FEATURES OF TROPICAL AGRICULTURAL SYSTEMS

Dr. V. K. Venugopal
Former Professor & Head
Department of Soil Science and Agricultural Chemistry College of Agriculture, Vellayani
Consultant Digital University, Kerala

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Trends in Tropical Agriculture

- Pressure of world population explosion exerted more on the people of developing countries.
- To confront the pressure of world population explosion farmers, researchers and extension workers were compelled to join the Seed – Manure revolution born with the label of Green Revolution
- The aim of this Revolution was to provide food for the increasing population by enhancing the harvest per unit area and the intensification of number of cultivation seasons.
- Green revolution practices, introduced in late 1960s resulted in significant increase inr agricultural production .
- High yielding hybrid seeds introduced during Green Revolution were new to our environment and farmers had to practice new techniques to get higher production

- Hybrid seeds required greater nutrients and more prone to pest, and diseases
- Greater use of chemical fertilizer, pesticides and weedicides in large quantities were additional burden to farmers.
- .Hybrid varieties being dwarf in nature could not compete with weeds.
- Application of weedicides or manual weeding was essential to mitigate weeds, adding to the cost of cultivation.
- From land preparations to harvesting all agricultural practices, related to hybrid varieties were more labor intensive involving greater cost..

High External Input Agriculture

Definition:

High external input Agriculture (HEIA)include technologies that utilize high external inputs such as chemical fertilizers , pesticides to control pests and diseases, herbicides to control weeds and irrigation facilities for water management. All these technologies bring about substantial yield increase but are often beyond the financial reach of the small - holder farmers.

Advantages of High External Input Agriculture (HEIA)

1. Agricultural Production could be rapidly increased to meet the demand for food for the increasing population.
2. Availability of adequate food materials diminished many problems related to diseases caused by mal-nutrition nutrient syndromes

3 Improved varieties gave yields within a short period of time.

4. Mechanization solves the problem of labour shortage.
5. Income and profit margins of the products were increased.
6. Productivity of land increased.
7. Increased market facilities for production

Disadvantages of HEIA

1. Increase in soil erosion due to constant furrowing by machinery.
2. Dependence on imported machinery, chemical fertilizer, pesticides, hybrid seeds and other inputs.
3. Extensive use of pesticides disturbed the natural mechanism of controlling pest and diseases as the artificial pesticides kill both pests and their natural enemies.
4. Use of artificial agro-chemicals adversely affected the soil pH, cation exchange capacity, soil structure, and reduce microbial activities destroying the life of soil
5. Although the need for high capital investment, large scale farmers benefited while small scale farmers with poor capital accumulated debt.
6. Introduction of hybrid varieties and neglect of environment friendly traditional varieties and their genetic resources caused their extinction along with conventional agricultural knowledge and techniques

Low External Input Agriculture

- The world food production tremendously increased as a result of High external input agricultural practices introduced by green revolution.
- The result was excessive capital, unsustainability of the systems and negative impact on the environment, and other associated problems
- Therefore development of an agriculture system using lesser external inputs, less expensive and environmental friendly has become a need of the hour

Definition

- Low-External-Input and Sustainable Agriculture (LEISA) is agriculture which makes optimal use of locally available natural and human resources such as soil, water, vegetation, local plants and animals, and human labor, knowledge and skill and which is economically feasible, ecologically sound, culturally adapted and socially justice.

Objective

LIESA System is to maintain the agricultural production at an optimum level using less external inputs in a eco- friendly environment.

LIESA practices concentrate heavily on the following factors

- Maintaining a living soil.
- Creating biodiversity
- Recycling of resources
- Natural Pest management.
- Inclusive of forest trees

LIESA is based on the following principles

- Creating a favorable condition for growth and sustenance of plant by stimulating soil microorganisms as far as possible and adding organic matter sufficiently.
- Maintaining nutrient at optimum level assuring the balance of nutrients in soil by Nitrogen Fixation, recycling and utilization of nutrients available in the deep layers and addition of external fertilizer as and when necessary to complement deficiencies
- Controlling the micro climatic conditions to minimize loss of resources, due to sunlight, air and water. use of biological and mechanical methods to prevent soil erosion
- Minimizing loss of resources caused by pests and diseases. Integration of Pest control methods giving priority to natural biological control of pests by natural enemies on the principle that prevention is better than eradication.
- Promoting biodiversity

Some LEISA Techniques and Practices

Soil and water conservation management

- Terraces and other physical structures to prevent soil erosion
- Contour planting
- Hedge rows and living barriers
- Conservation tillage
- Mulches, cover crops.

Soil fertility enhancement

- Manures and composts
- Biomass transfer and green manures

Control of weeds and pests

- Intercrops and rotations
- Integrated pest management

Low input technologies organic farming

- Organic farming technologies in managing soil fertility include use of plant ash, cattle manure, green manure, mulching, urine-manure slurry and other organic manure inputs
- Intercropping to reducing the risk of total crop failure, mixtures of cash and food crops to be included in the system

Cover crops and Green manures

- A crop grown to provide soil cover to prevent erosion by wind and water, regardless of whether it is later incorporated.
- Green manuring helps to supplement nutrients organic matter, improves physical properties and microbial activity of soil
- Cover crops and green manures are generally annual, biennial, or perennial herbaceous plants grown in a pure or mixed stand during all or part of the year, and as such can be seen as a special case of intercropping
- Catch crops also called cover crops are fast growing growing planted following the main crop, to specifically reduce losses of nutrients especially nitrogen by leaching

Cereals and pulses low input pest control methods

- Growing crops like cowpea , marigold helps to prevent nematode infection similar pest repellent crops have been identified for specific situations to control pests like weevils and beetles.
- A number of herbal products have been identified for pests of various crops and are being commonly used by farmers.

Crop residue management and conservation tillage

These practices minimize nutrient loss, increase water storage capacity, crop damage, and improve soil quality

- Specific types of conservation tillage are minimum tillage, zero tillage or no till, ridge-till, mulch-till, reduced-till, strip-till, rotational tillage and crop residue management are commonly practiced

Integrated pest management (IPM)

- Use of resistant varieties
- Crop rotation
- Cultural practices
- Optimal use of biological control organisms
- Certified seed
- Protective seed treatments
- Disease-free transplants or rootstock
- Timeliness of crop cultivation
- Improved timing of pesticide applications

Reference

Daniel H. Janzen ,1973, Tropical Agro-ecosystems, in Science , Vol. 182, No. 4118, American Association for Advancement of Science


Thank You