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Integrated Crop-Livestock Farming Systems For The Sustainable Livestock Production

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Abstract: ***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 range lands).For sustainable development in agriculture and livestock must include integrated crop livestock farming system with efficient soil, water crop and livestock management practices, which are environmentally friendly and cost effective. In integrated crop livestock farming system, crop residues can be used for animal feed, while manure from livestock can enhance agricultural productivity. Conventional agriculture is known to causes oil and pasture degradation because it involves intensive tillage, in particular if practiced in areas of marginal productivity. Integrated Farming System (IFS) plays an imperial role for maximizing their profit and production to meet the nutritional requirement with food security with less investment. Based on the principle of enhancing natural biological processes above and below the ground, the integrated system represents a winning combination that reduces erosion, increases crop yields, soil biological activity and nutrient recycling; intensifies land use, improving profits and can therefore help reduce poverty and malnutrition and strengthen environmental sustainability. A judicious mix of agricultural enterprises like dairy, poultry, piggery, fishery, sericulture etc. suited to the given agro-climatic conditions and socio-economic status of the farmers would bring prosperity in the farming.***

Keywords: ***Integration of crop- livestock farming, mixed crop livestock production, integrated farming system***

I. INTRODUCTION

Due to increasing population of humans and livestock increased productivity demand is placed up on integrated crop-livestock systems. 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 (Lal and Miller, 1990; Gupta *et al*., 2012). Within this frame work, an integrated crop-livestock farming system represents a key solution for enhancing livestock production and safe guarding the environment through efficient resource use. In integrated crop livestock farming system the waste of one enterprise becomes the input to another for making better use of resources (Tiwari, 1993). For example, crop residues can be used for animal feed, while manure from livestock can enhance agricultural productivity by intensifying nutrients that improve soil fertility as well as reducing the use of chemical fertilizers (Gupta *et al*, 2012).Intensification and improved efficiency of livestock production mean less green house gases per unit of milk and more milk per unit of water. The present article presented with the comprehensive review about various aspects of IFS. It helps to any investigation, as it gives an idea of crop livestock integration, their constraints opportunities also provides a basis for interpretation and discussion of the findings for the future research investigation.

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II. THE IMPORTANCE OF MIXED CROP-LIVESTOCK SYSTEMS

Mixed crop-livestock systems produce 50% of global cereals, 34% of beef and 30% of milk. Almost one billion people rely on these systems as their primary source of livelihood (Herrero *et al*, 2009). A recent review and up-date of global farming systems assessments stressed the importance of including how crops and animals are produced and how they interact, if such information is to be used in the context of priority setting and targeting related to livelihoods (Robinson *et al*, 2011). 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 express a winning combination that reduces erosion, Increases crop yields ,soil biological activity and nutrient recycling, Intensifies land use, improving profits and Can therefore help reduce poverty and malnutrition and strengthen environmental sustainability but small farmers need to have sufficient access to knowledge, assets and inputs to manage this system in a way that is economically and environmentally sustainable over the long term (FAO, 2001).

III. COUPLED NATURE OF CROP-LIVESTOCK INTERACTION NEED FOR SUSTAINABLE LIVESTOCK PRODUCTION

Herrero *et al.*(2009;2010) distinguish 2classes of crop-livestock systems, which differ in their degree of intensification and potential for further growth. Mixed intensive systems have higher population density, high agro-ecological potential, especially through irrigation, and good links to markets with some purchased inputs being regularly used. In contrast, mixed extensive systems have medium population density, moderate agro-ecological potential, are largely dependent on rain-fed agriculture and use few purchased inputs. The latter systems have potential for sustainable intensification, the former have in many cases reached limits in terms of biophysical aspects and some may need to de-intensify. Market orientation and strong and growing demand for food provide power full incentives for intensification and greater efficiency of both crop and livestock enterprises in Smallholder mixed systems in India. We also present below some ideas on how to exploit the mutually reinforcing nature of crop-livestock systems to raise productivity in a manner that is both ecologically and economically sustainable (Vinod Gupta *et al* 2012).In mixed systems intensification of both crop and livestock production is needed. Straw, stover and other fibrous by-products of cereal and legume production, thinning and weeds make important contributions to ruminant diets in a wide range of agro ecologies and farming systems. Livestock manure can contribute to the nutrient needs of the crops and help to maintain soil organic matter and beneficial physical properties, such as water and nutrient retention capacities. In remote chains for inorganic fertilizers, livestock manure can be the only source of applied nutrients. Liu *et al.* (2010) estimate that 23% of the nitrogen for crop production in mixed systems comes from livestock.

IV. INTEGRATED SYSTEMS -DRIVERS AND TRENDS

Integrated crop-livestock systems are under considerable pressure due to rapidly rising human populations in developing countries. In addition ,the trend towards increased urbanization and rising incomes in these regions leads to shift in diets less reliance on staples (cereals and tubers); demand for better quality and more diverse diets made up of more fruit and vegetables; and much more meat, milk, eggs and fish the animal-source foods (Delgado *et al*. 1999; FAO 2011; Otte *et al*. 2012).The rising demand presents environmental, economic and social challenges, such as land and water degradation, greenhouse gas emissions and smallholder marginalization. It also presents opportunities for some (not all) crop livestock systems to be part of a positive livestock-sector transformation in developing countries(Tarawali *et al*. 2011, Duncan *et al*. 2013).Balancing these issues necessitates addressing the current low productivity of mixed crop-livestock systems and their unfavorable environmental foot print, in the context of a complex of both technological and institutional dimensions (Pretty *et al*.2011).Such a positive trajectory will include a shift from smallholders raising many low producing animals to fewer, more productive livestock in efficient and market-linked systems. Mohanty *et al*. (2010) reported a successful tribal integrated farmer in Orissa who was getting enhanced the productivity as well as the profitability and sustainability after adopting the IFS as compared to the conventional farming system and earned 7 times higher Net Monetary Return (NMR) as compared to traditional method of farming.

V. CONSTRAINTS IN IFS

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 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. Mixed farms are Prone to using more manure than crop farms do. Manure transportation is an important factor affecting manure use. Kadam *et al*. (2010) observed that the constraints of IFS as high cost of concentrate feed and unavailability of green fodder (40 per cent) and 30 per cent of the respondents expressed lack of market facilities and

absence of cooperative societies. 20, 6 and 4 per cent of the respondents were expressed lack of scientific knowledge on rearing of animals, unavailability of improved breeds in the local markets and lack of financial support respectively as the major constraints in the IFS. Poorani *et al*. (2011) reported that the integrated farmers from Palladam district of Western Zone of Tamilnadu indicated the insufficient quantity of fodder to their livestock during off - season as a constraint in the IFS.

VI. CHALLENGES

Develop strategies and promote crop livestock synergies and interactions that aim to 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;(d)Simultaneously safeguard the environment with prudent and efficient use of natural resources Devise measures(for instance, facilitating large-scale dissemination of bio-digesters) 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.

VII. OPPORTUNITIES

- ✓ Intensification of agriculture which is currently occurring in most farming systems favours crop–Livestock integration
- ✓ Poor soil fertility, unavailability or increases in prices of fertilizers, and labour shortages, have forced farmers to rely on alternatives such as manure and traction.
- ✓ Farmers can grow crop in the wet season and engage in livestock enterprises in the dry season.
- ✓ Livestock enterprises are more lucrative than crop farming so it is advantageous to integrate livestock Into farm activities.
- ✓ Many indigenous, emerging, and developed technologies are available to support sustainable crop–livestock integration. These include improved cereal and grain legume varieties, cropping systems, weed and nutrient management strategies, the eradication of most livestock diseases, and the development of modeling and all-year-round feed packages for animals.

VIII. CONCLUSION

From this review it is concluded that Integrated crop-livestock is frequently advocated as one of the most promising solutions to soil fertility decline and productivity losses in intensifying systems. Sustainable development is the only way to promote rational utilization of resources and environmental protection with out hampering economic growth and integrated Farming Systems hold special position as in this system nothing is wasted, the by-product of one system becomes the input for other. India has a considerable livestock, poultry population and crop wastes. All efforts have to be mobilized to reclaim the resources and to put them to use effectively. A lot of extension attention is however required to educate farmers on utilization of crop livestock production system.

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