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INTEGRATED CROP-LIVESTOCK FARMING SYSTEM

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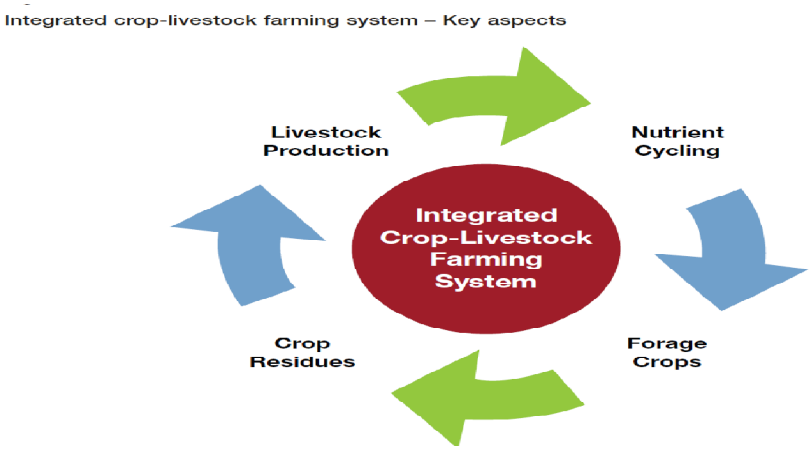
Small farmers in developing countries are poorer than the rest of the population, often not getting enough food to lead normal, healthy and active lives. Dealing with poverty and hunger in much of the world therefore means confronting the problems that small farmers and their families face in their daily struggle for survival. One option for economically and ecologically sustainable development of farming systems is the integration of agriculture, livestock and aquaculture. The integration of livestock with crops, or mixed farming, is the major characteristic of settled agriculture phase II. Livestock fed arable crops and improved pasture produced on the farm is the main focus. Crops are intimately integrated with livestock as manures are used to maintain soil fertility together with N fixing legumes. Much of the farming in Western Europe and Eastern USA was of this type between 1850-1945. However, the recent increased control of nutrient effluents has begun to favour this form of farming again over industrial monoculture.

Introduction:

Population growth, urbanization and income growth in developing countries are fuelling a substantial global increase in the demand for food of animal origin, while also aggravating the competition between crops and livestock (increasing cropping areas and reducing rangelands). The livestock revolution is stretching the capacity of existing production, but it is also exacerbating environmental problems. Therefore, while it is necessary to satisfy consumer demand, improve nutrition and direct income growth opportunities to those who need them most, it is also necessary to alleviate environmental stress. Conventional agriculture is known to cause soil and pasture degradation because it involves intensive tillage, in particular if practiced in areas of marginal productivity. Technologies and management schemes that can enhance productivity need to be developed. At the same time, ways need to be found to preserve the natural resource base. Within this framework, an integrated crop-livestock farming system represents a key solution for enhancing livestock production and safeguarding the environment through prudent and efficient resource use. The increasing pressure on land and the growing demand for livestock products makes it more and more important to ensure the effective use of feed resources, including crop residues.

An integrated farming system consists of a range of resource-saving practices that aim to achieve acceptable profits and high and sustained production levels, while minimizing the negative effects of intensive farming and preserving the environment. Based on the principle of enhancing natural biological processes above and below the ground, the integrated system represents a winning combination that (a) reduces erosion; (b) increases crop yields, soil biological activity and nutrient recycling; (c) intensifies land use, improving profits; and (d)

can therefore help reduce poverty and malnutrition and strengthen environmental sustainability.



Advantages and main constraints

Advantages:

In an integrated system, livestock and crops are produced within a coordinated framework. The waste products of one component serve as a resource for the other. For example, manure is used to enhance crop production; crop residues and by-products feed the animals, supplementing often inadequate feed supplies, thus contributing to improved animal nutrition and productivity.

The result of this cyclical combination is the mixed farming system, which exists in many forms and represents the largest category of livestock systems in the world in terms of animal numbers, productivity and the number of people it services.

Animals play key and multiple roles in the functioning of the farm, and not only because they provide livestock products (meat, milk, eggs, wool, hides) or can be converted into prompt cash in times of need. Animals transform plant energy into useful work: animal power is used for plugging, 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. Excreta have two crucial roles in the overall sustainability of the system:

(a) 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.

(b) 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.

Crop residues represent the other pillar on which the equilibrium of this system rests. They are fibrous by-products that result from the cultivation of cereals, pulses, oil plants,

roots and tubers. They are a valuable, low-cost feed resource for animal production, and are consequently the major source of nutrients for livestock in developing countries. The overall benefits of crop-livestock integration can be summarized as follows:

• Agronomic, through the retrieval and maintenance of the soil productive capacity;
• Economic, through product diversification and higher yields and quality at less cost;
• Ecological, through the reduction of crop pests (less pesticide use and better soil erosion control); and
• Social, through the reduction of rural-urban migration and the creation of new job opportunities in rural areas.

This system has other specific advantages:

• It helps improve and conserve the productive capacities of soils, with physical, chemical and biological soil recuperation. Animals play an important role in harvesting and relocating nutrients, significantly improving soil fertility and crop yields.
• It is quick, efficient and economically viable because grain crops can be produced in four to six months, and pasture formation after cropping is rapid and inexpensive.
• It helps increase profits by reducing production costs. Poor farmers can use fertilizer from livestock operations, especially when rising petroleum prices make chemical fertilizers unaffordable.
• It results in greater soil water storage capacity, mainly because of biological aeration and the increase in the level of organic matter.
• It provides diversified income sources, guaranteeing a buffer against trade, price and climate fluctuations.

Constraints:

- Nutritional values of crop residues are generally low in digestibility and protein content. Improving intake and digestibility of crop residues by physical and chemical treatments is technically possible but not feasible for poor small farmers because they require machinery and chemicals that are expensive or not readily available.
- Crop residues are primarily soil regenerators, but too often they are either disregarded or misapplied.
- Intensive recycling can cause nutrient losses.
- If manure nutrient use efficiencies are not improved or properly applied, the import of nutrients in feeds and fertilizers will remain high, as will the costs and energy needs for production and transportation, and the surpluses lost in the environment.
- Farmers prefer to use chemical fertilizer instead of manure because it acts faster and is easier to use.
- Resource investments are required to improve intake and digestibility of crop residues.

Challenges:

• Develop strategies and promote crop livestock synergies and interactions that aim to (a) integrate crops and livestock effectively with careful land use; (b) raise the productivity of specific mixed crop-livestock systems; (c) facilitate expansion of food production; and

(d) simultaneously safeguard the environment with prudent and efficient use of natural resources.

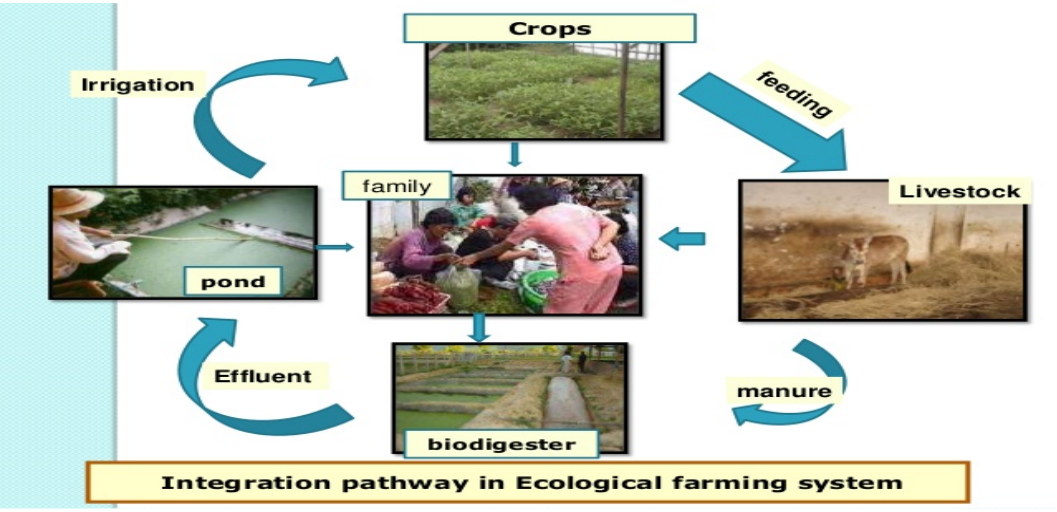
• Devise measures (for instance, facilitating large-scale dissemination of biodigesters) to implement a more efficient use of biomass, reducing pressures on natural resources; and develop a sustainable livestock manure management system to control environmental losses and contaminant spreading.

Key principles:

• Cyclic: The farming system is essentially cyclic (organic resources – livestock – land – crops). Therefore, management decisions related to one component may affect the others.

• Rational: Using crop residues more rationally is an important route out of poverty. For resource-poor farmers, the correct management of crop residues, together with an optimal allocation of scarce resources, leads to sustainable production.

• Ecologically sustainable: Combining ecological sustainability and economic viability, the integrated livestock-farming system maintains and improves agricultural productivity while also reducing negative environmental impacts.



Conclusion:

Integrated crop-livestock is frequently advocated as one of the most promising solutions to soil fertility decline and productivity losses in intensifying systems. Crop residues make up a major component of livestock diets in mixed crop-livestock systems and, therefore, improving the use and nutritional quality of crop residues is important to enhancing farm productivity and profitability. Residues of cereal crops are generally nutritionally inadequate to produce high quality and quantity manure, meat and milk. Introduction of legume fodder as a supplement not only provide nitrogen to the rumen microbes, allowing them to improve utilization of the low quality forage but also increase the availability of energy through increased digestibility. Development of dual purpose cowpea varieties that better feed both human and livestock will give farmers new and better choices for improving levels and efficiency of livestock production. Farming practices that encourages rotation between cereals and legumes as well as application of manure are recommended strategies which will turn around the fortune of agriculture in the region, and hence improve the livelihoods of the ever increasing populations now

afflicted by climate change. The entire system is currently being threatened by unpredictable climate challenge. The capture and storage of excess rainfall and the use of resource-efficient irrigation remain the only guaranteed means of maintaining cropping intensification. By restoring soil fertility and reducing weed population yields increases to a much greater extent at both farm and regional levels than by using purchased agro-inputs. Increased livestock productivity in terms of weight gain, milk production and traction make the system not only profitable but also supply the protein requirements of the ever increasing urban populations.

References:

Council for Agricultural Science and Technology. 1999. Animal Agriculture and Global Food Supply. In Task Force Report, no. 135. Ames, Iowa: CAST.

Delgado, C., M. Rosegrant, H. Steinfeld, S. Ehui and C. Courbois. 1999. Livestock to 2020: The Next Food Revolution. Food, Agriculture and the Environment Discussion Paper 28, Washington, D.C.: International Food Policy Research Institute.

Food and Agriculture Organization of the United Nations. 2000. Small Ponds Make a Big Difference: Integrating Fish with Crop and Livestock Farming. Rome: FAO.

Food and Agriculture Organization of the United Nations. 2001. Mixed Crop-Livestock Farming: A Review of Traditional Technologies based on Literature and Field Experience. Animal Production and Health Papers 152. Rome: FAO.

Food and Agriculture Organization of the United Nations. 2003. Integrated livestock-fish farming systems. Rome: FAO.

Food and Agriculture Organization of the United Nations. 2007. Tropical Crop-Livestock Systems in Conservation Agriculture. The Brazilian Experience. Rome: FAO.

Food and Agriculture Organization of the United Nations and World Bank Group. 2001. Farming Systems and Poverty: Improving Farmers' Livelihoods in a Changing World. Rome: FAO.