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7. Integrated Farming System: Key for Economic Stability of A Farm

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Abstract:

IFS is an effective interdisciplinary whole-farm approach for tackling the problems encountered by small and marginal farmers. By integrating numerous agricultural enterprises and reusing crop by-products and leftovers on the farm itself, the method seeks to increase income and employment from small holdings. The farmers need to be guaranteed a consistent income to live at least slightly above the poverty line. Production must advance or output must steadily rise to address the challenges posed by the current economic, political, and technological environment. Farming practices and ways of thinking are always evolving. Productivity improvement could be a key factor in ensuring food and nutrition security for a huge population. This entails implementing cutting-edge agronomic practices and technology that promise to increase the productivity of conventional agricultural systems. Agronomic practices like the liberal application of inorganic pesticides and fertilizers during the 20th century significantly increased productivity, however adverse environmental degradation and rising operating costs in agriculture raised questions about the viability and sustainability of the agricultural industry. Around 75% of the households reside in rural areas of emerging countries where their means of livelihood are reliant on agriculture and related activities, either directly or indirectly. Unsustainable agriculture affects the livelihood of millions of small farmers and causes environmental damage. In order to increase income and food and nutrition security in developing nations, agricultural production systems must be strengthened for greater sustainability and higher economic returns.

Keywords:

Small and marginal farmers, consistent income, diversification, sustainability, increased productivity, livelihood. "Agriculture is the most healthful, most useful and most noble employment of man."

– George Washington

7.1 Background of Integrated Farming Systems:

Technical scientists and social scientists did not communicate much in the middle of the 1960s. As a result of the adoption of better varieties of wheat, rice, and maize that were quite responsive to fertilizer, good climate (i.e., favourable temperature) and soils, and very homogeneous and favourable environment of production, and these factors, the Green Revolution was starting to have a significant amount of success in Asia and Latin America (Grote, 2021). Additionally, improved inputs were easily accessible, and the products could find a market. There hasn't been a Green Revolution, nevertheless, across the majority of Sub-Saharan Africa and several regions of Latin America and Asia. This is due to the fact that the climate is frequently unfavourable.

Farmers in Green Revolution regions were able to profit from the better technologies even if they did not do things exactly as they should have and their inputs were highly scalable (for example, they could use a small amount of enhanced fertilizer or seed or a large amount). To succeed, farmers must follow exact procedures (such as planting in moist soil) and use lumpy inputs (such as control over traction) in less hospitable environments, such as the low rainfall regions found in many African and Latin American nations. Additionally, yield increases are not ideal because they frequently involve minor adjustments in yields rather than major (i.e., revolutionary) ones. Thus, experiment station-based technical scientists had great success in their work in the regions of the Green Revolution due to the technology's amazing capabilities. The FSR approach, which involves close collaboration between technical and social scientists, was developed as a result of the failure to use a similar strategy in agriculturally underdeveloped regions (i.e., with resource-poor farmers) (Norman, 1993).

Integrated farming systems (IFS) appear to be a promising remedy for small and marginal farmers with limited resources to meet the demand for food production's sustainability, income stability, and improvement in nutrition (Korikanthimath, 2009). With crop activity as the foundation, the integration of various agriculturally related enterprises will offer ways to reuse the output and waste of one component as an input for a connected component, improving soil health and lowering production costs, ultimately increasing the farm's overall income.

A farming system is a method of managing resources that aims to produce agricultural products economically and sustainably in order to satisfy a variety of farm household needs while preserving the resource base and upholding the good quality of the environment (Oberč *et. al.,* 2022).

The benefits of integrated farming systems include the sharing and pooling of resources and inputs, the effective use of household labour, the preservation, use, and conservation of agricultural biomass, including the effective application of FYM, the control of soil fertility and health, the creation of income and employment for a large number of people, and the improvement of economic status through the efficient and profitable use of underutilized resources. Finding and implementing acceptable farming systems is necessary due to population pressure on the land which is causing division and fragmentation of land holdings (Korikantimath and Manjumath, 2008).

The main objective of the farming system approach is to raise the income and living standards of marginal and small farmers by integrating agroforestry, horticulture, dairy, sheep and goat rearing, fishery, poultry, pigeon, biogas, apiculture, sericulture, mushroom and crop by-product utilization (Kumar *et. al.,* 2012).

The difficulty comes in continuously improving social and technological disciplines and integrating them to fit the region and homestead families in a way that can guarantee higher production with stability, ecological sustainability, and equity.

The technical viability and financial viability of integrated farming systems have been proved in experiments conducted in a variety of environments, including low land, irrigated upland, and upland. IFS can be practised in a variety of ways with varying degrees of intensity depending on socioeconomic structure, soil characteristics, farmer choice, and, most crucially, farmer resource availability (Rahman and Sarkar, 2012).

In addition to making it easier to earn money, these farming system models create more jobs for family members and reduce the risk connected with traditional cropping systems.

7.2 Introduction:

Any nation's wealth is directly correlated to its population's wealth. The fundamental necessities of today include food, clothes, health, housing, education, security, roads, power, and clean water. Produced by farmers. In India, agriculture accounts for more than 60% of all employment. India's economic growth would therefore be reliant on the well-being of its farmers. The use of superior technology and the wise distribution of resources (land, labour, money, machinery, etc.) are necessary for this. In accordance with the Economic Survey of India, between 1990 and 2007, the food grain's growth output slowed to 1.2%, which is less than the 1.9% population growth. By 2030, 1370 million people are expected to live in our country, and by 2050, 1600 million people. We must produce 289 and 349 mt of food grains throughout the corresponding periods in order to meet the demand for the future. According to the country's current situation, by 2030, non-agricultural uses might replace existing agricultural uses, causing the area under cultivation to decline by more than 20% (Gill *et al*., 2005).

An Integrated Farming System (IFS) is a mutually dependent and interconnected system of production based on various crops, livestock, and allied subsidiary innovativeness to amplify the utilization of nutrients from each system of farming. It limits the negative impact of these enterprises on nature (Vikaspedia, n.d.). It imitates the natural ecosystem by maintaining the concept of a food chain, creating a food web and agro-ecosystem in a specific, confined area.

This whole-farm management method, which is based on the nutrient cycle, strives to provide more sustainable agriculture. It is a diversified approach applied to any farming system worldwide. It includes consideration of detail and continuous enhancement in all areas of farming production through well-versed administrative measures. Integrated farming combines the best contemporary equipment and methods with regionally appropriate traditional techniques.

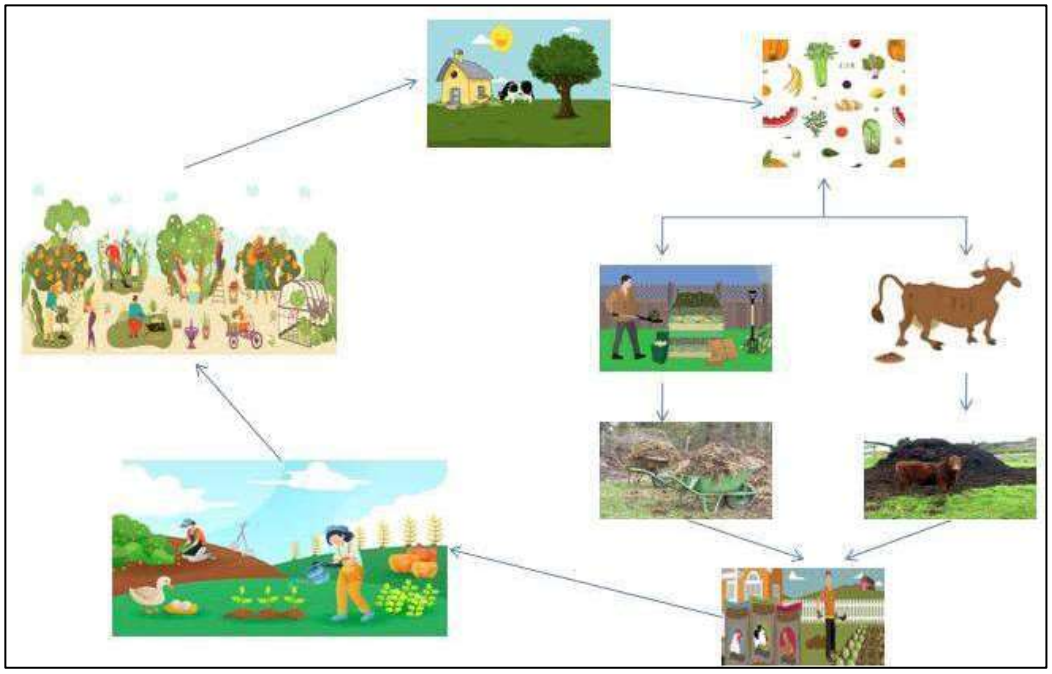

Figure 7.1: Integrated Farming system plan. ***(Source: Haobijam, et. al., 2022)***

7.3 Concepts of Integrated Farming System:

According to Okigbo (1995), an IFS is a mixed agricultural system made up of at least two autonomous but conceptually linked components of a crop and livestock enterprise. According to Jitsanguan (2001), the IFS is a system of aquaculture that is integrated with livestock and in which fresh animal waste is used to feed fish.

Additionally, there are synergies and complementarities between enterprises that comprise a crop and animal factor that serve as the foundation of the IFS concept. The phrase "farming arrangement" refers to a grouping of agricultural businesses where the owners distribute funds for the effective use of definite activities to increase farm output and profitability. Some of these farm enterprises include agriculture, agroforestry, livestock, aquaculture, horticulture, and sericulture. (singh, 2004).

IFS is described as a farming system component by (Radhamani *et al.*, 2003) that improves the utilization of organic wastes and crop residues from the field while also enhancing productivity and reducing risk and profit.

According to (Jayanthi, 2006), IFS is a part of FRS (agricultural System Research), which introduces a change in agricultural practices for boosting crop yield and ensuring excellent resource utilization. According to (Panke et al., 2010), the product, With a high degree of complementarity effects, the input or output of one enterprise or component should be the output for the other enterprises.

7.4 Goals of Integrated Farming System:

The four primary goals of IFS are.

a. Maximising the output of all component companies to provide consistent and sustainable revenue is the first of IFS's four main goals.
b. Reaching agroecological equilibrium and revitalizing/improving the productivity of the system.
c. Use cropping techniques to naturally control weeds, and disease, and reduce the number of insect populations and their intensity.
d. reducing the usage of chemicals (fertilizers and pesticides) to give the community healthy food and a chemical-free environment (Manjunatha, 2014).

7.5 Basic principle of Integrated Farming System:

Farming was practiced in conjunction with livestock animals, and the use of the land, water, and plants was maximized. A more connected manner of farming than one-way farming techniques is referred to as an integrated farming system. The term "integrated bio-systems" can refer to a system of agriculture that manage the output of fish and livestock, as well as livestock and crops.

In this system, "waste" is inputted from one component to another through a network of connected businesses. Costs are decreased, while productivity and/or income are increased. Farmers achieve a general rise in the production of the whole farming system by using trash as a resource, in addition to eliminating waste.

New integrated farming techniques include Crop rotation, zero tillage, site-specific nutrient management, conservation technology, usage of bio-fertilizers, integrated nutrient management, and agricultural systems are some examples of nutrient management techniques. that enable farmers to monitor their operations in relation to a farm's productivity and profitability as well as the profitability of entire farms.

By utilizing the right cropping techniques, such as rotation of crops, mix cropping and intercropping, there will be less competition for water, food, and space, which is the primary objective of an integrated agricultural system.

Additionally, ecologically friendly practices will be used. by employing a multi-story design that maximizes the use of all available space and fosters strong interactions between both abiotic and biotic components.

The elements influencing the execution of IFS:

- Characteristics of the soil and climate in particular locations; Availability of resources and labour on the land.
- The present rate of resource consumption.
- The economics of premeditated integrated farming.
- Farmer's leadership skills.

7.6 Essentials of Integrated Farming System:

In regions with only one crop grown annually, regions with little irrigation, and regions with little precipitation, agriculture combined with livestock raising not only gives family members extra sources of income and career prospects throughout the year, but also reduces the cost of fertilizers by using livestock excrement as manures. increased agricultural yields; soil fertility was preserved. Feed costs will be brought down by using crop waste as livestock fodder. By integrating agriculture with the production of fodder and Azolla, we can increase the advantages of growing animals. Small and marginal farmers make up more than 80% of all farmers in our country who own less than one hectare of land. Therefore, small and marginal farmers can grow legumes like Pillepesara and Stylo as well as fodder like millet, corn, and forage grasses like Co-4 and guinea grass as well as to feed animals on portion of their property. Crop rotation allows small-scale farmers with one hectare of land to divide it into 0.8 hectares for farming and 0.2 hectares for the production of fodder, resulting in greater profits from farming, meat, and milk, allowing them to make a greater profit.

7.7 Advantages of an Integrated Farming System:

The IFS method modifies farming practices to enhance crop productivity and make the best use of available resources. Assures that agricultural trash is recycled in a coordinated manner for industrial uses. Depending on the agroclimatic conditions and socioeconomic position of the farmers, a practical mix of agribusinesses, such as fishery, poultry, piggery, dairy, silk farming, etc., can bring prosperity to agricultural operations (Kumar, 2012). Increasing food production to meet the demands of our nation's rapidly expanding population. Relatively active recycling of animal waste from dairy, pig, poultry, and other sources can reduce environmental pollution while also increasing farm income. lowering input costs by reusing waste from linked activities. Through the production of goods like eggs, meat, milk, vegetables, silkworms, and cocoons, integrated farming can bring in a consistent income. Animals will have access to nutrient-rich fodder as a result of techniques like border cropping and intercropping that are used in the cultivation of fodder crops. Energy-saving - By supplying substitute fuel sources as by-products of various industries, the IFS system efficiently decreases the further dependency on fossil fuels as a source of energy. In order to address the fodder shortage, perennial fodder trees can be established on the farm's property. The nitrogen that these bean trees fix for the soil is also used to produce high-quality animal feed.

IFS is used to produce fuel and industrial wood, therefore resolving the fuel and timber crisis. Additionally, it lessens deforestation and aids in maintaining the natural ecosystem. Employment Creation: By combining livestock and agricultural businesses, more jobs will be available and the need for labour will rise. Agro-businesses - The growth of the country's agribusiness and agro-industries is also greatly aided by the production of agricultural goods in IFS. Increased input efficacy - As reliance on external inputs like fertilizers, food, agrochemicals, and energy has decreased, this farming system's input efficiency has increased dramatically. The farmer makes money all year long because to the range of enterprises in IFS. It has a favourable impact on aspects of farmers' lifestyles like food, housing, health, and education.

One of the most significant advantages of integrated farming is the enhanced production system. A rise in productivity is defined as an increase in economic harvest in each unit area each unit over time due to the cropping intensity and associated farming operations. The profit margin rises along with productivity. This is due to the fact that we are dumping waste or by-products from one farming operation into another. Utilizing cutting-edge technology is one of an integrated agricultural system's main advantages. This is due to the high cost of implementing modern technology. The resources of large farms make it simple for them to adapt. But small farmers frequently experience financial difficulties.

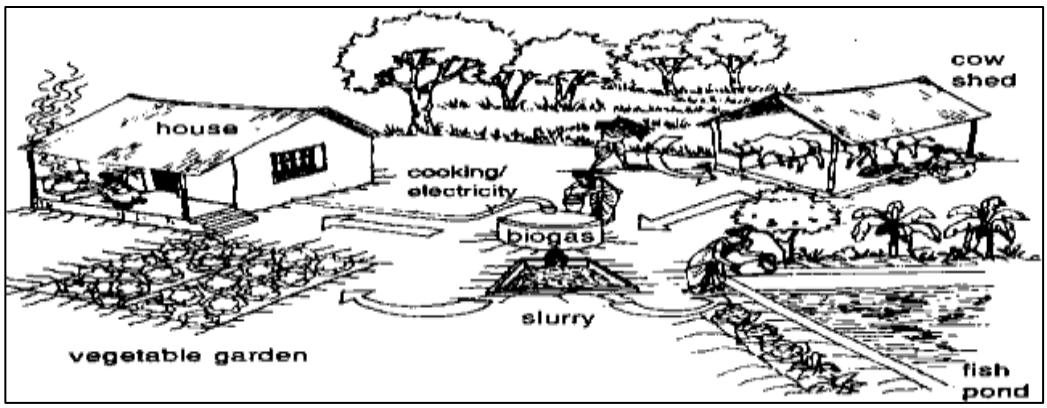

Figure 7.2: Example of Rural IFS Model

Farm productivity is rising, which results in more economic output per unit of time and space. Profitability increases due to lower production costs caused by waste recycling. Farm production is integrating and/or incorporating more economically significant components, which enhances sustainability.

7.8 Components of Integrated Farming System:

A. A: Crops for planting, flowers, forage and fodder crops, agricultural forests, sugarcane, fiber crops, cereals, legumes, oilseeds, fruits, vegetables, and spices.
B. B: Animals and poultry, including cows, buffaloes, pigs, goats, sheep, chickens, and ducks
C. C: Paddy cum Fish Culture, Composite Fish Culture, and Fingerling Production.
D. D: Secondary Agriculture - Examples of secondary agriculture include apiculture, mushroom, food processing, vermicomposting, biogas generation, Azolla, and silk growing. It is possible to develop an integrated farming system by integrating the aforementioned four components (A + B, B + C, A + C, A + D, B + D, C + D, A + B + C, B + C + D, A + B + D). Agrarian policy to rise the total output and sustainability of IFS.

- Adapting a more productive agricultural system based on the amount of rainfall and soil moisture that is available.
- Selecting the appropriate cereal crop varieties, tree species that produce pods or leaves continuously throughout the year.
- Additional fodder leaves, crop leftovers, etc. should be preserved as silage or grass throughout the lean season (summer) and wet season.

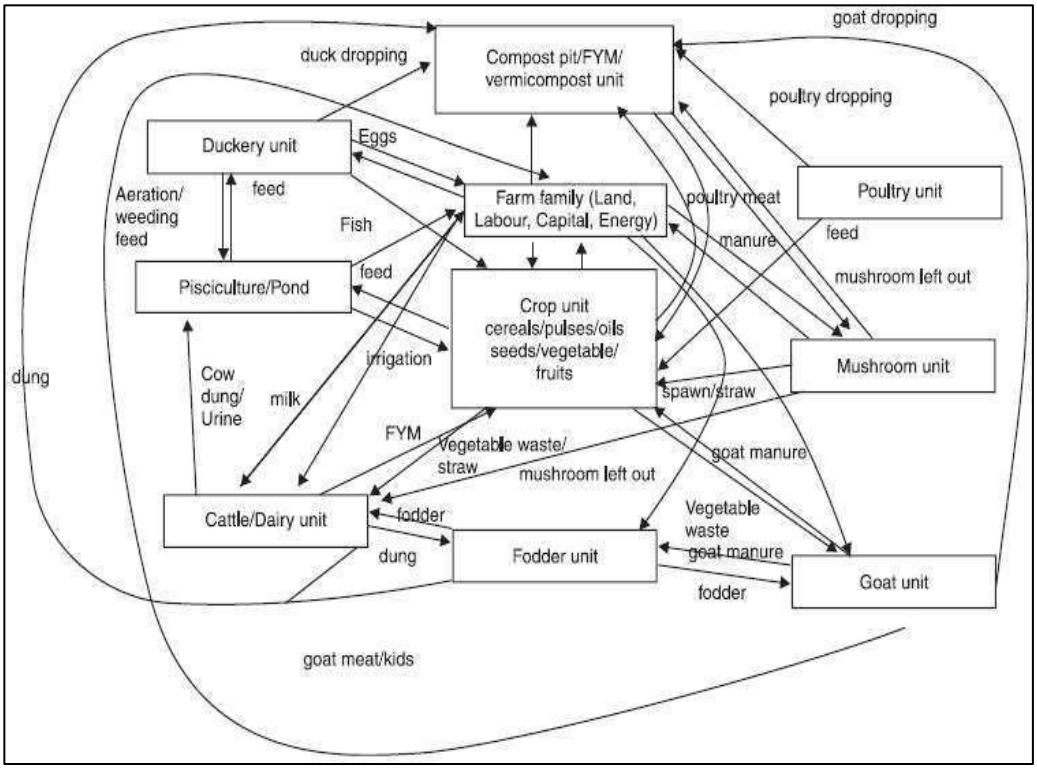

Figure 7.3: The input-output flow of a well-designed integrated farming system
Source: Kumar et al (2018)

7.9 Integrated farming system models:

Depending on the local environmental factors, integrated farming can take on many different forms. Rao (1996) suggested different types of integrated farming systems and a few of them have been mentioned below

7.9.1 Fish and livestock integrated system:

The raising of livestock and fish using similar farming techniques is an illustration of integrated farming. Farm leftovers like leaves, stalks, or other waste materials can be given to fish.

Additionally, livestock manure that accumulates around fish farms can be used to grow plankton, which is a significant source of food for fish. Silk warms (also known as sericulture) can be increased close to fish farms.

The pupae and other waste fish can then be fed the silkworm. Fish pond silt is greatly sought after by farmers as it makes excellent manure and fertilizer for land crops. As a result, integrated farming has a multicultural perspective that respects the environment and offers financial resources for sustainable growth.

7.9.2 Fish-duck integrated farming:

Ducks are quite compatible with farmed fish, therefore raising them in fish ponds works well with the fish culture method. Farmers can gain from this arrangement in a variety of ways. The ducks fertilize the pond with their waste when given free range at the pond's surface. Due to their effective manner of producing pond manure, ducks have been referred to as manuring machines. 60% of the overall expense is made up of culture (Saikia, *et. al.*, 2020).

Ducks help in exhausting soil nutrients, managing aquatic vegetation, loosening the pond's bottom with their shells, and improving the productivity of the pond. Ducks are biological aerators because they acerate the water as they swim.

On the pond's edge, duck houses have been constructed. Therefore, duck activities don't need any additional land. Ponds provide the majority of the food that ducks need in the form of larvae, aquatic grasses, insects, earthworms, and other such things. Farmers typically offer kitchen garbage, molasses, and rice bran for this purpose as they require relatively little food.

7.9.3 Cattle-fish integrated farming:

It is very nutritious and is used for cleaning both urine and livestock barns. You can feed fish with the leftover cattle feed. Building cattle sheds on the fish pond's broad embankment will allow trash and laundry to run right into the fish pond. For a 1.0-acre pond, 5 to 6 cattle will be adequate.

7.9.4 Integrated fish farming with agriculture:

Fish farming and gardening together Growing - To meet the daily fruit needs of a household of 4-5 persons, 200 m2 of land is normally needed. A larger area than 200 m2 is frequently enclosed by fish pond embankments. Ponds make up roughly 25 to 33% of the land used for farming (Chakrabarti, 2014).

7.9.5 Fish farming with vegetable farming:

Normally, 200 square meters of land are needed. Fish pond embankments offer greater space for kitchen gardens and are necessary. In a single year, two vegetable crops can be grown. Vegetables including okra, bitter gourd, beans, eggplant, french beans, cucumber, pumpkin, cauliflower, tomato spinach, peas, and others are thought to be perfect for growing on the backs of ponds.

7.9.6 Integrated fish farming with rabbit farming:

The rabbit home is constructed with embankments in the rabbit-fish integration so that trash and laundry may be dumped right into the pond. The pond's 1.0 hectares can be fertilized with the excretions of 300–400 rabbits. It is feasible to generate 3500–4000 kg of fish by stocking 15000 fingers per acre each year.

7.9.7 Integrated Fish with pig farming:

It has evolved a scientifically accurate and financially successful pig farming and fish culture production method for Indian environments. Pig compost is either thrown into the pond directly or taken out of the animal house and thrown into the pond. On or very close to the back of the pond, there are pig stalls built. Because it increases the biological activity of the water, which in turn encourages fish growth, pig dung is the ideal fertilizer for ponds. Furthermore, fish directly consume pig waste, which is a 70% digestible source of food for fish. Pond muck and fish food are no longer required with this configuration.

7.9.8 Integrated fish-horticulture/agriculture farming:

In this type of farming, the growing of horticulture/agricultural crops on the dyke of the pond was done to utilize the maximum use of the limited space with maximum return. As dyke of ponds accounts for about 25-33 % of the farm area, by growing fruits, vegetables, pulses, and oilseeds on the dykes, the required fruits and vegetables of the family can be met along with earning extra income by selling them. In this system of farming, the recommended fish species are such as *Channa marulius*, Common carp, C. *strialus* and tilapia, and the recommended fruit crops maybe a banana, papaya, coconut, lemon, guava, etc. and vegetable were bitter guards, French beans, pumpkin, tomato, cucumber, bottle gourd, brinjal, lobia, lady's finger, tomato, cauliflower, cabbage, peas, and spinach (Haobijam & Souvik, 2020).

7.9.9 Integrated fish-chicken farming:

In this type of farming, meat from a chicken or egg reduced the cost of feed and fertilizer in fish culture resulting in maximum return from minimum input. The chicken shelter was mostly built over or adjacent to the fish ponds, and the excreta from the chicken was recycled as fertilizer and fed to the fishponds. An effective method of building a chicken shelter above the pond resulted in maximizing the use of space and reducing the labour work for transporting manure into the ponds. As recommended, stocking about 500 to 600 poultry chickens/ha was sufficient to fertilize an area of one hectare of waterbody under integrated farming with fish. As the production manure from the chicken was around 50kg/daily (0.10-0.08 kg excreta/bird/year daily, 36.5-29.2 kg/bird/year). The production from this type of farming was about fish around 4500 to 5000 kg/ha/year, about 70000 eggs, and chicken meat of about 1000 kg/year.

7.10 Integrated farming system: Higher income, economic stability and sustainability:

7.10.1 Enhanced income:

IFS offers the chance to use a component's output as the least expensive input for another component. Eliminating middlemen's influence in the majority of the inputs utilised increases profitability per rupee invested by lowering production costs. In Asian mixed farming systems, small ruminants like goats and sheep fill a crucial ecological and economic niche.

Asia is home to 20% of sheep and 60% of goats, respectively. In India, goat sales account for 30% of all farm income. The results of the IFS study in Tamil Nadu are fascinating. A little farm of 2 acres generated an additional Rs 12,000/- in revenue from its 6 goats. In the Delta and Northwestern districts, In the rainfed black soil regions of Southern Tamil Nadu, tree legumes like Acacia senegal (Gum Arabic tree), Leucaena leucocephala (Subabul), Prosophis cineraria (Khejri), and perennial fodder grass produced an additional revenue of Rs 12,500 per year from a farm area of 1.6 ha. According to studies, crops and animals makeup around a third of the typical net income for agricultural households. Small landowners were better suited to maintaining livestock to generate additional money for the farming family (Hashmi, 2003). According to reports, the use of poultry and dairy-based integrated agricultural systems over cropping alone resulted in a 148% increase in return.

7.10.2 Employment generation:

One of the primary factors to be taken into account when evolving any farming system is gainful employment. On a tiny plot of land measuring 1.25 ha, the Over the course of two years, IFS study in Bhubaneshwar added 573-man days of employment in the fields and horticulture, fisheries, duckery, poultry, , mushroom, apiary, dairy, and agro-forestry (Tarai, *et. al.,* 2016). One hectare of coconut farming in Kasargode needed 150-man days., and when dairy-based integrated farming was introduced, that number rose to 1000-man days. Cropping produced 400-man days on its own, compared to 904-man days in integrated farming systems having six buffalo.

Raising cows and buffalo required a lot of family labour and provided small and marginal farmers with significant employment opportunities. Under integrated farming practises, a herd of 200 goats provided two people with year-round full-time employment. The adding of 270 poultry birds to a crop cum poultry firm was found to boost labour utilisation in integrated agricultural systems by 182%.

Cropping alone produced 245-man days, but integrated farming systems with sericulture produced 598-man days annually from one hectare (Surve, 2014).

7.10.3 Nutrient recycling:

Applying pigeon and poultry manure that has been recycled or composted along with inorganic fertilizer, A notable increase in the post-harvest accessible NPK nutrients can significantly enhance soil fertility status, even with higher nutrient removal through crop absorption (Al-Suhaibani, 2021). It improved soil fertility and gave better opportunities for manure to be recycled into crops when nitrogen was applied as 50% fertilizer and 50% goat dung. Continuous dairy farming strategies increase the availability of nutrients and organic carbon in the soil.

7.10.4 Alternate land use options:

IFS provides alternatives to traditional crop production methods that are more appropriate for places where subsistence farming is practised in delicate ecosystems because they have more promise and flexibility in land usage.

7.10.5 Agri-silvicultural system – lesser risk:

In order to meet the ecological and socioeconomic needs of the population, agro-forestry is a system of integrated, self-sustaining land management that includes woody perennials alongside agricultural crops, such as pasture/livestock, either simultaneously or in order on the same unit of land. Tree farming may replace hazardous farming, especially in dryland regions, because of the low initial cost, the intercropping's guaranteed seasonal revenue, and the accessibility of a range of raw materials to support cottage industries.

7.10.6 Agri-horticultural system – additional income:

Fruit-based systems of cropping are recognized for their capacity to generate income, create jobs, and defend against crop failure during drought years. Trees like the *Annona squamosa*, *Eugenia jamolana*, and *Psisdium gujava* can coexist with maize, sorghum, and cowpea. Agrihorticulture methods provide the maximum benefit-cost ratio when compared to yearly harvesting under Alfisol's rainfed settings.

7.10.7 Silvi/hortipastural system-improved) sustainability:

One of the agroforestry techniques that integrates fruit trees with grazing is horticulture. The trees suitable for the system are *Acacia Senegal and Prosopis cineraria*, while the grasses include *Cenchrus glaucus* and *Cenchrus ciliaris*. Guava, custard apple, and mango are compatible forage crops with Stylo and Cenchrus. In Tamil Nadu's southern region, it was discovered that the gross revenue and B: C ratio achieved from black gram + neem, black gram + tamarind, sorghum + neem, and sorghum + tamarind, were sustainable.

7.10.8 Land Reclamation and Integrated Farming System:

Seven million hectares of land in this nation are thought to be affected to varied degrees by soil salinity and sodicity. The afflicted areas' agricultural production is being hampered by such poor soils. The farmers continue to plant crops without using soil reclamation techniques and have extremely low crop yields since they are typically uninformed of the severity of the issue. 0.85 million hectares of land are damaged by salt , primarily scattered in the Midnapore and 24 Parganas districts, In terms of the distribution of saline-sodic soils, West Bengal comes in third, behind UP and Gujarat. Only the Sundarbans areas of the 24 Parganas district make up 94% of the State's salt-affected land.

7.11 Limitations in Integrated Farming System:

Lack of improved varieties, cultivars or breeds of livestock, lack of knowledge, particularly on the components of feed, and the potential for supplemental use of their own produce are some restrictions. Other restrictions include high initial investment, particularly in the acquisition of businesses, participation in cross-disciplinary activities like Lack of better cultivars, varieties, or breeds of livestock, as well as problems with fishing, horticulture, forestry, and other related industries.

7.12 Conclusion:

It is already evident that the most vulnerable populations, children aged 1-5 and women expecting babies, can immediately benefit from the poorest households' ability to lift themselves out of extreme poverty, especially when the effort is routed via females. The main objective is to build systems to feed depending on the use of regional assets must be taken into account of socio-economic aspects. In accordance with the "ladder concept," attention should be given to mini livestock which includes, cattle, ducks, pigs, chickens, goats, and sheep while still recognizing regional and cultural variation. Animal and plant wastes added as organic residues may also help the soil become healthier, which will raise productivity and not have any detrimental effects on the environment. On-farm research is a process that is ongoing. Farmer experimentation has always resulted in locally relevant technologies. Excellent "researchers" and "extensionists" are frequently farmers. The greatest strategy to combine research and extension is in this manner. Faster and a "natural selection" of technologies and priorities occur when research is conducted on farms. In some circumstances, it is beneficial if an "on-station" study is conducted in addition to on-farm research. It enhances space utilization and also increases the production per unit area. It offers a variety of goods. The use of cover crops, organic compost, and proper crop rotation increases the fertility and physical structure of the soil. Due to appropriate crop rotation, weeds, insect pests, and illnesses are reduced. Utilizing livestock waste and crop residues reduces the need for external inputs such as fertilizers, chemicals, fodder, and energy. Higher net returns to the family's land as well as imputed labour resources, but there must be a clear grasp of how this relates to the realities of the farmer's situation.

Innovative prospects for preserving and enhancing biodiversity exist thanks to integrated farming systems. Such systems place more focus on resource utilization optimization than they do on system component maximization. By combining the knowledge and continuous inputs of farmers, students, scientists and researchers, and from other nations with similar eco-sociological conditions, i.e. through an integrated farming system, the welfare of poor farmers can be improved.

Our main obligation is to address the youth of today. It will be crucial to give young people a platform to cater to the needs of farming systems that are professional and business-oriented. Additionally, the management of knowledge-intensive farming systems will benefit greatly from the involvement of highly educated and skilled youth. By enhancing their skills through advanced training, the youth population will be better equipped to establish supply chains for primary and secondary agriculture. The only way to keep young people in agriculture is to create microbusiness models since they provide opportunities for a regular, sustainable income. Youths from metropolitan regions with connections to the rural system may be lured to work in rural areas by farming systems that are highly productive, commercially successful, environmentally friendly, and sustainable. This may stop transmigration in its tracks and encourage agroecological tourism.

7.13 Future scope for integrated farming system:

A database on farming systems must be created in relation to the various types of farming systems, infrastructure, economics, and sustainability. Farming systems with a range of holding sizes, as well as those that are more or less economically viable or widely accepted,

require the creation of new research modules. Refinement at a research station on a cultivator's field of the techniques developed there. Weather inclinations and climate threats must be anticipated and a contingency plan formulated to address them. A policy structure must be created for planners to take into account in order to promote it widely while using only a small amount of cash, such as short-, medium-, or long-term financing as well as other promotional incentives.

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