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Doubling Farmers Income through Livestock Based Intergrated Farming System

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Introduction:

All over the world, farmers work hard to earn their living. However, not all the farmers make money, especially small family farmers. There is very little leftover after they pay for all their inputs (seeds, livestock breeds, fertilizers, pesticides, energy, feed, labor, etc.). The emergence of integrated farming systems (IFS) has enabled farmers to develop a framework for an alternative development model to improve the feasibility of small sized farming operations. It refers to agricultural systems that integrate livestock and crop production or integrate fish be known as integrated bio systems. In this system, an inter-related set of enterprises is used so that the "waste" from one component becomes an input for another part of the system. This reduces costs and improves production and/or income. Since it utilizes waste as a resource, farmers not only eliminate waste but they also ensure an overall increase in productivity for the whole farming system. Adopting the integrated farming system approach will definitely help in the doubling of farmer's income.

Fish - livestock farming systems:

Fish- livestock farming systems are recognized as highly assured technology where predetermined quantum of livestock waste obtained by rearing the livestock in the pond area is applied in pond to raise the fish crop without any other additional supply of nutrients. The main potential linkages between livestock and fish production concern use of nutrients, particularly reuse of livestock manures for fish production. The term nutrients mainly refer to elements such as nitrogen (N) and phosphorus (P) which functions as fertilizers to stimulate natural food webs rather than conventional livestock nutrition usage such as feed ingredients. Both production and processing of livestock generate by-products that can be used for aquaculture. Direct use of livestock production wastes is the most widespread and conventionally recognized type of integrated farming. Production wastes include manure,

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urine and spilled feed; and they may be used as fresh inputs or be processed in some way before use.

Based on the type of livestock used for integration there are many combinations in livestock-fish systems. Some of the combination are listed and discussed below.

Cattle-Fish Culture:

Manuring of fish pond by using cow dung is one of the common practices all-over the world. A healthy cow excretes over 4,000-5,000 kg dung, 3,500-4,000 liter urine on an annual basis. Manuring with cow dung, which is rich in nutrients results in increase of natural food organism and bacteria in fishpond. A unit of 5-6 cows can provide adequate manure for 1 ha of pond. In addition to 9,000 kg of milk, about 3,000-4,000 kg fish/ha/year can also be harvested with such integration.

Pig-Fish system:

The waste produced by 30-40 pigs is equivalent to 1 ton of ammonium sulphate. Exotic breeds like White Yorkshire, Landrace and Hampshire are reared in pig-sty near the fish pond. Depending on the size of the fishponds and their manure requirements, such a system can either be built on the bund dividing two fishponds or on the dry-side of the bund. Pigsties, however, may also be constructed in a nearby place where the urine and dung of pigs are first allowed to the oxidation tanks (digestion chambers) of biogas plants for the production of methane for household use. The liquid manure (slurry) is then discharged into the fishponds through small ditches running through pond bunds.

Pig dung contains more than 70 percent digestible feed for fish. The undigested solids present in the pig dung also serve as direct food source to tilapia and common carp. A density of 40 pigs has been found to be enough to fertilize a fish pond of one hectare area. The optimum dose of pig manure per hectare has been estimated as five tones for a culture period of one year. Fish like grass carp, silver carp and common carp (1:2:1) are suitable for integration with pigs.

Pigs attain slaughter maturity size (60-70 kg) within 6 months and give 6-12 piglets in every litter. Their age at first maturity ranges from 6-8 months. Fish attain marketable size in a year. Final harvesting is done after 12 months of rearing. It is seen that a fish production of 3,000 kg/ha could be achieved under a stocking density of 6,000 fish fingerlings/ha in a culture period of six months.

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Poultry-Fish Culture:

Poultry raising for meat (broilers) or eggs (layers) can be integrated with fish culture to reduce costs on fertilizers and feeds in fish culture and maximize benefits. Poultry can be raised over or adjacent to the ponds and the poultry excreta recycled to fertilize the fishponds. Poultry housing, when constructed above the water level using bamboo poles would fertilize fishponds directly. In fish poultry integration, birds housed under intensive system are considered best. Birds are kept in confinement with no access to outside. Deep litter is well suited for this type of farming. About 6-8 cm thick layer prepared from chopped straw, dry leaves, saw dust or groundnut shell is sufficient.

Poultry dung in the form of fully built up deep litter contains: 3% nitrogen, 2% phosphate and 2% potash, therefore it acts as a good fertilizer which helps in producing fish feed i.e. phytoplankton and zooplankton in fish pond. So application of extra fertilizer to fish pond for raising fish is not needed. This cuts the cost of fish production by 60%. In one year 25-30 birds can produce 1 ton dip litter and based on that it is found that 500-600 birds are enough to fertilize 1 ha water spread area for good fish production. Daily at the rate of 50 kg/ha water spread area poultry dung is applied to the fish pond.

Duck-Fish Culture:

A fish-pond being a semi-closed biological system with several aquatic animals and plants, provides excellent disease-free environment for ducks. In return ducks consume juvenile frogs, tadpoles and dragonfly, thus making a safe environment for fish. Duck dropping goes directly in pond, which in turn provides essential nutrients to stimulate growth of natural food. This has two advantages, there is no loss of energy and fertilization is homogeneous. This integrated farming has been followed in West Bengal, Assam, Kerala, Tamil Nadu, Andhra Pradesh, Bihar, Orissa, Tripura and Karnataka. Most commonly used breed for this system in India is the ‘Indian runners’.

It is highly profitable as it greatly enhances the animal protein production in terms of fish and duck per unit area. Ducks are known as living manuring machines. The duck dropping contain 25 per cent organic and 20 percent inorganic substances with a number of elements such as carbon, phosphorus, potassium, nitrogen, calcium etc. Hence, it forms a very good source of fertilizer in fish ponds for the production of fish food organisms.

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For duck-fish culture, ducks may be periodically allowed to range freely, or may be put in screened resting places above the water. Floating pens or sheds made of bamboo splits may also be suspended in the pond to allow uniform manuring. The ducks may be stocked in these sheds at the rate of 15 to 20/m2. It is better if the ducks are left in ponds only until they reach marketable size. Depending on the growth rate of ducks, they may be replaced once in two to three months. About 15-20 days old ducklings are generally selected. The number of ducks may be between 100 and 3,000/ha depending on the duration of fish culture and the manure requirements.

Livestock-crop production system:

An "integrated crop-livestock system" is a form of mixed production that utilizes crops and livestock in a way that they can complement one another through space and time. The backbone of an integrated system is the herd of ruminants (animals like sheep, goats or cattle), which graze a pasture to build up the soil. Eventually, sufficient soil organic matter builds up to the point where crops can be supported. Animal can also be used for farm operations and transport. While crop residues provide fodder for livestock and grain provides supplementary feed for productive animals.

		
Azolla Unit (Green Fodder)	**Napier Bajra (Green Fodder)**	**Gunea Grass (Green Fodder)**

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Solar based drip system	**Biogas Plant**	**Vermi compost units**

Animals play key and multiple roles in the functioning of the farm and not only because they provide livestock products (meat, milk, eggs, wool, and hides) or can be converted into prompt cash in times of need. Animals transform plant energy into useful work: animal power is used for ploughing, transport and in activities such as milling, logging, road construction, marketing, and water lifting for irrigation. Animals also provide manure and other types of animal waste.

Animal excreta have two crucial roles in the overall sustainability of the system:

Improving nutrient cycling: Excreta contain several nutrients (including nitrogen, phosphorus and potassium) and organic matter, which are important for maintaining soil structure and fertility. Through its use, production is increased while the risk of soil degradation is reduced.

Providing energy: Excreta are the basis for the production of biogas and energy for household use (e.g. cooking, lighting) or for rural industries (e.g. powering mills and water pumps). Fuel in the form of biogas or dung cakes can replace charcoal and wood.

One key advantage of crop-livestock production systems is that livestock can be fed on crop residues and other products that would otherwise pose a major waste disposal problem. For example, livestock can be fed on straw, damaged fruits, grains and household wastes. Integration of livestock and crop allows nutrients to be recycled more effectively on the farm. Manure itself is a valuable fertilizer containing 8 kg of nitrogen, 4kg of phosphorus and 16 kg of potassium per ton. Adding manure to the soil not only fertilizes it but also improves its structures and water retention capacity.

Advantages of Integrated Farming System:

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Productivity: IFS provides an opportunity to increase economic yield per unit area per unit time by virtue of intensification of crop and allied enterprises especially for small and marginal farmers.

Profitability: Cost of feed for livestock is about 65-75% of total cost of production; however use of waste material and their byproduct reduces the cost of production, conversely it is same for the crop production as fertilizer requirement for crop is made available from animal excreta no extra fertilizer is required to purchase from outside farm as a result the benefit cost ratio increases and purchasing power of farmers improves thereby.

Sustainability: In IFS, subsystem of one waste material or byproduct works as an input for the other subsystem and their byproduct or inputs are organic in nature thus providing an opportunity to sustain the potentiality of production base for much longer periods as compare to monoculture farming system.

Balanced Food: All the nutrient requirements of human are not exclusively found in single food,to meet such requirement different food staffs have to be consumed by farmers. Such requirement can be fulfilled by adopting IFS at farmer level, enabling different sources of nutrition.

Environmental Safety: In IFS waste materials are effectively recycled by linking appropriate components, thus minimize environment pollution.

Recycling: Effective recycling of product, byproducts and waste material in IFS is the corner stone behind the sustainability of farming system under resource poor condition in rural area.

Income Round the year: Due to interaction of enterprises with crops, eggs, meat and milk, provides flow of money round the year amongst farming community.

Saving Energy: Cattle are being used as a medium of transportation in rural area. More over cow dung is used as such a burning material for cooking purpose or utilized to generate biogas thereby reducing the dependency on petrol/diesel and fossil fuel respectively, taping the available source within the farming system, to conserve energy.

Meeting Fodder crisis: Byproduct and waste material of crop are effectively utilized as a fodder for livestock (Ruminants) and product like grain, maize are used as feed for monogastric animal (pig and poultry).

Employment Generation: Combining crop with livestock enterprises would increase the labour requirement significantly and would help in reducing the problems of under

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employment to a great extent IFS provide enough scope to employ family labour round the year.

Conclusion:

It has been accepted by everyone across the globe that sustainable development is the only way to promote rational utilization of resources and environmental protection without hampering economic growth. Developing countries around the world are promoting sustainable development through sustainable agricultural practices which will help them in addressing socio-economic as well as environmental issues simultaneously. Within the broad concept of sustainable agriculture "Integrated Farming Systems" hold special position as in this system nothing is wasted, the byproduct of one system becomes the input for other. It refers to agricultural systems that integrate livestock and crop production. Moreover, the system help poor small farmers, who have very small land holding for crop production and a few heads of livestock to diversify farm production, increase cash income, improve quality and quantity of food produced and exploitation of unutilized resources.