

Interaction between livestock and crop farming in Northern Nigeria: an integrated farming systems approach

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Abstract

The study looked at the role of livestock and its interaction with crop production in an integrated crop-livestock farming system in Katsina State. Field data were collected through household survey of 120 respondent located in six villages in Katsina State. The result shows that there was a high level of crop-livestock integration among the smallholders in the study area. Livestock in the study area is important as a production factor, for subsistence, cash and as a source of wealth. Livestock was of prime importance in providing draft power and a source of savings and investment to the households. Also, output from livestock such as manure was intermediate product used for soil improvement for crop production. Animals, particularly small ruminant and poultry, were sold according to cash needs for household and crop inputs. They are also purchased as a source of savings/investment for the households. Workhulls were more commonly used for the various crop cultivation processes while donkeys were mainly used for carting and transportation. Crop residue supplementation accounted for about 70% of the total feed intake during the dry season. The study also revealed that livestock provided about 20% of the annual household income.

Keywords: Farming systems, crop residue, draught power, manure

Introduction

The objective and strategy of agricultural planning in Nigeria have been geared to the idea of attaining self-sufficiency in livestock and crop production to meet up with the growing population. As population pressure increases, intensification in agricultural production is presumed to depend greatly on integrating livestock into crop farming systems (McIntire *et al* 1992). Integration of crop and livestock under the same management system ensures that by-products from both enterprises that would be otherwise unused could be efficiently utilized. This system of production provides many opportunities for recycling and

organic farming in response to high cost of production inputs (Assefa, 1989). If farmers cannot resort to external inputs because of the costs, the interaction between crop and livestock activities represents their main opportunity for intensification. Research and project activities for sustainable development of integrated crop-livestock production systems should therefore aim at understanding and strengthening the existing link between the two sub-sectors. This can be achieved through assessment of the present state of their interactions within the traditional natural resource base.

Katsina State is most suited for both crop and livestock farming in the country. Crop and

livestock production in the area are not mutually exclusive but intimately merged with the emphasis on each component varying among households. The nature of crop-livestock interactions and the contributions of each component within the farming system would depend on the extent to which either component is being practiced. This study investigated the feasible interactions between livestock husbandry and crop farming. The study also aimed at determining the type and extent of livestock contributions within the integrated crop-livestock farming systems in Katsina state.

Methodology

The data used for this study were obtained from a questionnaire-based survey conducted in Katsina State in the 1998/99 cropping season. The state is situated within three ecological zones namely; Sahel, Sudan and Northern Guinea Savannah. It occupies a total land area of about 2.4 million hectares, out of which 1.64 million hectares are under both rainfed and irrigated farming (KTARDA, 1998). Katsina State is divided into three Agricultural Development Project (ADP) zones. Samples were stratified by ecological zone in order to arrive at a general overview of farming systems in the entire state. Two villages were purposively selected from each zone based on the popularity of integrated crop-livestock farming systems. The villages selected are; *Barhim* and *Are* in zone I, *Nasarawa* and *Gazari* in zone II and *Kuki* and *Rimaye* in zone III.

Primary data were collected from 120 randomly selected households in the state; comprising of 40 households in each agro-ecological zone. This was accomplished through a single visit interview using structured questionnaire. The questionnaire was designed to answer detailed questions on household characteristics, crop-livestock interactions, and resource allocation to crop and livestock in the household. Where necessary, some key members of the household

were also interviewed. The data collected were analysed using simple descriptive statistics such as frequency counts, percentages and cross tabulation.

Results and Discussion

Livestock ownership and management structure

The dominant livestock species in the area are cattle, sheep, goat, donkeys, poultry, and horses. In terms of population, poultry was the most common livestock species, followed by goat, sheep, cattle, donkey and horses in that order. The ownership of donkey per household is very low because donkeys have been replaced by work-bulls for most activities. The livestock ownership structure for cattle, sheep and goat is presented in Table 1. The livestock distribution over households was very uneven as about 54% of the household had an average of two work bulls, about 43% had between 3 to 8 while less than 3% had more than 10 heads. About 25% and 40% of the households had between 2 to 5 sheep and goats respectively while 36% and 41% had between 6 to 10 sheep and goats respectively. The average size of livestock holdings per household across the ecological zones were estimated from Table 1 using the formula:

$$\frac{(\text{End} + \text{Exit}) + (\text{Beginning} + \text{Entry})}{2}$$

Where:

- End = Number of livestock at the end of the year under study
- Entry = Number that entered the stock in the year (birth, purchase)
- Beginning = Number of livestock at the beginning of the year.
- Exit = Number that left the stock within the year (sold, died, consumed)

The analysis revealed that the average number of cattle, sheep and goats in zone I were 3, 7 and 13 respectively. The numbers in zone II were 5, 9 and 12 while the averages in zone III were 4, 8 and 12 for cattle, sheep and goats

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respectively. The numbers of all species of livestock were more in zone II, followed by zone III while the least numbers were observed in zone I. Cropping activities were more intense in zone II thus the households have more access to surplus income which can be invested on different livestock species as a store of wealth. This zone is in the southern part of the state and thus favours livestock production in terms of

feed availability. Zone I, which recorded the least population of the various livestock species is located in the northern part bordering the Sahel where problems of feed and water scarcity is predominant, particularly during the dry seasons. Fattening of bullocks and rams is a common practice in all the zones, particularly in zone I.

Table 1 Livestock population structure across ecological zones in Katsina state

Livestock	Initial No.	No. sold	No. bought	No. of birth	No. of dead	Consumed	Final No.
ZONE I							
(N)* = 40							
Cattle	91	35	37	0	0	0	93
Sheep	238	59	19	12	9	5	196
Goat	445	80	28	34	15	7	405
ZONE II							
(N) = 38							
Cattle	179	24	20	0	0	0	165
Sheep	302	26	31	23	10	10	310
Goat	421	48	31	35	6	12	403
ZONE III							
(N) = 37							
Cattle	121	28	31	0	0	0	114
Sheep	259	40	21	22	5	17	238
Goat	413	61	18	30	15	13	371

(N)* = total number of respondents.

Cattle were kept mainly for cultivation purposes while sheep and goats were kept mainly for meeting household cash need. According to the results presented in Table 2, about 35%, 42% and 57% of the respondents in zones I, II and III respectively kept livestock mainly for food and ceremony, while 78%, 71% and 51% of the respondents in the respective zones indicated savings and investment as their major reasons for keeping livestock. Other reasons for keeping

livestock include: draft power, 90%, 87% and 89%; income, 63%, 45% and 41% and manure, 28%, 16% and 22% of the respondents in the respective zones. These results revealed that draft power and savings/investment were the major reasons for keeping livestock in the study area. Although manure is becoming very important for soil improvement in the study area, few of the households interviewed kept livestock just for the purpose of the manure.

Table 2 Reasons for keeping livestock across the ecological zones of Katsina state

Reason	ZONE 1 (N=40)	ZONE 2 (N=38)	ZONE 3 (N=37)
Savings & investment	31	27	19
Food & ceremony	14	16	21
Draft power	36	33	33
Income	25	17	15
Manure	11	6	8

N = Number of respondents.

Note: Multiple responses allowed.

Most of the households kept their animals in the barn at night and allowed them to graze during the day. However, sheep and goat were usually tethered throughout the rainy season to avoid damage to crops. Livestock have access to a variety of feed during the rainy season, but availability of feeds is a problem during the dry season, particularly in zone I. Available livestock feed in the state includes grasses, *dusa* (chaff from processed cereals like maize, millet and sorghum), *kaikai* (cowpea and groundnut husk) and crop residue such as cowpea and groundnut haulms and cereal straw. Crop residue and by-product supplementation in the dry season was observed to be as high as 70%.

Off-take rates

The off-take rates, calculated as the proportion of the total stock that left the farm (sold, died, consumed) during the survey period were 38%, 37% and 23% for cattle, sheep and goat in zone I, the rates in zone II were 13%, 15% and 16% while the rates in zone III were 23%, 24% and 24% for the respective livestock types. The off-take rates were higher for cattle than sheep and goat in zone I while the rates were higher for sheep and goats than cattle in the two other zones. All the cattle that left the stock during the survey year were sold in all the zones. None of the respondents indicated cattle mortality or slaughter during the survey year. The study also revealed that income from sale of cattle was the highest followed by goat and then sheep. Except

for cattle in zone I, and sheep in zone II, the total numbers of off-take were higher than the in-take in all the zones. If this trend is allowed to continue it would have a negative impact on the livestock population in the study area.

Interactions between livestock and crop farming in the integrated system

The most prominent features of crop-livestock interaction are the extent to which crop residue are used to feed animal, use of work animals to provide draft power and application of manure to improve soil fertility. Households in the study area were actively involved in integrating livestock into crop farming systems at varying intensities. The nature of crop-livestock interaction within the farming systems of the study location is presented in Fig. 1. Crop residue, which would otherwise be wasted or left on the field, were used as feed resource for livestock production while manure from livestock production were used as fertilizer source for improving the soil for crop production. Also livestock production provided draft power as labour resource for crop production while the household residual labour was used for livestock production during the off-farming season. Revenue from crop production and other off farm income was invested into purchasing livestock as a form of savings and investment thus providing ready cash for purchasing crop inputs and meeting other household expenditure. Income from crop

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and livestock constituted the total farm income in the integrated crop-livestock systems. However, all the households surveyed in the three zones claimed that their major income was from crop production. Livestock contributed only about 20% to the total annual income generated by the households in all the zones. This finding conforms to that of Gunther *et. al* (1992) who asserted that the contribution of livestock sector to the income of rural households is low.

Crop residue utilization

Fodder production is not a common practice in the study location. Two major reasons were given for this; lack of knowledge on its

production and inadequate land. Crop residue is a major feed resource in the study locations, particularly during the dry season. Straws from cereal crops were left on the field and livestock were allowed to graze these fields (those close to the homestead). However, legume haulms (mainly cowpea and groundnut) were transported to the house for feeding in the sheds. The study revealed that crop residue from the farm-household last for only 3-6 month after harvesting as result of poor handling and storage facilities. Crop residue supplementation accounted for about 70% of the total feed intake during the dry season.

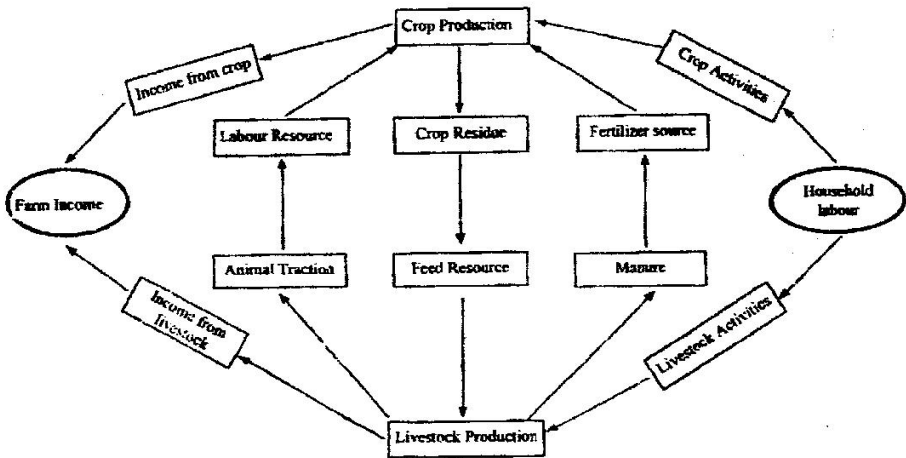


Fig. 4.3. Pattern of crop-livestock integration in the farm-household systems.

Source: Field Survey, 1998

Manure utilization

Manure is livestock waste product that serves as input in the crop subsystem. Manure is recognized as a supplement to inorganic fertilizer in improving soil fertility. The study

revealed that the available manure from the households was not able to cover all their plots therefore in most cases it was used on farms closer to the homestead. This was attributed to its bulkiness and the insufficient quantity

produced. The respondents claimed that the manure from the household constituted between 10%-100% of the total manure used on the farms, with an average of about 40%. The quantity applied varied from 20 *mangala* (400 kg) to 100 *mangala* (2000 kg) per hectare. The use of manure in the study area was attributed to increasing cost and or unavailability of inorganic fertilizer and reduction or elimination of fallow period.

Draft power utilization

Draft power is most important for field preparation and transportation of farm inputs, harvested products, firewood, water, crop residue, and other farm implements. The major animals used for traction in the study area were oxen and donkey. However, oxen were more commonly used in all the zones for the various crop cultivation processes while donkeys were mainly used for carting and transportation. The principal tasks performed with the aid of draught animals in the study area were planting, weeding, and harvesting of groundnut and transport of manure, farm inputs and harvested produce. Equipment used for harnessing these animals include, ridger (*garma*), weeder (*chakarkara*), cart (*amalanke*) and woven basket (*mangala*).

Conclusion

For general agriculture as well as for livestock production, the need for development is great and the modest objective of maintaining per capita levels of production constitutes a formidable challenge in the light of the rapidly growing population. Livestock is of crucial importance in the farming systems of northern Nigeria. Livestock in the study area is important as a production factor, for subsistence, cash and as a source of wealth. Livestock is of prime importance in providing draft power and a source of savings and investment to the households. Also, waste product from livestock such as manure was intermediate products used for soil improvement for crop farming. It is therefore recommended that policy choice should be

geared towards enhancing a closer and efficient integration of livestock into crop farming to achieve optimum benefit from this production system. Such measures will entail extension education in animal husbandry, crop residue management, development of low-cost credit and input supply arrangement. The strategy of an appropriate package for intensifying the interaction between livestock husbandry and crop farming is bound to accomplish the desired objective of attaining sustainable development in agricultural production.

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