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ANALYSIS OF FACTORS FACILITATING THE ADOPTION OF MANURE CONTRACT AMONG RURAL FARMERS IN ZAMFARA GRAZING RESERVE

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ABSTRACT

This study evaluates the factors that affect the adoption of manure contract as soil management strategy in the study area A Probit analysis was used to analyse factors that facilitate farmers' adoption of manure contract in the study area. A total of 85 adopters and non adopters of manure contract were sampled using structure questionnaires administered in 2002 on farmers in Dumburum, Shamashalle, Ajja and Tsabre all within the Zamfara grazing reserve in Zamfara state. Results of the Probit analysis has shown that the length of days involved in manure contracting, the previous contract relationship, tribal affinity, trust and seeing others in the past getting involved in manure contract were the important factors facilitating farmers adoption of manure contract in the study area. The results has demonstrated the interdependence of croppers and herders within the Zamfara grazing reserve and the positive role manure can play in facilitating this vital relationship thereby reducing conflict over resource use as well as contributing to enhancing farmers crop production, and herders animals production in the area. One could therefore infer that resource-poor rural farmers in Nigeria are very innovative in adapting to local resources like manure through local exchange relationship in solving vital production problems in their locality

KEYWORDS: Adoption, manure contract, rural farmers, soil fertility, northern Nigeria

INTRODUCTION

Agricultural productivity in Nigeria has been experiencing a downward slide over the years. One of the major reasons for this dwindling agricultural productivity fortunes is because the resource-poor rural farmers that are the backbone of agriculture production lack the needed financial resources to maintain the fertility of their soils. This lack of resources for soil fertility maintenance has led to poor soil fertility arising from fertility depletion over the years. With helps coming from no where in form of subsidies, these resource-poor farmers are beginning to look inward on how the fertility of their soil could be enhanced with the use of resources in their local environment. Generally, in the northern part of Nigeria and especially in Zamfara, animal manure is considered the richest local means of maintaining soil fertility.

In the past, manure for cropping has been sourced from farmers owns animals and such have encouraged the practice of farmers including animal husbandry as part of farm enterprise. This type of farm set up is referred to as closely integrated crop-livestock systems (McIntire *et al*, 1992). However, since not all the farmers are involved in animals husbandry as part of their farm enterprise, and consequently do not generate manure from own farm, to overcome the problem of lack of manure for farming, farmers enter into contracts based on the exchange of manure deposition for crop residues grazing with the transhumance herders (Williams *et al*, 1995; Powell *et al*, 1996). Most farmers in Zamfara grazing reserve have over the years been involved in manure contracting with the local herders in sourcing the needed manure for soil fertility maintenance. Manure contract has been classified as a form of weak association between crop and livestock production referred to as crop-livestock interaction.

It has been observed by Jahnke (1982), that cattle are the most important domesticated ruminants in the Savannah zone with cattle ownership and thus the control of manure mainly in the hands of Fulani herders. Although some Fulani now grow crops and some farmers keep cattle, the majority of the manure used in cropping comes from traditional linkages between the two specialised groups, which allow farmers to gain access to manure through manure contracting. The socio-economic aspects of this manure exchange have been well documented (MacCowen *et al*, 1979; Toulmin, 1983; Powell *et al*., 1996).

Manure has been viewed as a very important input needed for sustainable agricultural production particularly in developing countries where most of the resource-poor small-scale farmers are not able to afford the conventional chemical fertilizers in maintaining the fertility of their soils. According to Brouwer and Powell (1995; 1998), the application of manure to soil enhances the following· 1). Improvement in soil physical condition and· the provision of N,P,K and other mineral nutrients, 2). The application of livestock manure increases soil organic matter content, and leads to improved water infiltration and water holding capacity as well as an increase cation exchange capacity, 3). Manure and urine raise the PH level and accelerate the decomposition of organic matter and termite activity, and 4). If inorganic fertilizer, especially nitrogen, is combined with manure, the manure reduces soil acidification and improves the nutrient buffering capacity and the release of nutrients (Williams *et al*., 1995).

The importance of manure and the prominent role manure contract is playing in helping farmers that have no animals have access to manure have long been recognised. However factors facilitating farmers participation in adoption of manure contract for soil fertility maintenance have not been evaluated, and as a result, there is need to provide information to bridge this gap.

The focus of this study is therefore to evaluate the factors that determine farmers participation in manure contract adoption in the Zamfara grazing reserve since it is considered that the maintenance of the fertility of the current areas under crop production will enhance sustainable production as well as the preservation of the grazing reserve, since such fertility maintenance will reduce farmer's encroachment on the grazing reserve thereby ensuring the preservation of the reserve biodiversity.

Research Methodology

Study area, manure contracting process and data for the research

Zamfara grazing Forest Reserve is located between 6^0 30' and 7^0 15' E, and 12^0 05' N in the North of Zamfara state, and shares a border with the Niger Republic to the north, Sokoto state to the West and Runka Reserve of Katsina state

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to the East. The annual rainfall within the reserve ranges from 500 mm in the north to about 850 mm in the south with considerable inter-annual variations. The vegetation of the reserve is of a northern Sahel savannah type.

The Zamfara reserve was established in 1918, and covers as of today an area of about 2300 km^2, including the four enclave villages located within the reserve, namely, Shamashalle, Dumburum, Ajja and Tsabre. There are about 50 other villages lined up in the western fringes of the grazing reserve. About 130,000 people live within and around the reserve and are utilising its natural resources (ARCA, 1995). The reserve is very important for livestock grazing in the rainy season for the transhumance pastoralists as well as the herds being raised by the sedentary farmers living in the enclaves and the adjoining villages. After grain harvest, most of the livestock are fed with stubbles. At the heart of the dry season, most of the transhumance pastoral herds leave the region in search of greener pastures and water. However, about one third of the Fulani who have become sedentary stay in the region throughout the year (Schaefer *et al*, 1998).

In spite of the low average population density of about 80 persons per Km^2, pressure on cropland is very high. The estimate of the actual land area available per household of about 8 persons (Eckert and Hoffmann, 1998) is between 1.6 and 1.8 ha for Dumburum, Ajja, and Shamashalle, but about 5.4 ha for Tsabre (Hoffmann, 1998). Plot size among farmers in Zamfara reserve ranges from 0.2 to 4 h with an average of 1.1 ha. As arable land is increasingly becoming limited due to population growth, shifting cultivation and fallow are no longer practised, and therefore the cultivated fields are under permanent use for the past 40 years, thus making the fertility maintenance of the cultivated field a very important requirement for sustainable production. The maintenance of the area already designated for cultivation in this forest reserve has the potential of reducing further deforestation and therefore essential for the sustainability of the forest reserve in itself. This is so in view of the unilateral bush clearing activities often embarked upon by farmers to enlarge their farms or to acquire fresh land due to loss of fertility of the old ones they have abandoned (Hoffmann, 1998). The position stated above has made the fertilization of the cropping area to be more compelling and underscores the importance of manure contract adoption in solving the fertility maintenance problems among the farmers in the Zamfara grazing reserve.

Manure contract exchange between croppers and herders is normally carried out under a mutual trust agreement between the croppers and the herders. The pastoralists night-corral their herd on fields in the late dry season, when no more crop residues are on the field and the surrounding vegetation get scarce. Animals are graced on browse and the near-by bush during daytime. Corralling of livestock during the late dry season results in a net transfer of nutrients from rangeland to the cropland. It also returns dung and urine to the soil, and results in better crop yields than dung alone (Powell *et al*., 1996). Crop farmers usually pay for such manure deposited mostly with a 100 Kg bag of grain for a week contract and occasionally with cash when grains are not available for exchange. However, the other exchange involving crop residues grazing after crop harvest does not attract payment since the residues on the croppers' field at this time compensate for the manure deposited and in some cases, the pastoralists may be required to part with some monies or gifts if the quantity and quality of residues on the field were very high.

Data was collected from 85 respondents with the use of structured questionnaire in Zamfara grazing reserve comprising croppers involved in manure contract for soil fertility maintenance and those that were not involved. Stratified random technique was employed in the selection of the respondents in the study area from among the 1000 households living in the grazing reserve in 2002 cropping season. Information was collected on farmers' socio-economic and demographic attributes. Other important information was on whether farmer adopt manure contract for fertility maintenance or not and the factors driving the adoption, the expenses on crop production, labour expended in man-hour were equally collected. Finally, output from farms and the prices of produce were equally collected in the study area.

Theoretical considerations of the modelling of adoption behaviour

Since the early work on adoption by Roger (1962), efforts that have been made to explain the determinants of adoption have received a boost. There are two major groups of paradigms for explaining adoption found in literature: the innovation-diffusion, and the economic constraint paradigms.

The innovation-diffusion model, following the work of Roger, contended that access to information about an innovation is the key factor determining adoption decisions (also Agrarwal, 1983). The appropriateness of the innovation is taken as given here, and the problem of technology is reduced to communicating information on technologies to potential end users. By emphasising the use of extension, media, and local opinion leaders, or by the use of experimental station visits and on-farm trials, "sceptic" non-adopters can be shown that it is rational to adopt (Adesina and Zinnah, 1993).

In contrast, the economic constraint model (Aiken *et al*., 1975) contends that economic constraints, reflected in asymmetrical distribution patterns of resource endowments, are the major determinants of the observed adoption behaviour. A lack of access to capital (Havens and Flinn, 1976) or land (Yap and Mayfield, 1978) is seen as a factor significantly constraining adoption decisions. While attempts have been made to assert the superiority of the economic constraint model over the innovation model (Hooks *et al*., 1983), such conclusions have been challenged (Nowak, 1987).

Many other concepts have recently been developed and used to quantitatively determine adoption processes. One of these concepts, which is implicitly used in one form or the other in agricultural economics literature (Gould *et al*., 1989; Norris *et al*, 1987; Lynne *et al*., 1988 Adesina and Zinnah, 1993), suggests that the perceived attributes of innovation conditions determine adoption behaviour. Farmers, as reasoned, have subjective preferences for technology characteristics (Ashby and Sperling, 1992; Ashby *et al*., 1989) and these could play a major role in technology practice adoption. The adoption or rejection of technologies or farm practices by farmers may be based upon farmers' perceptions of the appropriateness or inappropriateness of the characteristics of the practices under consideration.

A number of studies have investigated the influence of various socio-economic factors on the willingness of decision makers to use new technologies (Nerlove and Press, 1973; Roe, 1983; Shakya and Flinn, 1985). From most of these studies of adoption behaviour, the dependent variables are constrained to lie between 0 and 1 and the models used are exponential functions. One common feature of these models is that Univariate and Multivariate Logit and Probit models and their modifications have been used extensively to study adoption behaviour of farmers and consumers (Nerlove and Press, 1973;Schmidt and Strauss, 1975; Garcia *et al*, 1983; Akinola, 1987; Akinola and Young, 1985; Adesina and Zinnah, 1993). Maddala (1983) and Shakya and Flinn (1985) have recommended Probit models for the functional forms with limited dependent variables that are continuous between 0 and 1, and Logit model for discrete dependent variables.

Following Rahm and Huffman (1984), farmer adoption decisions are reasoned to be based upon utility maximization. If, for example, we define a variant of soil maintenance technology by j, where j = 1 for the institutional arrangement evolving for the acquisition of manure through manure contract to facilitate manure availability for soil fertility maintenance and j = 0 for the old management practice of not applying anything to the soil for the purpose of maintaining the soil fertility. The non-observable underlying utility function that ranks the preference of the ith farm household is given by U (M_{ji}; A_{ji}).

From this, the utility derivable from the soil fertility maintenance practices depends on M which is a vector of farm and farm household-specific attributes of the adopter and A which is a vector of the attributes associated with that particular maintenance practices or technology in question. Though the utility function is unobservable, the relation between the utility derivable from a jth management practice is postulated to be a function of the vector of observed farm, farm household specific characteristics (e. g, farm size, age, family size education etc) and the practices or technology characteristics (e. g: enhance availability of manure, meet food needs, guarantee more income etc) and a disturbance term having zero mean:

$$\mu_{ji} = \alpha_j F(M_i, A_i) + \varepsilon_{ji} \quad j = 1, 0, i = 1 \ldots n \ldots \quad (1)$$

The equation as in (1) does not restrict the function in F to be linear. Since utilities U_{ji} are random, the ith farm household will select the alternative j = 1 if $U_{1i} > U_{0i}$ or the non-observable (latent) random variable $Y^* = U_{1i} - U_{0i} > 0$. The probability that Y_i equal one
(i.e), that the farm household adopts a soil maintenance practices is a function of the independent variables.

$$P_i = P_r(Y_i = 1) = P_r(U_{1i} > U_{0i})$$

$$= P_r[\alpha_1 F_i(M_i, A_i) + e_{1i} > \alpha_0 F_i(M_i, A_i) + e_{0i}]$$

$$= P_r[e_{1i} - e_{0i} > F_i(M_i, A_i)(\alpha_0 - \alpha_1)]$$

$$= P_r(\mu_i > - F_i(M_i, A_i)\beta)$$

$$= F_i(X_i\beta) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where X is the n x k matrix of the explanatory variables, and β is the k x 1 vector of parameters to be estimated, P_r (0) is a probability function, μ_i is a random error term, and F ($X_i\beta$) is the cumulative distribution function for μ_i evaluated at $X_i\beta$. The probability that a farm household will adopt participation in a particular soil maintenance practice like manure contract is a function of the vector of explanatory variables and the unknown parameters and an error term.

2.3 Statistical considerations for the modelling of manure contract adoption behaviour

The concern here is to estimate the determinants of farmers' participation in the adoption of manure contract as soil maintenance strategies to facilitate improved crop productivity. As a first step, it is assumed that the adoptions of soil maintenance strategies by different classes of farmers are a linear function of farm household characteristics and the attributes inherent in these soil maintenances practises. However, the decision as to whether a farmer adopts or not is based on self-selection rather than random assignment. Thus adoption A_i should be endogenised using an index function model (e.g. Heckman, 1976; Maddala, 1983; and Greene, 1997). This index to estimate farm household adoption of manure contract is:

$$A_i^* = Z_i'\gamma + \mu_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where A* is an unobservable index variable denoting the difference between the utility of adopting these maintenance practices (U_{1i}) and the utility of not adopting them (U_{0i}). If $A_i^* = U_{1i} - U_{0i} > 0$, then the individual household $_i$ will adopt a chosen soil fertility maintenance strategy. The term Z'γ provides an estimate of $U_i1 - U_i0$, using farm household characteristics and the attributes of the soil maintenance practices, Z_i, an explanatory variables, while U_i is an error term unobserved by the researcher and assumed to be normally distributed $U_i \sim N(0,1)$. This model is estimated with a standard Probit log-likelihood function.

Variables in the adoption participation of manure contract as soil fertility maintenance strategy

To estimate the models in equations 3, data was collected in 2002 from Zamfara reserve on manure contract adoption participation as soil maintenance practices fur the purpose of maintaining the fertility of soils in the study area. These data together made up of 85 croppers households comprising those involved in manure contract adoption for soil management and those that are non-adopters of the practice There were four enclaves in the Zamfara reserve where the data were collected. These are Dumburum, Shamushalle, Ajja and Tsabre.

Various practices "technologies" be it advanced or traditional in nature has their inherent peculiar characteristics that drive the participation of farmers in their adoption. For the croppers, the decision to participate in manure contract is what is under investigation and as such the dependent variable is manure contract coded as MANURE_C. This indicator variable was scored one for the households that participated in manure contract adoption as soil management strategy and zero for non-participants. There are six explanatory variables that determine the decision of farmers to participate in manure contract. They are: the duration of time herders are willing to camp their livestock on the farmers field, prior business relationship of cropper with herder, tribal closeness of the cropper with herder, the perceived level of trust existing between the cropper and the herder, because farmers see other farmers participate in contract with noticeable benefits and because it increases soil fertility

Looking at these variables one by one, the duration of time the herders are willing to allow their animal stay on the field "DURSTAY" is purely based on manure economics that is within the ambit of farmer rational behaviour predicated on the motive of what amount of manure he would gain from participating in manure contract. Knowing fully well that the longer the livestock are camped on his field, the more the quantity of manure that would be voided on his field and the better for the fertility of his field and consequently the better the nutritional status of his field, it is therefore expected that arrangement between the croppers and herder that allows the herd to stay long on the field will elicit positive decision to participate in manure contract by the croppers. Farmers' response on this variable was obtained by asking the farmers to say for how many days he will expect a herder to camp his animals on his field to elicit his participation in manure contract.

The second explanatory variable has to do with the prior relationship of the croppers and herders "RELATION". A contract that has no formal agreement is fraught with the danger of defaults by either of the parties involved and consequently under this informal institutional business arrangement, care is taken in selecting partner with utmost certainty of non-default. Since there is no better way of guaranteeing non-default, each party is more comfortable with someone they have had such informal business relation with before. Such prior relations are usually very important in guiding the decision of farmers to participate in manure contract.

The third variable is tribal affinity with the herder. People usually have better confidence reposed on people from their own tribe under the rural settings of these farmers since there is no legal basis yet in getting agreement executed. Therefore, finding person of the same tribe willing to do manure contract will encourage the cropper to participate in manure contract. In fact, there is a very close association between the Hausa farmers and the Fulani herders in the whole country to the intent that they are said to be people of same origin and bounded together by same culture and religion. This made them to be generally referred to as Hausa-Fulani. This is because there is basically no difference between them when looked at from many points of view. Because of this understanding, which is nationally recognised, these people

have come to regard themselves as the closest tribe among the many tribes we have in Nigeria and are able to do things together in common.

The fourth variable is trust in the other partner involved in the manure contract "TRUST". People are generally more comfortable with the person they feel they can trust when it comes to dealing with others in an informal contract that has no legal backing and as such trust is an essential ingredient in guiding the decision of croppers. It is also significant here because there is the feeling that the religion bond that a Muslim brother could be trusted is important in finding partners for manure contract or finding contract partners. Therefore, the religion factors could be very vital here in deciding whom to trust.

The other variable was termed "BANWAGON" in which the farmers said they adopted the practice because they have seen other farmers do same. And lastly was because the farmers thought it would increase the fertility of their soil. All these variables apart from the number of days the farmers are willing to camp their animals on farmers field are binary or dummy variable taking the values of one or zero.

2 Results and discussion

3.1 Factors motivating the adoption of manure contract in the study area as soil management strategy.

As presented in Table i below, there are a number of reasons behind the adoption of manure contract by farmers. The prior relationship with the farmer is seen here on the table as an important factor. This is because having prior relationship with somebody before may help to have a good understanding of the personality one is dealing with, as to whether one could do business with him. About 35% of the farmers therefore posited that they would be much ready to enter into manure contract only with the person they have known before and have had dealing with in the past.

Table 1: Factors motivating farmers to participate in manure contract as soil management strategy.

Factors	Frequency	Percent	Cumulative %
Prior business relationship	14	35.00	35.00
Tribal affinity	9	22.50	57.50
Trust	9	22.50	80.00
Because others do same	6	15.00	95.00
It increases soil fertility	2	5.00	100.00
Total	40	100.00	

Source: own data, 2002

On the other hand, tribal affinity and trust on the herders rank second as important conditions that determine whether a cropper would be ready to do manure contract with herder. In this community, people are more confident doing business with people of the same tribe based on the fact that such a person would most probably not engage in cheating. In the same vein, a person that is already known to be of trustworthy character and integrity are easily engaged with in contract rather than somebody with an otherwise unknown attributes and character. It must be stated that the contractual agreement of this type between herders and croppers is a sign of good social relationship and farmers testified that it has helped to foster better understanding and the spirit of interdependence among the croppers and herders thereby reducing conflict between them.

On the other hand, there are people who said they participated in contract because they have seen other farmers participating with noticeable benefits. These farmers are following other and that forms the variable referred to as "BANDWAGON". Of the total respondents, 15% said they participate in contract because they have seen other farmers do it. The last but not the least are the farmers who said they participated because they thought the practice would improve the fertility of their soils and consequently crop yields and this category forms 5% of the total population of the respondents.

Also, apart from these general factors, the proposed duration of stay of livestock of herders on farmers' fields would determine the willingness of the croppers to participate in a manure contract as shown in Table ii below. This is so because the number of days the animals stay would determine the quantity of manure deposited on the farmer's field. It was found as presented on the table bellow that 7 days is the minimum numbers of days the farmers are ready to accept for a contract. Consequently, an overwhelming percentage (62.5%) of the 40 croppers said that they would be ready to participate in a contract if the herders are ready to camp their animals for at least 7 days on their field. Next is 17.5 % who said that the herd must camp for at least 30 days before they can participate in such contract.

However, the quantity and quality of residues on the farm will determine the bargaining power on the number of days he is ready to accept for contract participation. Expectedly, fields with grain stalks mixed with legumes residues like beans or groundnut would be more attractive for contract since such mixtures are considered very rich for animals' nutritional requirement. However, the number of animals a herder possesses would also determine his eligibility for contract participation as the croppers would be much willing to participate in contract with herders with larger herd sizes since the more the cattle, the more the quantity of manure that the croppers would get.

Table ii: Duration of animals stay on field as determinant of croppers' participation in manure contract adoption

Number of days stay	Frequency	Percent	Cumulative %
7 days	25	62.50	62.50
14 days	3	7.50	70.00
30 days	8	20.00	90.00
32 days	4	5.00	100.00
Total	40	100.00	

Source: own data, 2002

Determinants of decision to participate in manure contract by all croppers in the study area

From Table iii, the general response by croppers to the factors that determine croppers decision to participate in manure contract adoption as strategy for soil fertility management are as shown. The model correctly predicted 96.47% of the observations, with significant chi-squared value of 86.39. All the six variables explaining adoption had coefficients that were significantly different from zero. Three of these variables were positively associated with the adoption of manure contract participation for the 85 crop farmers in the study area. This attests to the importance of this informal institutional arrangement of manure contract adoption participation as a bail out measure for the farm households without own-livestock to produce manure and who could not afford the conventional chemical fertilizers for maintaining the fertility of their soil.

The veracity of motives claimed by these farmers and the significance of their results showed that without any doubt, the manure contract adoption participation have taken roots in the place between herders and the croppers who are poised to ensure they could maintain the fertility and sustainablity of their soil productivity. The farmers in this part of Nigeria are generally poor and manure use would continue for the nearest

future to be the most feasible alternative for them to keep their soils productive.

Looking at the variables, the duration of stay of the livestock on the field of croppers during contracting was a very important factor in the decision of farmer to participate in manure contract adoption. The longer the herder agrees to camp his animals on the field, the more likely the cropper is favourably disposed towards participation. This is because the longer the animals stay, the more the manure that would be voided on the field and the better for the fertility of the soil and consequently the better the productivity of the soil.

In the same vein, the prior business relationship with the herder was found to be significant but with negative sign. This may be an indication that such a business relationship in the past have turned sour and would consequently not encourage farmers' participation in manure contract. On the other hand, tribal closeness of the parties involved and the level of trust they reposed on each other that can serve as guarantee to allay the fear of cheating would all encourage the croppers to participate in manure contract adoption as a strategy for soil fertility management by the croppers in the study area.

Moreover, the last two reasons are because they have seen other farmers participating with probable good results, and that it could increase the fertility of their soils are also statistically significant.

Table III: Results of Probit model for the adoption of manure contract participation by all croppers in the study area.

Variables	Coefficients	St deviation	t-ratio	P-value
Duration of stay on field	0.37***	0.075	4.85	0.000
Prior business relationship with herders	-2.69**	0.86	-3 07	0.002
Tribal closeness	1.72**	0.61	2.84	0.005
Trust reposed on contract partner	1.08*	0.53	2.05	0.040
Because I see other farmers participate in manure contract	-1.12*	0.47	-2.37	0.018
It increases soil fertility	-2.24*	0.95	-2.36	0.018
% Correctly predicted = 96.47				
Model CHI-SQ = 86.39***				
Log Likelihood function = -15.44				
N = 85				

* = Significant at 10% level, ** = Significant at 5% level, *** = Significant at 1% level.
Source: own data, 2002

SUMMARY AND CONCLUSIONS

This paper showed that there are factors affecting the decision of farmers to participate in farm practices adoption. It was discovered that most of the identified variables influencing farmers to adopt manure contract participation for maintaining the fertility have their coefficients to be statistically significant in explaining farmers manure contract adoption. The results have gone a long way in demonstrating the important role manure contract is beginning to play in sustaining crop production in Zamfara grazing reserve. It has also demonstrated the interdependence relationship that exists between the croppers and herders in the Zamfara grazing reserve. It is hoped that the expansion of this contract arrangement between herders and croppers would not only enhance sustainable production, but would help to foster better relationships between croppers and herders in the use of natural resources and reduce drastically incidence of conflicts between them. However, available local customary laws should be strengthened to give legal backing to manure contract and hence smoothen the process of contracting among these rural farmers.

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