

Class- B. SC. (Ag.) VI- Semester

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e-lecture on “The Necessity of Sustainable Agriculture”

Intensification of agriculture through massive adoption of modern agriculture depend up on high yielding varieties, increased used of synthetic or chemical fertilizers and pesticides, greater exploitation of natural agricultural resources such as irrigation potentiality of surface and ground water, land resources, labourers and farm mechanization have largely been responsible for spectacular achievement in the food grain production that we have achieved over last few decades. Paradoxically however, over exploitation of natural and renewable resources and indiscriminate and irrational use of inputs like inorganic fertilizers and pesticides in view of producing more and more from unit piece of land are being increasingly realized to serious impair the ecological balance putting environment in jeopardy. This in turn necessitates increasingly huge amount of pesticides to combat pest problems. Indiscriminate use of pesticides has emerged as a potential source of danger to sustainability of environment that endanger the existence of all forms of life on this planet. Perils and pitfalls of pesticides have been well evidenced due to their residual toxicity in our food chain. From a number of trials conducted across the country, toxic residues of pesticides have been found in the food stuff not only of plants but also of animal origin like milk and milk products, fish, meat and egg etc. at concentrations much higher than the permissible level of human body. Therefore, the apparent contradiction of our necessity of nutritional security and economic viability on one hand and environmental sustainability on the other makes it inevitable to resort to the eco- friendly sustainable farming system which fulfill meet both these objectives. Let us we understood the scenario created by green revolution in our country.

Some Highlights of Green Revolution and its Impact in India

Prior to independence, population growth rate was 26% while the growth rate in agriculture was very low i.e. 0.3% and our country was facing great challenges to food security. After independence, in 1951 when first five year plan was promulgated, it focused more attention towards the development of agriculture and a team experts in agriculture from Ford Foundation was invited by the Government of India for advice to boost agricultural production in the country. On the advice of this team 15 districts in the country having most favourable conditions for agriculture were selected and agricultural inputs were liberally provided to these districts. The meagre met with success-encouraged government to extend this Intensive District Development Programme to other districts and a new scheme was designated as Intensive Area Development Programme (IADP). During the year 1962-63 Dr. Norman E. Borlaugh Director, International Wheat and Maize Research Centre, Mexico was engaged to explore mutant of dwarf wheat having great yield potential and response to fertilizers.

The Government of India requested to the Field Director of Rock Feller Foundation, Mexico in year 1963 for crop materials and also for arranging a visit by Dr. N.E. Borlaugh. His team visited different agricultural institutions of the country and greatly impressed with potential, which the dwarf varieties offered for increasing wheat production in India. After returning to Mexico, Dr. Borlaugh sent 100 Kg seeds of each dwarf and semi dwarf wheat varieties for multi locational trials in India.

Indian scientists developed two wheat varieties viz. Kalyan Sona and Sonalika from selection method. In year 1965-66 India imported two million tonnes of wheat seed from U S A, but fortunately, Dr Borlaugh discovered high yielding varieties of wheat seeds at Mexico (CIMMYT). High yielding varieties of rice were discovered by Dr M S Swaminathan and other scientists at

International Rice Research Institute, Manila in Philippines during the same time.

Several suitable varieties of wheat and rice were released for different agro-climatic conditions of the country. These miracle seeds combined with fertilizer application and refined cultivation technologies gave new breakthrough and changed the entire scenario of Indian agriculture. In year 1968, about 18% area and 36% of total production was only due to dwarf wheat and new technologies. This agricultural breakthrough, with similar developments matched in rice and maize production. As observed by **Dr. Borlaugh** :

“Never before in the history of agriculture has a transplantation of high yielding varieties coupled with an entirely new technology and strategy been achieved on such a massive scale, in so short period of time and with such great success.”

In fact, the green revolution in India is neither a stroke of luck nor an accident of nature. The success is based on careful planning and gigantic administration efforts. It was the result of teamwork in which number of scientists and administrators participated. Green revolution was the culmination of an international effort to conquer the problem of hunger. In concrete words “the Indian scientists refined the technology for Indian conditions, administrators made for supply of credits to farmers and organized extension works. Politician made policy decisions and industrialists machines and fertilizers and pesticides.” Finally, the farmers who learnt the new technology; made green revolution a reality by their hard work. however, it was mainly confined to the states of Punjab, Haryana and western U.P. and also in two crops wheat and rice.

Key Factors Responsible for Green Revolution in India

Several factors like awareness of farmers, land reforms in many states, development of co-operative societies, input arrangement policies etc. played vital role in the occurrence of green revolution in India but major three input

factors which played most important role and mainly responsible for this were as follows:

(I) Introduction of high yielding varieties

Introduction of Mexican wheat having dwarf nature increased the production many fold due to unprecedented adaptability, resistant to common diseases and high yielding potentials. Likewise, HYV's played key role in increasing production of rice, maize and several other crops.

(II) Use of chemical fertilizers

These new dwarf wheat varieties were highly responsive to the chemical fertilizers. And, the increment in yield was very much higher than that of local Indian varieties. HYV'S of rice and wheat along with hybrids in maize and other crops arrested a vast area under these crops and some other crops.

(III) Expansion of irrigated area

After introduction of these high yielding varieties government made efforts for development of big and smaller projects, dams and network of canals wherever possible. Government also encouraged the installation of tube wells, pump sets and other irrigation facilities and by providing subsidies etc to farmers. As a result the gross irrigation potential has expanded from the pre plan level of 22 m ha in 1950-51 to over 89 m ha in 2006. The high yielding varieties greatly responded to the irrigation water and the production was multi folded in comparison to prior records. Combining these three major components, Indian agriculture revolutionized and a new scenario emerged in front of the country. In this context, Dr Norman E Borlaugh rightly said;

“If the *high yielding varieties* were the catalysts that ignited the Green Revolution; the *chemical fertilizers* were the fuel that powered its forward thrust and *irrigation* the oxygen that maintained.”

Beneficial Impact of Green Revolution

The impact of green revolution may briefly be described as under:

(I) Rapid increase in crop productivity

The data regarding crop production in our country makes it clear that wheat production after green revolution in 1970-71 increased by than 100 per cent and in year 2000-01 it increased about 12 times over the 1950-51 level. Rice production also increased more than four times along with food grain production. The fast improvement in production and productivity of other crops was also observed but it was not matched with the rice and wheat crop because other crops were considered as secondary during that period.

(II) Self-sufficiency in food security

There was tremendous increase in food grain production during 1965-66 to 1980 and fulfilled the Indian food basket with 200 mt by turning of the century (2000-01) which touched a tune of 284.83 mt during 2017-18. India became self-reliant in food grain production with sufficient buffer stock.

(III) Marginal lands under cultivation

The marginal and low fertile lands steadily shifted to cultivation of crops due to introduction of HYV; technologies, population pressure and industrialization. The net cultivated area in 1950-51 was about 54m. ha. which has increased up to 140m.ha. at present in the country.

(IV) Mechanization of agriculture

Mechanization, like use of tractors, seed drills, planters, ploughs, threshers, tube wells, engines, pump sets, harrows and cultivators and combine harvesters etc. boosted the agricultural production and improved the quality of works as well as produces. Mechanization also helps in saving time and energy in agricultural operations ultimately reduces cost of production.

(V) Crop intensification

Instead of single cropping, HYV's responsive to fertilizers and irrigation made farmers able to grow 2-4 crops/year in a field. It was also possible due to introduction of short duration HYV's of different crops.

(VI) Crop diversification

Due to introduction of high yielding varieties of different crops, farmers motivated toward highly remunerative crops and crop rotation against lower ones. In this regard where irrigation facilities were developed rice-wheat crop rotation became prominent in whole country because of its profitability.

(VII) Commercialization of agriculture

During the green revolution and thereafter farmers attracted towards profitable or cash crops like sugarcane, potato, vegetables, tobacco etc. and farmers adopted widely in vast area of these crops. Agriculture commercialized due to availability of credit, development of roads, marketing facilities and more profit.

(VIII) Development of agro - industries

During the Green Revolution period agro based industries like sugar factory, cold storage, fodder, rice, flower, fruits products emerged steadily and the number is increasing day to day. Thousands people are engaged in agro industries and having employment.

(IX) Availability of agricultural produce at cheaper rate

Due to adequate production of crops, food grains and other agricultural products became available at much cheaper rate to the society and raw materials to agro-industries.

(X) Higher income

Farmer's total income increased with increasing the agricultural production as a whole.

(XI) Improvement in status of farmers

With the commercialization, farmers/cultivators becoming rich to richer. Their standard of living is also increasing in the same manner in which they earned the money from their own business i.e. Agriculture.

Harmful Consequences of Green Revolution

On the cost of food security several harmful consequences emerged during and after green revolution period due to indiscriminate use of inputs and over exploitation of natural agricultural resources. Major consequences during and post period of Green Revolution are as under:

(I) Health Hazards

Residual effect of toxic agro chemicals in food causes various types of diseases in human as well as in animals both.

- (a) **Blue baby Disease** – Undesirable effects of excess nitrate ingestion in food and water cause human health hazards especially babies up to 6 months. Nitrate of fertilizers converted into nitrite in the intestine and absorbed in blood stream. Young babies cannot detoxify it reduces blood O² transportation and skins become blue.
- (b) **Cancer** – Amines create skin cancer when skin expose to ultraviolet radiation of the ozone layer.

(II) Environmental Hazards

Following environmental health hazards are appeared from green revolution and post green revolution period and country is facing a lot of challenges e.g.:

- (a) Ground water contamination
- (b) Eutrophication
- (c) Nitrate poisoning
- (d) Soil pollution
- (e) Acid Rains
- (f) Green House effect
- (g) Atmospheric pollution

(III) Soil Sickness

Due to imbalance of nutrients in soil, it becomes unable to supply nutrients properly.

(IV) Continued deterioration of soil fertility

- (V) Widespread of micro-nutrients deficiency
- (VI) Destruction of soil properties and susceptibility to soil erosion.
- (VII) Imbalance in production
- (VIII) Weeds as menace
- (IX) Stagnation in crop yields
- (X) Substitution of nutritious crops by cash crops caused loss of biodiversity
- (XI) Development of resistance against insects, pests and diseases
- (XII) Decline in profit due to increase in cost of cultivation
- (XIII) Deterioration in quality of produce
- (XIV) Products do not meet international standard
- (XV) Decline in the availability of per capita arable land.
- (XVI) High-risk investments
- (XVII) Increasing suicidal cases of farmers

Science and technology have helped man to increase agricultural production from the natural resources like, land, water, environment, crops and labours etc. But the realization that this has been achieved at the cost of the nature and environment, which support human life itself, is becoming clear. It has been fully evident that the present pattern of agricultural production system, which ignores the economic viability and ecology and environment, cannot sustain the achievement of man without substantial erosion of factors that support life system of all living things on the earth.

Besides these, a lot of other effects have seen in Indian agriculture by the Green Revolution. According to WHO, due to globalization of trade the Indian market is facing big competition. Today the different concern and problems of modern agriculture gave birth to the **concept of Sustainable Agriculture**. Therefore, it is felt to adopt an alternative agriculture for sustainability in production and soil health. The essential practices for long term sustainability of agriculture remains same i.e. **back to nature**. This sustainability can be achieved by adopting new agricultural concepts of farming such as **organic**

farming, natural farming, biodynamic agriculture, holistic farming, ecological farming etc.

In this perspective a quotation of **Mahatma Gandhiji** is appropriately fitted here. He had said, “**Nature provides for everybody’s needs but not everyone’s greed**”.
