

Animal Based Smallholding Farms in Developing Countries with Special Reference to Bangladesh

Dr. M. SADDULLAH

Visiting professor, Graduate School for International Development and Cooperation,
Hiroshima University, Japan

Abstract

Small farm systems combining crop and animals are the important categories especially in Bangladesh. The value of crop-animal systems lies in their positive contribution to sustainability and economic growth. A central goal of the small farm is to generate a minimum target income and a sustainable system. These types of small scale farming are widely practiced in South East Asia and East Asia as for example China, Indonesia, Vietnam, where animal production is integrated with fish farming and vegetable production. Increasing population pressure in Bangladesh results in progressively smaller agricultural holdings and traditional grazing areas are taken over for crop production. The production systems in Bangladesh are characterized with small litter size or flocks, no or minimal inputs, low outputs and periodic destruction of animals by disease. Typically the litter size or flocks are small in number with each household containing 2-3 cattle and 7-10 poultry. Animals are owned by individual households and mostly maintained under a scavenging system with little or no inputs for housing, feeding or health care. Under the prevailing situation in Bangladesh like other developing countries, the introduction of more productive integrated intensive farming systems is imperative. Maximum sustainable productivity can only be achieved by integrating intensive livestock and poultry keeping with crop production and agroforestry. Farmers consciously diversify the use of their resources to produce mix activities, which are economically rewarding and highly stable. As such in small-scale farms in the tropical countries, cattle, goats, sheep, pigs, chicken, ducks are commonly reared in combination with mixed cropping.

Permanent Address: Professor Dr. M. Saadullah, Dept. of Animal Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh. E-mail: saad@bdonline.com

1. Introduction

A number of definitions have been proposed to describe both small farmers and small farms. In general terms, a small farmer owns a tiny parcel of land and animal, suffers chronically from scarcity of capital and he has limited access to credit and inputs. In addition, he faces unstable markets and prices, he receives very little technical support and because of his lack of economic clout, his participation in the control and operation of agricultural institution is limited (Dillon and Hardaker 1980). The small farms are with complex interrelationship among animals, corps, fish and farming families, involving small land holdings, minimum resources of labour and capital. The farmers from which may or may not be

able to derive a regular and adequate supply of food or acceptable income and standard of living.

A variety of highly productive small-scale intensive mixed farming systems have developed in many developing countries, where agricultural holdings had become too small to support traditional farming practices. These intensive systems are generally based on crop growing, integrated with milk production from small herds of dairy cows or goats, and usually involve the recycling of organic matter in the form of crop residues and manure, and some form of agroforestry.

2. Characteristics of Small Farm

2.1 Smallholding farms: Since the majority of the rural population in developing countries in the tropics made up of small farmers, many national, regional and international institutions have shown some interest during the past few years. They also made efforts to study the small farmer and his agricultural production systems, in order to improve the well being of the farm family. In this regard, Wharton (1969) suggests that about 50% of world population depend on subsistence agriculture, that almost 40% of cultivated land are in the hands of the small farmer. Based on FAO, Agrostat 1991, the percentage of small farms in the farming system of selected countries is shown in Table 1. The small size of the holdings is one of the characteristics of small farm systems. The actual size of the farm varies from one country to another. The Table 2 illustrates differences between countries within the Asian region (Devendra 1993).

Table 1. Percentage of small farms in the farming systems of some selected countries of South East and East Asia (FAO 1991)

Country	% Small farm
Bangladesh	90
Combodia	95
Indonesia	90
Laos	95
Malaysia	70
Myanmar	95
Philippines	80
Thailand	76
Vietnam	95

This smallest farm size occur in Bangladesh (<0.4 ha), while households cultivating paddy in Thailand have average holding of 0.3 ha of land. In South East Asia, the average size of small farms is about 1-2 ha. The household size in Bangladesh ranges form 4-5 members (BBS, 1996). The variation in size of the small farms in some countries in South East Asia and East Asia is not so much different form each other.

Table 2. Variation in size of the of small farms in some countries in south East Asia and East Asia (Devendra 1993)

Country	Landholding	Definition
Bangladesh	<0.4 ha	Subsistence farmer
	0.4-0.8	viable & potentially viable owners
India	2-4 ha	Small farmer
	0.8-2 ha	Marginal farmer
	<0.8 ha	Agricultural labour
Indonesia	0.66 ha	Java
	1.2 ha	Average size
Korea	< 1 ha	Small farm
Malaysia	< 1 ha	Small farm
Nepal	1.6-1.6 ha	Rice farm
	2.1 ha	Rubber
Philippines	2.5 ha	Terai
	1.0 ha	Hills
Sri Lanka	2.5 ha	Terai
	1.0 ha	Hills
Thailand	2.8 ha	Average
	1.2 ha	Agri-household
	0.3 ha	Rice farm

2.2 Animal production systems in small farm: Agricultural production systems especially those involving both crop and animal components are complex. Devendra (1993) has described the systems of integration of different types of animals with crop in the farming system in South East Asian countries, as follows:

- a) Systems combining crops, non-ruminant and fish: Pigs and ducks are the prevalent animal species found in mainly annual cropping systems. These systems are very important in countries as China, Vietnam, Indonesia and Thailand. Important crops that generate feed are sugar cane, cereal crops and multipurpose trees.
- b) Systems combining crops and ruminant: The system is potentially important in those regions where tree are important such as in South East Asia, Asia Pacific, East Asia and Africa

Besides, it has been described that ruminant production of various monogastric animal production systems like chicken, ducks and pigs (Devendra 1993 and Dessie and Ogle 1996). Chickens, ducks and pigs are by far the most important animals in the culture of the peoples of the tropics especially in South East Asia, East Asia and Africa. In Bangladesh the production systems are characterized with small litter size or flocks no or minimal inputs, low outputs and periodic destruction of animals by disease. Typically the litter size or flocks are small in number with each household containing 2-3 cattle and 7-10 poultry. Animals are owned by individual households and mostly maintained under a scavenging system with little or no inputs for housing, feeding or health care. Although collecting feed and raising of animals are male dominated activities, women play a vital role in monogastric animal production activities. Furthermore, children also play a major role in raising livestock and poultry usually who spent about 4 hours a day (Paul and Saadullah 1991).

2.3 Values of small farm production system: Diversification is the backbone of small farm system. Farmers consciously diversify the use of their resources to produce mix activities, which are economically rewarding and highly stable. In such as small-scale farms in the tropical countries, goats, sheep, chicken and ducks are commonly reared in combination with mixed cropping (Saadullah 1995). Small farm systems combining crop and animals are the important categories especially in Bangladesh. The value of crop-animal systems lies in their positive contribution to sustainability and economic growth. A central goal of the small farm is to generate a minimum target income and a sustainable systems which are also widely practiced in South East Asia and East Asia as for example China, Indonesia and Vietnam, where pig production is integrated with fish farming, poultry raising and vegetable production (Devendra 1993). Advantages of these systems have identified as follows:

- Efficiency of scarce resource use in small farm
- Reduced dependence on purchased concentrates for ruminants, poultry, pigs and fish,
- Reduced cost of production
- Reduced pollution
- Bioenergetic efficiency
- Increased self reliance and sustainability

3. Constraints of Production in Small Farm

Factors associated with the low level of inherent input resulted in low level of economic efficiency of the smallholding farms. There are various problems like high cost of handling, collection, lack of managerial and technical skills to utilized the feeds in situ and lack of institutional support. Both the scales of operation and feeding technologies applied are not conducive to high economic returns. Recently in Bangladesh, small-scale dairy enterprises (Farms), poultry farms have been increasing in the urban and peri-urban areas with government subsidies under micro-credit programme of the banks and NGOs. This assistance resulted to grow increasing numbers of small scale of dairy, fattening and poultry farms in the country. However, these small-scale farms are facing the acute shortage of appropriate technology on feeds and fodder both in quality and quantity and management skills besides poor marketing facilities having no backward and forward linkage of marketing. A result most of the farms are struggling for existence and can not pay back the bank loan, which creates a threat to sustainable animal development in the country. There are also problems seasonally of processing and storage facilities as well as marketing of the products. The primary limitation to raising their level of productivity in the smallholding farms may be summerised as follows:

- lack of economical technology for better utilizaiton of local resources
- Non-availability of feed resources (quality & quantity)
- Climate and disease constraints particularly for chicken
- Uneven income distribution which limits growth in demand to a small farm segment of the population
- Environmental constraints, particularly urban chicken farm and piggery

4. Animal Based Small Farms

4.1 Cattle: One or two local or upgraded cattle will be the central features of smallholdings, provid-

ing cash income from sales of milk surplus to the family's requirements. With the general poor state of cattle owned by farm households in rural areas, increasing numbers of households in urban and peri-urban areas, particularly unemployed educated youths have invested in livestock and taken up programmes on rearing milking cows and fattening calves for milk and meat production, respectively (Miyani 1996). The entrepreneurs are also getting involved in commercial dairy, and seasonal animal fattening. There were 3450 dairy farms in 1989-90 and this number increased to 26,649 by 1994-95 (DLS, 1994-95). Considering the feed quality and quantity and disease resistant, most of the farmers prefer to keep local indigenous cattle in the farms but local X Exotic breed are not uncommon in many farms. From experiences elsewhere it is likely that the optimum level of exotic blood would be around 50%, possibly higher where management standards and feed quality are good and the climate is not too harsh. Ideally, the exotic should be a large-bodied breed, such as the Friesian, so that the adult male crosses would be suitable for draught purposes, and male calves not wanted for breeding could be reared for meat. Upgrading using artificial insemination is possible in the more accessible areas, but would obviously pose problems in the remote regions. An alternative approach could be to use a dual-purpose breed developed in a similar environment, such as Sahiwal, Sindhi and Hariana. Very recently cows are being used for traction in many parts of the country. It has been reported that pairs of well-fed and healthy cows, particularly the large-bodied types should be quite capable of meeting the draught-power requirements of smallholding. Research in countries where a considerable proportion of draught animal power is derived from cows has shown that milk yields (Saadullah 1995) and calf growth rates are not significantly reduced, provided that the cows are adequately fed when working.

4.2 Small ruminants: the backyard livestock especially goat farming, as being less capital-intensive than larger enterprise, can often be financed by dormant rural savings. There are about 10.20 million small, marginal and landless farmer families (BBS 1996). These farmers largely depend on livestock for their existence. Rearing of goat requires less capital and is more appropriate to rural economy where capital is scarce. This also provides employment to family members, which will improve their standard of living (Devendra 1992). These types of enterprise will not demand many special skills and can be managed easily by women and children in the rural areas and even if some skills are to be adapted that could be done without much cost. Goat and sheep does not need expensive houses, flock can be multiplied easily since the breeds that are available in the country is prolific and the foundation stock is cheaper. Last but not least, these farms provide self-employment without adversely affecting the main occupation, generate cash income and improve life style.

4.3 Chicken and ducks: Chicken and duck production would be useful additions to farms specially smallholder for a variety of reasons. Their main function would be as consumers of household waste and various by-products and providing meat, manure and in addition eggs in the case of poultry (Salek and Mustafa 1997). Chickens are particularly attractive, as specialized housing need not be provided. If they were confined, the manure could be collected and used as a supplement in dairy cow rations, being a valuable source of non-protein nitrogen.

4.3.1 Chicken: The backyard raising in tropical countries have been practiced in South East Asia and East Asia for centuries and will continue to exist in the years ahead. In an estimate, it was found that about 96% of eggs and 98% of poultry meat are produced from backyard production (DLS 1994-95).

This system has not only become an old practice, but also has an economic importance to the small scale farms, who keep them to supplement their income and also keep these animals as saving to be utilized in case of emergency. Village poultry flocks in Asia are usually 10 - 20 of birds of different ages per household. A whole village study in Bangladesh on weekly basis over a year showed average 8 chicks, 6 pullets and 3 hens per family. The average production of eggs per hen per year was only 42. Egg lay peaked at 27% during the rice harvest. Of the eggs produced 55% were set under a hen for further chicken production, 40% were eaten and 5% were sold. Of hens and pullets or cockerels grown, 56% and 44% respectively, were sold or eaten (Saadullah *et al.* 1990). In Bangladesh, chickens are the most widespread species of backyard poultry and ducks are second. The backyard poultry production system in Bangladesh can be divided in two production subsystems:

4.3.1.1 Traditional Backyard scavenging poultry Production: Where indigenous or crossbred between indigenous and purebred birds are raised under scavenging feeding systems. This system is a self-sustained system of production in the rural areas. This system relies primarily on local foodstuff as well as local replacement of breeding stock. There is no systematic breeding and male and female are grown. The available males are used for breeding with all hens in a house. The chicks are naturally hatched by mother hen. Eggs are set with ash, husk and small pieces of straw in a pot. The mother hens brood the chicks and spend a larger percentage of their time in rearing chicks after natural hatching.

4.3.1.2 Intensive Backyard (confinement) poultry production: where pure breeds like white leghorn, RIR, Fayomi or crosses between two pure-breed birds are raised under intensive system. In this production system, birds are reared with complete balanced ration prepared from locally available feed ingredients (Jensen 1996). Pure breed birds are available in the country at public sector farms. Raising poultry is one of the effective technologies to alleviate the poverty in small farm and improve nutritional status in the Bangladesh and else where in countries of this region. Women and children and usually take care of the chicken and ducks.

4.3.2. Ducks: There are various systems of duck production in the tropics. This one extreme is the extensive duck raising with 10-100 birds per family through free grazing in paddy field after harvesting on pond and lake. The other extreme is the intensive duck production systems with the scale of producing few hundreds to thousands ducks annually. The traditional systems of duck rearing in small farm of South east and East Asian countries, including Indonesia, Vietnam, Thailand, Malaysia and Bangladesh, is the seasonal grazing system combining with the scavenging on fish pond, lake river and coast. This system depends on rice harvesting and other naturally available feeds. More ducks are being raised during harvesting season and lesser during the long period of dry season. Ducks are scavenged for around seven hours a day in the pond or household areas and are supplemented with rice polish, fish waste, snail and oyster meat. Fish and Ducks are common feature of small scale farms in tropical region of the world. The traditional role of ducks in the agro-ecology of wet rice cultivation is to scavenge and extract food from flooded rice fields without damage to the growing crop and retrieve spent grain after harvest. Their controlled use in the management of many different rice field pests is traditional in Indonesia and analysis of crop contents indicates the importance of insects and molasses in the diet of ducks herded through rice field in Indonesia (Setiako *et al.* 1986). By scavenging in aquatic and semi-aquatic areas in an around of farm such as weed infested canals, lakes and reservoirs ducks could harvest and provide

nutrients for the fish pond systems that would otherwise be unavailable to the farmer.

4.4 Pig productions: Pig Production in the South East and East Asia region plays an important component in the farming systems, as they are commonly the major source of cash income. Majority of the pig raised by small farmers is local type. Unfortunately organised pig production system has not yet been developed in Bangladesh. Mostly the ethnic people are raising pigs under scavenging systems. The pig production systems in South East Asia and East Asia can be grouped into three categories namely

- Commercial production system
- Medium scale production system
- Small Scale Production System

Small-scale pig raisers in rural areas can be roughly divided into 3 categories with regard to their roles in rural pig production systems:

- Those who produce piglets
- Those who buy the piglets and feed them to market and
- Those who keep servicing boars for hire.

In this systems pig raisers who produce piglets and feed them to market weight are rarely found. The majority of pig raiser in rural areas is those who buy weaned pigs and raise them to market weight. The animal combination pattern in the Philippines of carabo + pig + chicken and pig + chicken are the commonest (Posas 1986). He also reported that 86% of the pig population in the Philippines is taken care by small holder.

5. Feeds and Fodder

Non availability of feeds and fodders both in quantity and quality is a major factor for low productivity in small farms. The major sources of feeds and fodder is given below:

5.1 Feeds from arable land: Traditionally feeding and nutrition of livestock is mainly based on crop residues available from crop production. Only limited amount of concentrated feed stuffs (cereal by-products) are fed, since the amounts available in the country is limited and most farmers are not prepared to invest money to purchase concentrates feed. The major components of the ration of farm animals, therefore, are straws, weeds from crop / fallow and common land.

5.2 Feeds from non-arable land: Non arable land contributes most of the green fodder for ruminant animals. Non-arable land at farm level is found around pond, embankments, on bunds and around homesteads. Outside the farm, it is usually public wasteland found around canal rivers, roadside and railways.

5.3 Aquatic plants: aquatic plants includes water hyacinth, dhal and other water biomass that grows naturally in the pond, canal ditches etc.

5.4 Feed Resources form agroforestry and homestead gardening: Using shrubs and tree leaves,

tender shoot and twigs as fodder especially for goats is traditional in the villages of Bangladesh. Cultivation of these shrubs and most of the trees requires no extra arable land or labour. The use of shrubs and tree fodder as livestock and fodder as livestock feed has recently been increasingly recognized (Saadullah, 1990). Types feeds available form homestead gardening and Agroforestry are as follows:

- Ground vegetation under tree/shrubs
- Cultivation of improved pasture leguminous cover crop has been shown to have a positive effect on the growth of trees and tree fodder
- Agroforestry by-products and residues

The primary utilities of the trees grown on the homesteads are fruit, juice, timber and building materials and the secondary utilities are fuel, fodder, green manure, handicrafts, fencing and windbreak. Various Agroforestry systems have been developed and described in the literature (Escalante 1985, Johnson and Nair 1985/Michon *et al* 1986 and Poschen 1986). Among them the common agroforestry systems includes:

- Agrisilviculture (tree and crops)
- Silvopastoral (tree and livestock)
- Agrisilvipastoral (tree, crop and livestock)

One of the most significant developments in animal agro-forestry is expanding the role of trees as a component in fodder production. This development has largely contributed to meeting the growing demand of tree fodder.

5.5 Agro-industrial by-products, miscellaneous feeds and supplements: the availability of these potentially very useful feedstuffs is often seasonal and localized. Agro-industrial by-products, such as maize bran and rice polishing, is relatively expensive and may be used more economically by monogastrics such as laying hens or pigs, but the increase in milk yields resulting from their use in dairy rations makes them extremely valuable dry season supplements for lactating ruminants. Molasses/ urea/ mineral blocks, if available, can result in significant improvements in the productivity of, in particular, cows on poor quality dry-season diets, and poultry manure is also an excellent low cost source of non-protein nitrogen and minerals (Saadullah 1991).

• Feeding System

Generally, majority of the livestock is maintained in the communal grazing land. They are allowed for grazing during the day on natural pasture, homestead forest and fallow land. Sometimes, mother does with small kids are kept tethered just besides the house. In rural areas a mixture of concentrate like that rice bran, wheat bran and oilcakes are mixed with water is fed with straw. In terms of feeding management of ruminant animal, most farmers practiced mixed management feeding systems, which may be classified as follows:

- Cut and carry systems:

- Feeds from natural vegetation of homestead, forestry and aquatic
- Grazing or tethering: fellow or harvested land, roadside, riverside etc.
- Kitchen waste: rice gruel, vegetable wastes, etc.

Soaked rice straw mixed with weeds and grasses is another common methods of feeding, which reduces dustiness, prevents wastage and improves intake. Urea treatment of an feeding urea molasses is in progress but needs simpler procedures for sustainability of these technologies. The experience clearly indicates that the ingenuity of women could be effectively utilized in taking a participatory approach to development or to the introduction of beneficial technologies. Farmers have been using oil cake mixed with water and have claimed beneficial effects for the livestock and for the fat content of milk.

7. Major Issues in Smallholding Farms

7.1 Research and technology: There is no doubt that the obstacles facing the small farms in tropical countries are formidable both as individual and collective level. They are not, however, insurmountable. Research relevant to small farm production has been shockingly deficient. For small holders, technological change must serve to increase resource productivity as well as labour productivity. Low cost and low external input requirements to facilitate its adoption should characterize it by small farmers. Research approach needs to be directed to the improvement of feed technologies and storage and marketing facilities. Extension training services that increase that farm productivity and the improvement of farmer's access to education must also be ensured. The total productivity of small holder farming systems can be increased considerably, by providing package of improved technical innovations and improvements.

7.2 Environmental degradation: Recently, problems have arisen in the big cities because of the repaid expansion of cattle and poultry farms/enterprises in residential and slump areas. The livestock pollute the urban environment. Also, untreated poultry and livestock effluent pollute the receiving environment. The tanneries situated in the residential area, slaughter houses and the practices of slaughtering large number of animals on the street where dead carcasses are left in the streets or residential areas and dumped in ditches, all create health hazards, pollute water and bad odors. Big poultry enterprises in urban households create waste disposal problems and generate many nuisances. There are other issues including conflicts between livestock owners and their neighbors, and other aspects of security problems, which are quarrels with neighbors and damage to crops, building plants and gardens.

7.3 Marketing: Marketing of livestock and poultry and their products needs to be reorganized. It has been observed that a chain of intermediate traders, "*beparies*" (village middle traders) is involved in transferring live animals and birds and their products form farmers/producers to the consumers. This raises the marketing cost and margin. Further, there is considerable fluctuation of commodity prices by seasons and regions reflecting the inefficiency of marketing. Moreover, market places are unhygienic and undeveloped. There is very little provision for processing and preservation of livestock products in and around farms and market places. Moreover, there is little market information system with provisions to encourage of backward and forward linkages. As a result, the farmer/producers are deprived of getting the fair price of live animals, birds and of their products.

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