

Integrated Farming System: A Smart Solution for Profitable and Eco-Friendly Farming

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ABSTRACT

Integrated Farming System (IFS) offers a sustainable solution for today's agricultural challenges, especially for small and marginal farmers. By combining crops, livestock, fishery, poultry and other enterprises, IFS maximize the use of available resources, minimizes waste and provides year-round income. This eco-friendly model reduces dependence on chemicals, enhances productivity and recycles farm residues, turning one enterprise's waste into another's input. With climate change, declining soil health and rising costs threatening traditional farming, IFS stand out as a smart, holistic approach. It not only supports environmental sustainability but also boosts food security, employment and economic resilience making it an ideal model for the next generation of farmers and agricultural enthusiasts.

INTRODUCTION

Nowadays, farmers are subjected to a high degree of uncertainty in their income due to their heavy on a single enterprise. India needs to adopt a “well designed” Integrated Farming System (IFS) to overcome this problem (Patra and Samal, 2018). Therefore, farmers have to diversify their farming to get a more sustainable income as if one fails, another one can provide income. The integration of various agricultural enterprises such as cropping, animal husbandry, fishery, poultry, etc. has great potential in the farming economy. This also helps in reducing wastage of output from one enterprise as it can be used as an input for another one.

Problems of present-day agriculture systems in India

- ❖ Decline in agriculture growth rate
- ❖ Decline in productivity
- ❖ Shrinkage in the net cultivable area
- ❖ Increasing environmental pollution
- ❖ Depleting groundwater table
- ❖ Increased cost of production
- ❖ Low farm income
- ❖ Problems of farm labours due to large scale migration
- ❖ Climate change and Variation in rainfall

INTEGRATED FARMING SYSTEM

Integrated systems involve bringing crops and livestock into an interactive relationship with the expectation that together, as opposed to alone, they will generate positive effects on outcomes of interest, such as profitability, overall productivity, and the conservation of non-renewable resources (Aditya *et al.*, 2017).

It is, however, much more than this. The “system” includes the environment, soil characteristics, landscape positions, genetics, and ecology of plants and animals. It also involves management practices, goals and lifestyles of humans, social constraints, economic opportunities, marketing strategies and externalities including energy supplies and costs and impacts of farm policies. Systems also reflect natural resources available and the impact of their use, wildlife issues, target and non-target plant and animal species, micro-organisms, and indeed all of the definable and indefinable factors that ultimately interact to result in an outcome that is never constant.

Integration of various farm enterprises within a farm ensures growth and stability in overall productivity and profitability. It also ensures recycling of residues, optimization of resources, minimization of risk and generation of employment. Various enterprises that can be included in farming system are crops, vegetables, fruits, flower cultivation, dairy, poultry, fishery, goat, pig, sericulture, mushroom cultivation, agroforestry, bee keeping, silviculture, agro-based industries and food processing. A judicious mix of enterprises that are complementary to cropping and suited to the given farm situation and the farmer's preference would bring overall prosperity.

Under farming system, the farm is viewed in a holistic manner. Farmers are subjected to various socio-economic, bio-physical, institutional, administrative and technological constraints. Conceptually, a Farming system is a set of elements or components that are inter-related which interact among themselves. At the centre of this interaction is the farmer, who exercises control and make choices regarding the type and outcomes of the interaction.

CONCEPT OF INTEGRATED FARMING SYSTEM (IFS)

Integrated farming system (IFS) is a broadly used term that explains the suitability of a more integrated approach towards farming over monoculture approaches. In this system an inter-related set of enterprises are maintained and the by-products or wastes from one production system becomes an input for another production system, which reduces cost and improves production and/or income. Thus, IFS work as a system of systems. FAO states that 'there is no waste', and 'waste is only a misplaced resource which can become a valuable material for another product' in IFS (Sahu *et al.*, 2017). For example, paddy straw, a by-product of rice crop can be used as a valuable input for mushroom cultivation or as dry fodder for dairy animals. Similarly spent of mushroom cultivation (used straw) can be used as a raw material in compost or vermicompost pits and by-products from dairy unit like dung can be used as fish feed or as raw material for a vermicompost unit. The farming system is essentially cyclic, organic resources - livestock - land - crops. Therefore, management decisions related to one component may affect the others. The integrated livestock-farming system not only ensures ecological sustainability and economic viability but also improves agricultural productivity to some extent.

ROLE OF INTEGRATED FARMING SYSTEM

The IFS approach, as a biophysical and socio-economic capsule has immense potential to address instability of income, food and nutritional insecurity, unemployment, vulnerability and poverty among farmers as well as landless labourers. The urgency for addressing issues of livelihood security and mainstreaming the rural poor into benefits of production technologies and development process in an integrated manner in the target

districts needs no emphasis. This calls for establishing synergy and complimentary to both at production system levels and beyond production, farm activities to non-farm activities.

OBJECTIVES OF INTEGRATED FARMING SYSTEM

- a) To integrate different production systems like dairy, poultry, livestock, fishery, horticulture, sericulture, apiculture etc., with agriculture crop production as a base.
- b) To increase farm resource efficiency (land, labour, products/by-products) so as to increase farm income and gainful employment opportunity.
- c) To maintain environmental quality and ecological stability.
- d) To ensure effective recycling of farm residues within the system.
- e) To maintain sustainable production system without damaging resources base environment.

GOALS OF INTEGRATED FARMING SYSTEM

- ❖ Maximize yield of all component enterprises to provide steady and stable income.
- ❖ Rejuvenation of system's productivity and achieve agro-ecological equilibrium.
- ❖ Avoid build-up of insect-pests, diseases and weed population through natural cropping system management and keep them below ETL i.e. Economic Threshold Limit.
- ❖ Reducing the use of chemicals (fertilizers and pesticides) to provide chemical free healthy produce and environment to the society.

- ❖ To maintain sustainable production system without damaging resources/environment.

IDEAL SITUATIONS FOR INTRODUCTION OF IFS

- ❖ The farmer wishes to improve the soil quality
- ❖ Soil salinity has increased as a result of inorganic fertiliser use
- ❖ Water is stored on-farm in pond or river charged outflow areas
- ❖ The farmer is wishing to maximise profits on existing holding
- ❖ The farmer is looking to reduce chemical control methods

ELEMENTS OF INTEGRATED FARMING SYSTEM

- ❖ Farm ponds
- ❖ Bio-pesticides
- ❖ Bio-gas
- ❖ Bio-fertilizers
- ❖ Solar energy
- ❖ Vermicompost making
- ❖ Green manuring
- ❖ Rainwater harvesting
- ❖ Watershed management

COMPONENTS OF INTEGRATED FARMING SYSTEM

The components of IFS include Agriculture, fish farming, horticulture, duck rearing, forestry, pigeon rearing, mushroom cultivation, sericulture, Azolla farming, dairy, kitchen gardening, poultry, fodder production, goat rearing, nursery, sheep rearing, seed production, piggyery, vermiculture.

The different types of IFS are:

- (1) Crop-livestock farming system
- (2) Crop-livestock-duckery farming system
- (3) Crop-livestock-poultry-fishery farming system
- (4) Crop-poultry-fishery-mushroom farming system
- (5) Crop-fishery- duckery farming system
- (6) Crop-livestock-fishery-vermicomposting farming system
- (7) Crop-livestock-forestry farming system
- (8) Agri-silvi-apiary farming system.

SCOPE OF INTEGRATED FARMING SYSTEM

- ❖ Integrated farming enterprises include crop, livestock, poultry, fishery, tree crops, plantation crops etc.
- ❖ A combination of one or more enterprises with cropping when carefully chosen, planned and executed, gives greater dividends, than a single enterprise especially for small and marginal farmers.

FACTORS INFLUENCING INTEGRATION OF FARM ENTERPRISES:

- ❖ Soil and climatic features of the area
- ❖ Availability of resources, land, labour and capital
- ❖ Present level of utilisation of resources
- ❖ Economics of proposed integrated farming system.
- ❖ Managerial skill of the farmer

INTEGRATED FARMING SYSTEMS RESEARCH NETWORK IN INDIA

Indian Institute of Farming Systems Research (IIFSR) was established by Indian Council of Agricultural Research (ICAR), at Modipuram, Meerut, Uttar Pradesh. Earlier, in 1968-69 it

was known as Project Directorate of Cropping System Research and the project was operating as All India Coordinated Agronomic Research Project (AICARP). During the year 2009-10 the PDCSR was renamed as Project Directorate of Farming Systems Research (PDFSR). The AICRP-IFS has 74 centres, i.e., 31 main centres, 11 sub centres and 32 on-farm centres.

Vision: Management of natural resources for the holistic improvement of small and marginal farmers through Integrated Farming Systems.

Mission: Improve food, nutrition, livelihood and financial security of small and marginal households through Integrated Farming Systems

On Station Research

- ❖ To undertake applied and adaptive research in Integrated Farming Systems (IFS), especially on production technologies for improving system productivity and resource use efficiencies.
- ❖ To develop efficient, economically viable and environmentally sustainable IFS models for different zones.

On Farm Research

- ❖ To undertake characterization of existing farming systems for identification of production constraints and problem prioritization.
- ❖ To optimize on-farm integration of farm enterprises for enhanced farm incomes, resource/input use efficiencies, and employment opportunities.

ADVANTAGES OF INTEGRATED FARMING SYSTEM

- ❖ **Productivity:** By virtue of intensification of crop and allied enterprises, IFS provide

an opportunity to increase economic yield per unit area per unit time.

- ❖ **Profitability:** The use of by-product of one component as the input of other reduces the cost of production as well as eliminates middleman interference thereby increasing the B/ C ratio.

- ❖ **Potentiality or Sustainability:** Organic supplementation through effective utilization of by-products of linked component provides an opportunity to sustain the potentiality of production base for much longer periods.

- ❖ **Balanced food:** The linkage of various components having different nutritional value enables to produce a complete and balanced source of nutrition.

- ❖ **Environmental safety:** Adoption of IFS minimizes the environment pollution to a great extent as the waste materials of one component becomes the input of other.

- ❖ **Recycling:** Effective recycling of waste material.

- ❖ **Income round the year:** The interaction of enterprises with crops, eggs, milk, mushroom, honey, cocoons silkworm provides income to the farmer throughout the year which reduces the financial crisis in the farmer's family.

- ❖ **Adoption of new technology:** Big farmers fully adopt the new technologies by the linkage of dairy / mushroom / sericulture / vegetable etc. which provides money flow round the year. This motivates the small/ original farmers to go for the adoption of technologies.

- ❖ **Meeting fodder crisis:** Every piece of land area is effectively utilized. Plantation of perennial legume fodder trees on field

borders not only fixes the atmospheric nitrogen which upgrades the land fertility but also minimizes the problem of non – availability of quality fodder to the animal component.

- ❖ **Employment generation:** IFS provides ample scope to employ family labour whole round the year. The integration of different components in IFS would increase the labour requirement significantly which in turn reduces the problems of unemployment to a great extent.
- ❖ **Agro – industries:** When the produce of one component in IFS are increased to commercial level then the produce of other components gets surplus adoption which leads to development of allied agro – industries.
- ❖ **Increased input efficiency:** The use of inputs in different components of IFS shows greater efficiency and high benefit cost ratio.

LIMITATIONS OF INTEGRATED FARMING SYSTEM

- ❖ Unavailability of varied farming system models
- ❖ Lack of knowledge/education among the farming community
- ❖ Non-availability of ensured marketing facilities especially for perishable products.
- ❖ Lack of animal feed throughout the year and unavailability of labour in needy times are the major constraint
- ❖ Resource poor farmers are not able to invest more capital as initial investment
- ❖ Lack of scientific knowledge on crop production and animal rearing

CONCLUSION

Sustainable development is the one of the ways to promote the rational utilization of resources and environmental protection without affecting economic growth and Integrated Farming Systems hold a special position as in this system nothing is wasted, the by-product of one system becomes the input for others. India has considerable livestock, poultry and crop wastes. IFS is a promising approach for increasing overall productivity and profitability through recycling the farm by-products and efficient utilization of available resources. About 95% of the nutritional requirement of the system is self-sustained through resource recycling. As the number of enterprises is increases, the profit margin also increase. It can further generate year-round employment opportunities for farming communities and provide better economic and nutritional security. This can go a long way in uplifting rural life through increased income.

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