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INTEGRATED INTENSIVE FARMING SYSTEMS (IIFS) AND ITS COMPONENTS

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INTRODUCTION

Technologies of the green revolution are frequently linked to environmental damage. Due to genetic homogeneity in the high-yielding hybrid crop varieties grown over wide, contiguous areas, increased susceptibility to pests and diseases is also a contributing factor to this damage, as is the overuse of chemical pesticides and mineral fertilizers. The per capita availability of land and water is steadily declining as the population grows. Higher productivity per unit of land and water is therefore essential. Owing to the environmental issues associated with conventional green revolution technologies, a few different production pathways must yield higher productivity per unit of land and water. We will need to produce more, but in a different way. Lack of productive employment is the cause of large segments of the population's inadequate purchasing power. Many times, modern industry does not require a lot of labour, so new jobs in rural areas must be found in the farm and non-farm sectors. Increasing productivity is economically necessary given the conditions of small holdings. Only a larger marketable surplus and multiple sources of income can increase a family's income. Increasing productivity is also ecologically necessary because it prevents the clearing of remaining forests for agricultural land.

WHAT IS INTEGRATED INTENSIVE FARM?

Aquaculture, dairy farming, poultry farming, hydroponics, algaculture, and the production of bio-fertilizers are all integrated in an integrated intensive farm. Compared to regular individual intensive farms, the benefits of integrating different types of intensive farming are greater. By-products from one system can be utilised in another system under the integrated farm model. The water used in intensive aquaculture has a high concentration of nitrates and carbon dioxide, which can be used to grow algae in an algaculture to produce high-value products and essential fatty acids. Aquaculture can make use of the alga culture's purified water. Cattle, fish, and poultry can be fed biomass derived from hydroponics and algal cultures. Microorganisms use the manure from dairy farms and the litter from poultry farms to create bio-fertilizer. The products produced by this integrated intensive farm are in high demand and command a high price in the market. The production of microalgae-derived high-value products is combined with traditional integrated farming. Productivity in intensive farming is enhanced by maintaining ideal growth conditions and making efficient use of available resources.

INTEGRATED INTENSIVE FARMING SYSTEMS

The agriculture sector can achieve an evergreen revolution with the help of the IIFS methodologies. Agribusiness intensification, diversification, and value addition are all components of the integrated farming system, according to Prof. M. S. Swaminathan, Chairman, M. S. Swaminathan Research Foundation (MSSRF), Madras. It contributes to increasing both the financial and physical accessibility of food, which in turn promotes sustainable food security for every member of a household. According to him, it is critical to emphasise individual food security in light of the growing feminization of poverty.

Utilizing farm resources intensively is a component of integrated intensive farming systems. For an intensification to be ecologically sustainable, it must rely on knowledge-intensive rather than capital-intensive techniques that, to the greatest extent feasible, substitute biological inputs grown on farms for chemical inputs purchased from the market. This type of input change is the result of integrated farming, which combines agro-forestry, fisheries, and animal husbandry. Organic recycling is made possible by this type of integrated farming system practice, which is the second component of the IIFS strategy. The establishment of bio-refineries to add value to all portions of plant and animal biomass is the third component of the strategy. Then, a symbiotic relationship between employment on and off farms can be established. IIFS seeks to decrease the number of hours worked and increase the economic value of each hour of work for farmwomen, who are inevitably overworked due to their multiple roles in a household, according to Dr. Swaminathan.

COMPONENTS OF IIFS

The following section discusses the seven IIFS components.

1. Soil Health Care:

A key component of sustainable intensification is healthy soil. The farming system includes blue green algae, Azolla, *Sesbania rostrata*, and other symbiotic and non-symbiotic nitrogen fixation sources. One of the key components is vermiculture. For the effective recycling of organic residues, enhanced composting techniques are employed in addition to bio-fertilizers. Small amounts of powdered neem cake and green leaf manures are used. These organic supplements stop de-nitrification, ammonia volatilization, and other processes from removing nitrogen from fertiliser. To save money on long-distance transportation, these heavy organic supplements must be produced on the farm.

2. Water Harvesting and Management:

Agronomic practices include rainwater conservation techniques so that rainwater can be used in conjunction with other water sources. It is essential to do the final ploughing across the slope and to plant the crop there. To maximise the benefits from the available water, the greatest emphasis is placed on adopting drip and sprinkler irrigation systems and improving the efficiency of on-farm water use. It is best to refrain from using the aquifer unsustainable. Cooperative management of command areas and watersheds is required to ensure economy, efficiency, and equity in the use of water.

3. Crop Management:

One crucial element is the integrated supply of nutrients. There are several ways to provide plant nutrients, including chemical

fertilisers, crop residues, organic manures, and biofertilizers. Only the balance that the crop needs is supplemented with chemical fertilizers; all other potential sources of nutrients are utilised. The selection of an integrated nutrient supply must take into account the local soil, agro-ecological conditions, and farming system. High yielding varieties and hybrids must be raised. It is imperative that the farming system's composition be carefully considered. The selection of crops, farm animals, and aquaculture systems will depend on a number of factors, including soil quality, water availability, agroclimatic features, household requirements, and most importantly, marketing prospects. Among farm animals, ruminants both small and large have an advantage because they can primarily subsist on crop biomass. Land-saving agriculture and grain-saving animal husbandry must be the cornerstones of IIFS.

4. Pest Management:

One element is the integrated pest management system. Numerous beneficial bacteria, including *Pseudomonas fluorescence*, and antagonistic fungi, like *Trichoderma viride*, are employed to manage a range of pathogenic infections in a diverse range of crops. They can be applied to roots and used for treating seeds. Additionally, they can be used straight on the fields. Farmers use a variety of botanical pesticides to either repel or eradicate pests, including neem derivatives, *Vitex nigundo* extracts, custard apple seed oil, and numerous decoctions of native plants. Toxic pesticides are substituted with biological control agents like parasites and predators. Additionally, a variety of bacterial and viral agents are available for efficient plant protection. Companion planting, trap cropping, using pheromones, and using light traps are other cultural practices that are useful. It is also essential for communities to work together to eradicate rodents and control a few crop pests.

5. Energy Management:

Energy is a necessary input. Maximizing the utilization of biogas, biomass, solar, and wind energy sources should be the goal. In hybrid configurations with biogas, solar and wind energy will be utilised for agricultural tasks like water pumping and grain and produce drying.

6. Post Harvest Management:

Adopting threshing, storage, and processing procedures is recommended. It is necessary to produce value-added products from every part of the plant or animal. When it comes to perishable goods like fruits, vegetables, dairy, meat, eggs, fish, and other animal products, post-harvest technology becomes crucial. Producers and consumers are impacted when production and post-harvest technologies are out of sync. An increase in urbanization causes dietary habits to diversify. As a result, processed food and animal products will see a rise in demand. The basis for promoting the agro processing industries must be consumer demand. To create more jobs, these processing industries ought to be supported in villages. To supply high-quality food to domestic consumers for export, investments in sanitary and phyto sanitary measures are crucial. For the purpose of providing roads, storage facilities, communication, and sanitary and phyto sanitary measures, the government must invest heavily. The idea of bio-refineries and the efficient use of agricultural residues would be worthwhile and revenue-generating

endeavours. By properly drying the produce with solar dryers and storing it in storage structures designed to withstand rodent, insect, and fungal attacks, grain losses can be avoided. The village itself can produce a range of finished goods using the crop residues and by-products. This will lead to jobs outside of farms.

7. Information, Skill Organisation and Management Empowerment:

The success of the IIFS system depends on a relevant, efficient information and skill empowerment system. Few centralised essential services, like the provision of seeds, bio-pesticides, and disease diagnosis and control techniques, will be necessary to support decentralised production systems. Farmers must receive up-to-date information on marketing, management, and meteorological factors. Key components include organisation and management. Depending on the region and farming system, measures must be taken to give small producers access to the advantages of scale in processing and marketing.

ADVANTAGES OF IIFS

- Farmers in IIFS report lower production costs for a variety of agricultural commodities when compared to the modern farming system.
- IIFS has higher annual net returns per unit area and per unit investment in land and water.
- IIFS is a sound integration of climate-resilient crop and livestock mix supported by eco-friendly technology.
- It guarantees sustainable soil health improvement and prevents water pollution. It gives farming families guaranteed job opportunities and income throughout the year.
- For the younger generation of farmers, IIFS offers an economically viable and intellectually stimulating alternative. It can also aid in slowing the migration of people from rural to urban areas.
- For farming families, the IIFS provides security of income and nutrition.
- For rural landless people, IIFS encourages more non-farming opportunities.

CONCLUSION

The best way to develop IIFS is through scientific and farmer participation in research. IIFS can be successful if it is a programme driven by people first, not technology. The cooperative relationship that exists between farmers and the natural resources they are endowed with lands, water, forests, flora, fauna, and sunlight is the fundamental component of IIFS. Without adequate public policy support in areas like land reform, tenure security, rural infrastructure, input and output pricing, and marketing area, small farmers will find it extremely difficult to implement IIFS. The path to attaining the objectives through agricultural diversification, intensification, and value addition in a way that is environmentally, economically, and socially sustainable is shown by the IIFS methodology. If appropriately executed, an integrated intensive farming programme can lead to a sustainable revolution in the green economy through the introduction of naturally reinforcing packages of technology, trade, training, and infrastructure.