern Himalayan region is the huge biospices having medical plants and aromatic properties. Opportunities can be explored to start the cultivation of such plants spices, which are perennial in nature and do not require disturbing of the land beneath due to weeding.

#### SUGGESTIONS:

- a) Since the majority of people are related to shifting cultivation and it cannot be eliminated completely, therefore policies should be made to improve the shifting cultivation so that adverse effect can be minimized.

- b) Credit Institution should be more effective so that people can go for various alternatives. The developments of transport and communication facilities at a faster rate are also required in this region.
- c) Building up mass awareness among the people and proper motivation to the concerns through dialogues meeting seminar, workshop, conference and publicity in electronic media for whole hearted participation.
- d) Research for optimum utilization of resources, production of value-added products of value-added produces, improve technology for various agriculture activities, improvisation of various indigenous methodology of production are also very much essential.
- e) Last, but not least, rapid increasing in population must be checked both for food security and economic use of existing resources so that resources can be reserved for future generation as far as possible.

#### CONCLUSION:

It is important to point out that reaching towards the goal of sustainable agriculture is the responsibility of all participants in the system including farmers, labourers, policy makers, researchers, retailer and consumers. Each group has its own part to play, its own unique contribution to make to strengthen the sustainable agriculture community.

#### References:

- Sethi, R.M., Nain, G.K.M., Sheshagiri Rao and Singh, R.R.. (1994). Status of Land Degradation in India. *Journal of Soil Water Conservation*. 38 (3 & 4), 163-172.
- Jackson, M.G. (2001). Let Us Take Another Look at Jhum Cultivation. *Asian Agri-history*. 5 (3), 197-223.
- Sharma, U.C. (1996). Yield sustainability and strategies in North-Eastern States. *Productivity*. 36 (4), 680-690.
- N.E.C. (1995). Basic Statistics of the North-East, Ministry of Home Affairs, Govt. of India.
- N.R.S.A. (1995). Report on Area Statistics of Land cover generated using remote sensing techniques. N.R.S.A., Hyderabad, 70.