



CROP LIVESTOCK INTERACTION PATTERNS IN FOUR SELECTED UPAZILA OF KHULNA DISTRICT

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Abstract: Traditional crop-livestock interaction patterns were investigated in four different *Upazila* under Khulna District of Bangladesh during the period from March to April, 2002. Data on different parameters viz. number of livestock and poultry, medium of cultivation, use of fertilizer and pesticides for crop production, type of integrated farming system, rate of production, quantity and use of cowdung, etc. were collected from randomly selected 117 farm family heads and were analyzed using statistical package SPSS. Most of the farmers had integrated farming approaches of which crop-ruminant-poultry (39.3%) and crop-ruminant-poultry-fish (33.3%) were remarkable ones. The average number of cattle, goats, chicken and ducks per farm family were 5.66, 2.42, 18.34 and 6.47, respectively. The average rice yield was 5.37 t ha⁻¹. Annual milk and egg production per farm family were 140.52 kg and 110.51 respectively. On average, 81.4% and 59.1% farmers used chemical fertilizer and pesticides respectively in crop production. Per cent of farmers practiced artificial insemination and vaccination for their livestock were 29.8% and 6.8% respectively. Forty six percent of families used cowdung as fuel and 1% as manure, whereas 53% used as both fuel and manure. The maximum crop and livestock productivity from available resources was achieved through integrating crops, animals and plants. Cowdung is recommended to apply more to crop fields instead of using as fuel. Proper utilization of crop residues and products as animal feed is also emphasized.

Key words: Crop, livestock, interaction, farming system

Introduction

In Bangladesh farming system, the major sub-systems are crop and livestock enterprises. These two components are interrelated and changes that occur in one sub-system, affect the other. In examining the benefits, the output of one sub-system becomes the output of other. The use of animal power for crop production, handling and threshing, followed by the use of animal manure to improve soil fertility by decomposition and in turn, the crop by-products are mainly used as animal feed (Huque *et al.*, 1989). The understanding of inter-relationship between components of the system, such as crop-livestock is integral to farming system approach. In discussing the conceptual framework for farming system research Shaner *et al.* (1982) points to interaction within the system that includes the inter-planting of crop, the integration of cattle and goats on the same pasture unit and the farm integration of livestock and crop. Livestock provide an economic motivation for environmentally sound crop production system and also an essential component of crop farming, supplying the major part of draft power required for land preparation, threshing, crushing and transport. Livestock manure is an important source of nutrients for crop production and for fuel for domestic use. The yearly total manure/dung production in Bangladesh is estimated to 11.64 t (Saadullah, 1995). Livestock also play an important role in the energetic cycling system of the rural and urban areas of Bangladesh. The livestock convert the agro-industrial by-products, which have little direct use for human into valuable product of human utility (Saadullah and Naz, 1999).

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Understanding of the present crop livestock integration pattern would be the basis for future research for improving the sustainable agricultural production in the region. Considering the above circumstances, the study was undertaken to identify the role of crop by products on livestock production and to assess the contribution of livestock and its byproducts on sustainable crop production system.

Materials and Method

The study was a field survey to identify the traditional crop-livestock interaction patterns and its role on sustainability of farming system. It was conducted in four (4) *Upazila* namely Dumuria, Batiaghata, Rupsha and Digholia under Khulna District of Bangladesh. These *Upazila* are situated under the same Agro-Ecological Zone (AEZ) of the Ganges Tidal Flood Plain (Anonymous, 1988). One hundred seventeen farm families (taking 29 farm families from each *Upazila* except the Rupsha where the number of farm families were 30) were selected randomly. Data were collected during the month of March-April, 2002. For collecting required information on various aspects of the study interview schedule were carefully prepared considering the objectives of the study. Data were collected by personal interview from the farm family heads. The studied parameters were the farm size, number of livestock and poultry, medium of land cultivation, use of fertilizer and pesticides for crop production, type of integrated farming system, rate of production, livestock management system, quantity and use of cowdung.

On the basis of land size the farmers of the study area were grouped into four categories according to Anon (1994), such as, landless: (0 to 0.49 acres), small: (0.50 to 2.49 acres), medium: (2.50 to 7.49 acres), and large: (7.5 acres and above). Analysis of variance was done on the basis of *Upazila* and land size by Statistical Package for Social Sciences (SPSS, 1999).

Results

A wide range of crop-livestock interaction patterns were found in the study area (Table 1). Among eight interaction patterns, the dominant one was crop-ruminant-poultry followed by crop-ruminant-poultry-fish while the least followed interaction patterns were ruminant-poultry and ruminant-poultry-fish. The non-interactive pattern found in study area was ruminant followed by only less than one percent of the farm families.

Table 1. Pattern of integrated farming system of the study areas (n = 117).

Components	Number of Farmers	Percentage	Rank order
Ruminant	01	00.9	7
Crop+Ruminant+Poultry	46	39.3	1
Ruminant+Poultry	02	01.7	6
Ruminant+Poultry+Fish	02	01.7	6
Crop+Poultry	08	06.8	4
Crop+Ruminant+Poultry+Fish	39	33.3	2
Crop+Ruminant	12	10.3	3
Crop+Fish	07	06.0	5
Total	117	100.0	

The number of livestock and poultry and the rice yield per family are shown in Table 2. It was found that each farm family had an average number of 5.66, 2.42, 18.34 and 6.47 cattle, goats, chicken and ducks, respectively. In Batiaghata *Upazila* the average number of cattle and ducks per farm family (8.04 and 7.71, respectively) were higher than the other three *Upazila*. The number of cattle per farm family was significantly different according to both *Upazila* ($p < 0.01$) and land size ($p < 0.05$). On the other hand average number of goats and chicken was found nonsignificant ($p > 0.05$). The average number of chicken per farm family was greater (28.71) in Dumuria than other three *Upazila*. It was clear that most of the small landholders lived in Digholia *Upazila*. The average rice yield of the study area was 5.37 t ha⁻¹. Rice yield were 3.48 t ha⁻¹, 3.22 t ha⁻¹, 7.5 t ha⁻¹ and 6.87 t ha⁻¹ for Dumuria, Batiaghata, Rupsha and Digholia respectively, and the differences were significant ($p < 0.001$).

Table 3 shows land cultivation techniques and utilization of cowdung by the farmers. It was found that majority (52.2%) of the farm families used mechanical device for their land preparation while only one-tenth (10.41%) of them used animal for the same purpose. About two-fifth (37.4%) of the farm families used both animal and mechanical device for their land preparation. Table 3 shows that 46% farm families used

cowdung just as fuel and only 1% farmer used as manure, whereas 53% used both as fuel and manure. Most of the farmers (93.2%) did not provide vaccination to their livestock (Table 4). Table 4 also shows that major proportions (81.4% and 59.1%) of farmers used chemical fertilizer and pesticides, respectively.

Table 2. Number of livestock and poultry, and rice production status per family by *Upazila* and land size (n = 117).

Group		Parameters				
		No. of cattle	No. of goat	No. of chicken	No. of ducks	Rice yield (t ha ⁻¹)
<i>Upazila</i>	Dumuria	5.81	2.50	28.71	4.71	3.48
	Batiaghata	8.04	0.00	10.70	7.71	3.22
	Rupsha	4.46	2.00	13.90	4.14	7.50
	Digholia	4.36	2.41	17.08	6.47	6.87
	Mean	5.66	2.42	18.34	6.47	5.37
	F-value	4.278	.045	.927	2.901	7.508
	Level of significance	**	NS	NS	*	***
Land Size	Landless (0.0-0.49 acres)	3.75	3.00	16.00	5.00	4.20
	Small (0.50-2.49 acres)	3.63	3.67	13.11	5.85	4.88
	Medium (2.50-7.49 acres)	5.46	1.00	12.43	6.42	6.08
	Large (≥7.5acres)	7.05	2.17	27.54	7.44	4.82
	Mean	5.66	2.42	18.34	6.47	5.37
	F-value	3.197	1.620	1.242	.526	0.70
	Level of significance	*	NS	NS	NS	NS

NS = Not significant (p>0.05), * p<0.05, ** p<0.01, *** p<0.001

Table 3. Land cultivation techniques and utilization of cowdung.

Factors	User (%)	
Techniques of land preparation	Animal means	10.4
	Mechanical means	52.2
	Both animal and mechanical means	37.4
	Total	100
Utilization of cow dung	Fuel	46.0
	Manure	1.0
	Both fuel and manure	53.0
	Total	100

Table 4. Different inputs being used by the farmers for crop and livestock production.

Inputs	User (%)		
	Use	Do not use	Total
Fertilizer application	81.4	18.6	100
Pesticide application	59.1	40.9	100
Artificial insemination	29.8	70.2	100
Vaccination	6.8	93.2	100

Table 5. Average milk yield and egg production by *Upazila* and land size.

Group		Parameters	
		Milk yield (kg household ⁻¹ annum ⁻¹)	Egg production (No household ⁻¹ annum ⁻¹)
<i>Upazila</i>	Dumuria	142.08±12.07	104.12±9.84
	Batiaghata	134.76±9.44	104.74±11.88
	Rupsha	143.84±13.77	126.06±8.17
	Digholia	140.57±9.61	105.64±10.28
	Mean	140.52±5.73	110.51±5.01
	F-value	0.11	1.15
	Level of significance	NS	NS
Land Size	Landless (0.0-0.49 acre)	91.54±19.28	110.31±18.40
	Small (0.50-2.49 acre)	120.00±10.39	111.64±7.56
	Medium (2.50-7.49 acre)	142.45±7.88	106.23±7.45
	Large (7.5>)	164.94±12.84	117.85±11.35
	Mean	140.52±5.73	110.51±5.01
	F-value	0.14	1.18
	Level of significance	NS	NS

NS= Not-significant.

Table 5 displays the average milk yield and egg production per household per annum on the basis of *Upazila* and land size. Higher milk yield/household/annum was found in Rupsha *Upazila* (143.84±13.77 kg) than the other three *Upazila*. The farmers belonging large land holders category produced much milk (164.94±12.84 kg) than the landless and small farmers (Table 5). In Rupsha *Upazila* the egg production/household/annum was higher (126.06±8.17) than the others. It was found that the large landholders produce more eggs/household/annum (117.85±11.35) than the other farmers (Table 5).

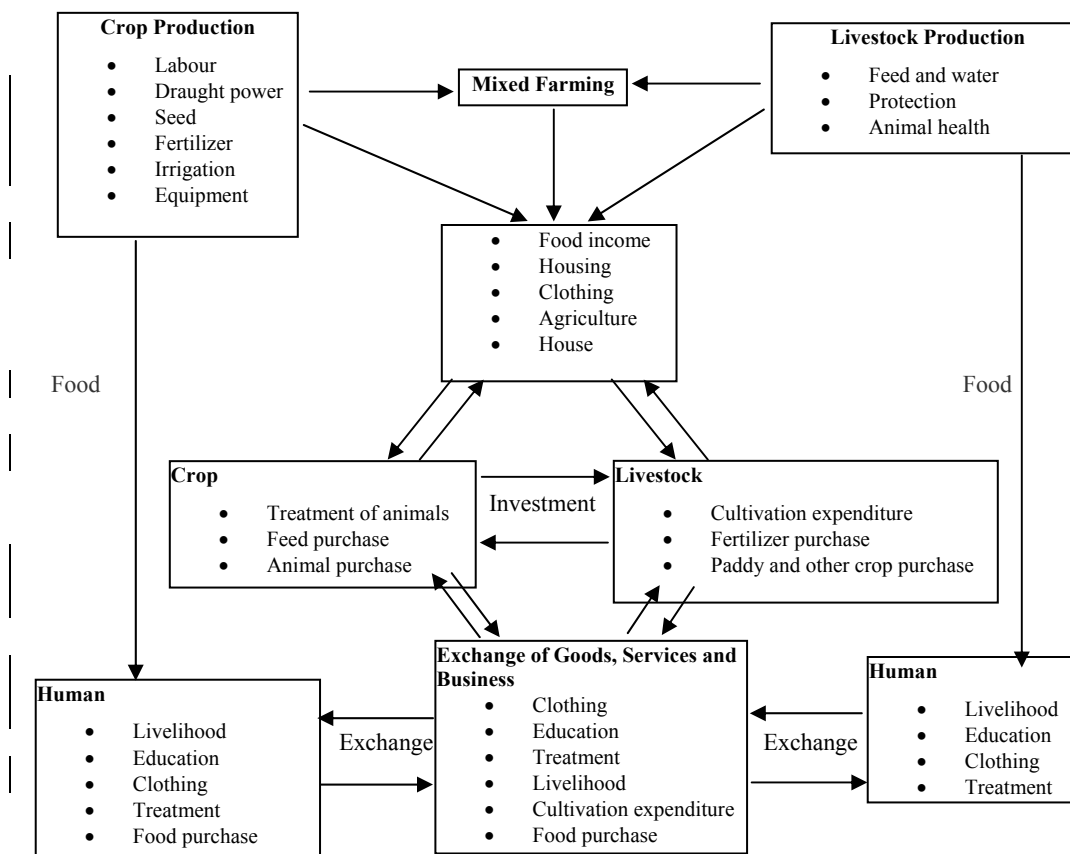


Fig. 1. Crop-livestock interaction patterns in the experimental area of Khulna district.

Discussion

A diversified crop-livestock interaction pattern was observed in the present study. Islam (2000) found that 46.7% of the total farmers practiced the integration of crop-livestock-poultry resources and 22.6% crop-livestock-poultry-fish in coastal region. However, most of the farmers of the study area were small landholders. To become self-sufficient the farmers practiced such type of farming systems. Crop residues were used as feed and fodder for the ruminant and poultry. It was found that rice yield was higher in Digholia and Rupsha *Upazila*. This is probably for the reason that the farmers from these two *Upazila* used to cultivate high yielding variety (HYV) of rice.

The result revealed that most of the farmers cultivated their land using mechanical devices. Islam *et al.* (2000) observed that 8.4%, 1.7% and 80.9% farmers cultivated their lands by animal, mechanical and both animal and mechanical means, respectively. The findings of the study indicate that pressure on animal power for land preparation decreasing day by day with the increase in mechanization or mechanical cultivation. Application of cow dung in the crop field was found minimum which is consistent with the findings of Hossen *et al.* (2000).

Most of the farmers (93.2%) did not provide vaccination to their livestock (Table 3). Table 3 also shows that major proportions (81.4% and 59.1%) of farmers used chemical fertilizer and pesticides, respectively. These results are in agreement with the findings of Karim *et al.* (1990). Lee (1995) showed that due to rapid industrialization farming system has transformed into a commercial and specialized production system. Fonzen and Oberholzer (1986) observed that crop production solely depends on livestock for manure and draft power and animals in turn, depend on for feeds and fodder.

The farmers belonging large land holders category produced much milk than the landless and small farmers. This may be the reason for economic solvency; the large farmers can able to input more for feeding and maintenance of their animals. In Rupsha *Upazila* the egg production/household/annum was higher (126.06 ± 8.17) than the others. It was found that the large landholders produce more eggs/household/annum (117.85 ± 11.35) than the other farmers (Table 4). As the landless farmers do not have land for crop production, therefore, they can give priority and intensive care on poultry production.

Conclusion

Most of the farmers practiced integrated farming to meet their overall demand that is reasonably stable arrangement of farming enterprises that the household manages according to well-defined practices in response to physical, biological and socio-economic aspect. Livestock was the source of manure used to sustain and/or increase production of crop components on the farm. On the other hand land cultivation was partly depends on draft animals. It was shown that maximum crop and livestock productivity from available resources through integrated technology, which employs crops, animals and plants. However, a larger part (46%) of cowdung was used as fuel. Considering the good quality of cowdung as manure, it can be recommended to apply more to crop field instead of using as fuel. On the other hand, it should be emphasized on the proper utilization of crop residues and products as animal feed.

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