

PASTURE PLAN FOR LIVESTOCK DEVELOPMENT IN SUDANO-SAHELIAN ZONE OF NIGERIA

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Abstract

This study was conducted in three northern states of Borno, Jigawa and Sokoto to determine status of pasture. The three States are located in a geographical area termed Sudano-Sahelian zone of Nigeria. Purposive and random sampling procedures were used to select the study area and respondents, respectively. Questionnaire instrument was administered to a sample of 210 farmers randomly selected for the study. Data collected were analyzed using descriptive statistics, mainly frequency distribution, means and percentages. The results show that all the farmers pointed to crisis of pasture degradation and land resource in general. Deforestation of vegetal resources was one of the major problems in the zone. Also, the farmers were aware of dwindling trend of crops and fodder over the years as catastrophic. The study therefore, proposed pasture model for adoption by the farmers to stabilize zone.

Keywords: Pasture, fodder, Pasture degradation, livestock, sudano-sahelian zone

Introduction

Pasture in Sudano-Sahelian zone of Nigeria has a history of meeting the demands of the livestock population. Growing human population in recent time couple with climate change has brought dearth scarcity and conflicts over the resource control in the zone. The results are loss of life, property, rapid reduction of fodder, low productivity of land resource and general poverty.

Sudano-Sahelian region is experiencing unprecedented environmental changes in land cover and land quality (Onyewotu *et al.*, 2003; Foley *et al.*, 2003). The changes emanate from the way humans put their land use and from climatic variability. The

overuse has led to desert like conditions in several areas. The current approach by government to stem pasture scarcity phenomenon is not sustainable for future prosperity of the zone.

Introduction of pasture crops in Nigeria started in the 1950s (Onifade and Agishi, 1988) and over the years pasture agronomists and ruminant livestock nutritionists have investigated pasture plants that could stand the variations of agro-ecological zones (De Leeuw and Brinckman, 1974). Different grasses and legumes are found in the different agro-ecological zones (Olubajo, 1974 and Agishi, 1988). Various grass species at present exist in Nigeria and the notable ones include *Cynodon nlemfuensis*; *Andropogon* spp. (*Andropogon gayanus* and *A. tectorum*), *Panicum maximum*, *Pennisetum* spp. (with *Pennisetum purpureum* and *P. pedicellatum*), *Imperata cylindrica*, *Melinis minutiflora*, and *Setaria sphacelata*. Also a number of exotic plants such as *Cenchrus ciliaris*, *Antheophora nigritana* and others were successfully established (Oyenuga, 1967). The legumes which include *Stylosanthes guianensis*, *Centrosema pubescens*, *Pueraria phaseoloides*, *Calopogonium mucunoides* have proved very valuable. *Desmodium* spp. and *Atylosia scarabaeoides* are found in the savannas of the north. There are also a number of tree legumes and multipurpose trees such as *Leucaena leucocephala*, *Spondias mombin*, *Gliricidia sepium*, *Erythrina* spp. that provide foliage for livestock at all seasons of the year (Aregheore, 1995; Aregheore and Yahaya, 2001).

In the Sahel savanna where the rainy season lasts between three and four months of the year, the dominant grass species are *Aristida*

stipoides and *Schoenefeldia gracilis*. The Sudan savanna zone which falls within the tsetse fly free zone belt of West Africa is excellent for rearing and breeding of ruminant animals (cattle, sheep, goats, horses, donkeys and camels). The grass species in this zone are the quick growing annuals that reseed easily. Browse trees also contribute to the fodder potential of the

zone. The grass species found include *Cenchrus* spp., *Schoenefeldia gracilis*, *Eragrostis tremula*, *Aristida* and *Loudetia* species, *Pennisetum pedicellatum*, *Andropogon gayanus* and *Andropogon pseudapricus*. Table 1 presents a summary of forage species found to be adapted in the different vegetation zones of Nigeria (Onifade and Agishi, 1988).

Table 1: A summary of forage crops for different Vegetation Zones of Nigeria

Forage	Vegetation Zones*				
	SDS	DS/SGS	NGS	SS/ShS	M
Grasses					
<i>Andropogon gayanus</i>	X	X	X	X	
<i>Andropogon tectorum</i>	X	X			
<i>Brachiaria decumbens</i>	X	X	X		
<i>Cenchrus ciliaris</i>	X	X	X	X	
<i>Chloris gayanus</i>		X	X		
<i>Cynodon dactylon</i>	X	X	X		
<i>Cynodon plectostachyus</i>	X	X	X		
<i>Digitaria decumbens</i>	X	X	X	X	
<i>Digitaria smutsil</i>			X	X	
<i>Hyparrhenia rufa</i>	X	X	X		
<i>Melinis minutiflora</i>	X	X	X		
<i>Panicum maximum</i>	X	X	X		
<i>P. maximum</i> cv Gatton		X	X	X	
<i>P. maximum</i> var. <i>trichoglume</i>		X	X	X	
<i>Pennisetum clandestinum</i>					X
<i>P. pedicellatum</i>				X	
<i>P. purpureum</i>	X	X	X		
<i>P. typhoides</i> cv Maiwa			X	X	
<i>Setaria anceps</i>		X	X		
<i>Sorghum alum</i>			X	X	
<i>Tripsacum laxum</i>	X	X	X		X
Legumes					
<i>Cajanus cajan</i>	X	X	X	X	X
<i>Centrosema pubescens</i>	X	X	X		
<i>Desmodium intortum</i>		X	X		X

<i>D. scorpiurus</i>		x	X		
<i>Gliricidia sepium</i>	X	X	X		
<i>Lablab purpureus</i>	X	X	X	X	
<i>Leucaena leucocephala</i>	X	X	X		
<i>Macroptilium atropurpureum</i>		X	X	X	
<i>Macrotyloma axillare</i>			X	X	
<i>M. uniflorum</i>		X	X	X	
<i>Neonotonia wightii</i>		X	X		
<i>Pueraria phaseoloides</i>	X	X	X		
<i>Stylosanthes guianensis</i> cv Schofield	X	X	X	X	
<i>S. guianensis</i> cv Cook		X	X	X	
<i>S. hamata</i> cv Verano		X	X	X	
<i>S. humilis</i>		X	X	X	

*SDS – South of Derived savanna; NGS – Northern Guinea Savanna; DS – Derived Savanna; SGS – Southern Guinea savanna; SS – Sudan savanna, ShS – Sahel Savanna; M – Montane

Source: Onifade, O.S. and Agishi, E.C. (1988).

Frequently, because of poor planning aggravated by inefficient planning practices and adverse weather conditions, basic feed supplies are erratic and inadequate in Sudano-Sahelian zone of Nigeria. It is not economical to plug these gaps with supplementary feed such as concentrates. A constant supply of roughage of good quality is the solid foundation of profitable livestock farming in the zone (Jones, Arnott and Klug, 1987). Pasture includes grazing, hay, silage, and roots. The objective of pasture planning is to meet the production capabilities of the zone with the animals' requirements in order to obtain the greatest margin over feed costs and within safe limits of natural resource utilization.

Pasture planning requires some crystal ball gazing, because we cannot predict future weather and, even if we could, we can hardly claim to know exactly how our pastures would respond to it. Unforeseen circumstances and opportunities will arise and it is essential to respond properly to these, regardless of the provisions of the plan. To achieve sustainable pasture

development in the zone, the objectives of the study was to: 1) study the livestock types kept by farmers in the zone, 2) major sources of pasture in the zone, 3) status of pasture in the area, and 4) propose pasture development model for the zone.

Methodology

The Study Area

The study was carried out in the Sudano-Sahelian States of Borno, Jigawa and Sokoto. The area was selected based on the following criteria: 1) there were good representation arable and livestock farmers, 2) the three States have long period of recorded history of pasture scarcity, and 3) they have not been affected by planned pasture development. The study involved filed observation, personal contacts with livestock and arable farmers using questionnaire and oral interview methods. Secondary data were also used to back up the primary data. The data were collected during 2009/2010 farming season.

The study area lies north of latitude 8° 101' N and extend to latitude 13° 531' N within

the Savanna region of Nigeria (Olaniran, 1987; Abaje *et al.*, 2011). With an estimated population of 113 million, human pressure on the land particularly in the marginal areas have continued to take its toll on the pasure, resulting in fodder shortage.

The land surface area of Nigeria is approximately 923,770 Km² and about 35% of this land mass is believed to be arable, while 15% is said to be used as pastures, 10% as forest reserve, 10% for settlements and the remaining 30% is considered uncultivable. However, another estimate puts the surface area as 91.07 million hectares, 57% of which is believed to be either under crops, or pastures while the remaining 43% is divided among forest, water bodies and other uses (Cleaver and Shreiber, 1994). The wet season hardly lasts for more than three months with less than 400mm in some parts of the extreme north. Farming is the major occupation of the people and characterized predominantly by livestock rearing and mixed cropping such as sorghum, millet, cowpea, rice, tomato, pepper and sweet potato. Crop production is still manually done in small-scattered pieces of land with the use of implements such as hoes, cutlasses and axes with very few medium and large-scale farmers that are engaged in tractor ploughing which is visible along access roads (Lambin *et al.*, 2001).

Sampling Procedure and Sampling Size

A two stage sampling techniques was used in selecting the study area and sampled respondents. The first stage involved the purposive sampling of three out of the seven States of Borno, Yobe, Jigawa, Katsina, Kano, Zamfara and Sokoto with high rates of pasture crisis. The seven States were arranged in an alphabetical order and assigned a number to each. These numbers were written in separate piece of papers and were put into a basket and then thoroughly mixed up. The researcher then blindfolded himself, dip his hand into the basket and

pick out a number. This process continued until the three were selected. In stage two, random sampling technique was employed to select the total of 210 for the study.

Data Analysis

Primary and secondary data were analysed using descriptive data, mean, frequency distribution and percentages.

Results and Discussion

Livestock pattern of the respondents

Table 2 shows that all the farmers kept one or more livestock types ranging from cattle to poultry. The pattern of livestock ownership shows that all the 210 (100%) respondents owned cattle, sheep goats and poultry in different numbers. This was closely followed by horses which were kept by 71 (33.8%) farmers while camels were kept by 52 (24.8%) and donkeys were kept by 45 (21.4%) of the farmers. Those with smaller livestock holdings (1-10) seemed to have kept horses, camels and donkeys. Farmers with livestock holdings above 50 did not keep any of the equines or camels. This is because equines and camels were means of burden in the area and farmers with larger livestock holdings can afford other motorized means for farm work or transportation. In terms of number, 45% preferred to keep large herds of cattle ranging between 91 and above. Poultry forms an important component of all categories of holdings but more so with range below 40. The finding shows the importance of cattle as a source of wealth while poultry is for meeting the ceremonial needs of the farmers. Those of them who kept a few number of livestock stated that fodder scarcity and prohibitive prices of supplementary feeds could not warrant them to keep large number of animals. It is however, interesting to note that cattle, sheep and goats which are responsible for land degradation were owned by all categories of livestock holdings by farmers.

Table 2: Livestock kept by Respondents

Range of Livestock	Percentage of the Respondents by Livestock kept						
	Cattle	Sheep	Goats	Donkeys	Horses	Camel	Poultry
1-10	3.3	3.8	2.4	82.2	94.4	98.1	2.9
11-20	4.3	5.9	14.3	15.6		2.0	5.9
21-30		2.4	4.8	9.1	2.2		2.8
31-40	2.9	5.2	10.0				9.1
41-50	1.4	19.0	12.9		2.8		3.3
51-60	9.5	23.8	10.0				1.0
61-70	10.5	9.5	19.0				2.9
71-80	4.3	13.3	5.3				1.9
81-90	15.7	5.2	5.9				2.9
91-100	24.3	5.9	4.3				6.7
101+			21.0		3.8		3.3
10.0							
Percent:	100	100	100	100	100	100	100

* = multiple response (i.e. responses falling in more than one categories)

Sources of pasture in the area

Table 3 shows the major sources of fodder in the area. Natural pasture is the main source of feed and it is followed by crop residues as expressed by 195 (92.5%) of the respondents. Many areas of Sudano-Sahelian zone of Nigeria are unsuitable for arable crop production because of highly variable and unpredictable rainfall coupled with poor soil fertility. Such conditions made livestock production conducive due to a great mobility, as herder and their livestock in such areas wander freely. However, the stocking rate of livestock in the area exceeds the carrying capacity of the land, forcing the herders to periodically leave their villages to the more humid south during the dry periods and back to the base in the north during wet season. Herders then move the herds to cultivated areas after grain harvest in order take advantage of the crop residues.

Decreased availability of arable land and the need to diversify income and improve soil fertility have helped to promote mixed crop-livestock integration. Manure from the animals are composted and used to fertilize cereal fields, especially for farmers without access to chemical fertilizers as commonly found in the area, while crop residues are preserved and stored to feed ruminants, especially during the dry months. Another few, 14 (19.5%) farmers depended on natural pasture and purchased residues. This category of farmers were the nomadic group who do not practice integrated mixed crop-livestock system. Nomadic herders usually access crop residues at payment of certain token of money to crop farmers. There were 12 (5.7%) farmers who rely solely on purchased residues. This category of farmers were mainly the traders who were in the business of fattening rams and bulls for profit especially during major feasts such as *Sallah* (the Muslim *Eid el Kabir*).

Table 3: Major Sources of Fodder for Livestock

Source	Frequency	Percent
Natural pasture/Crop residues	210	100*
Natural pasture/purchased residues	14	19.5
Purchased feeds only	12	5.7

* = multiple response (i.e. responses falling in more than one category)

Status of pasture in the area

Table 4 shows the current status of pasture in the area. A number of the respondents, 111 (52.8%), reported pasture is no longer adequate during all the seasons. Goats and sheep spend 59% and 65%, while cattle spend 50% of their daylight time grazing (Kiema, 1994). Livestock exploit natural pasture feeds, both herbaceous and leguminous plant species if given the chance. Pasture products (wood, grass) exploitation by resource users also affect plant groups in different ways. Another practice that has consequences on tree development is the fact that many herders

practice coppicing of palatable trees that may be out of normal reach of livestock to make them available to the animals. Some 75 (34.8%) farmers reported that pasture is only available during the rainy season when trees which look miserable and the grasses which normally exist in dormancy in the long dry season become green and spring up respectively. Another group of 26 (12.4%) farmers could not observe any change in the status of pasture in their area. This category of farmers were mostly found in the southern part of the States, which experience milder dry season.

Table 4: Status of pasture in the study area of the Sudano-Sahelian zone

Status of pasture	Frequency	Per cent
Not adequate all seasons	111	52.8
Available in rainy season only	73	34.8
No change of status observed	26	12.4
Total	210	100.0

Model for Pasture Development

Communities in the Sudano-Sahelian should be given a means for collective action to produce fodder seeds for the purpose of multiplication among them. Also they should be sensitized on the importance of woodlot for raising fire wood and poles. It is in line with this thinking that an organizational model for pasture development for Sudano-Sahelian zone is being proposed.

(i.e. design, implementation and evaluation);

- v. Flexibility to allow initiatives from individual while the action is on.

Guidelines

Sustainable pasture planning should be aimed at granting all development programmes and striking balance between and among activities and the environment. The following therefore are considered in formulating the plan

- i. Operation of the proposed plan in an ecologically appropriate manner;
- ii. Public education to create awareness about the danger of overgrazing and farming as well as deforestation;
- iii. Accessibilities to fodder seeds;
- iv. Community participation in the plan

Implementation of the Model

The organizational set-up structured in the model will be implemented at local government level of Sudano-Sahelian States. The model aimed at using the already identified institutions to modify the old practices. The model is organized upwards from the community to the local government level:

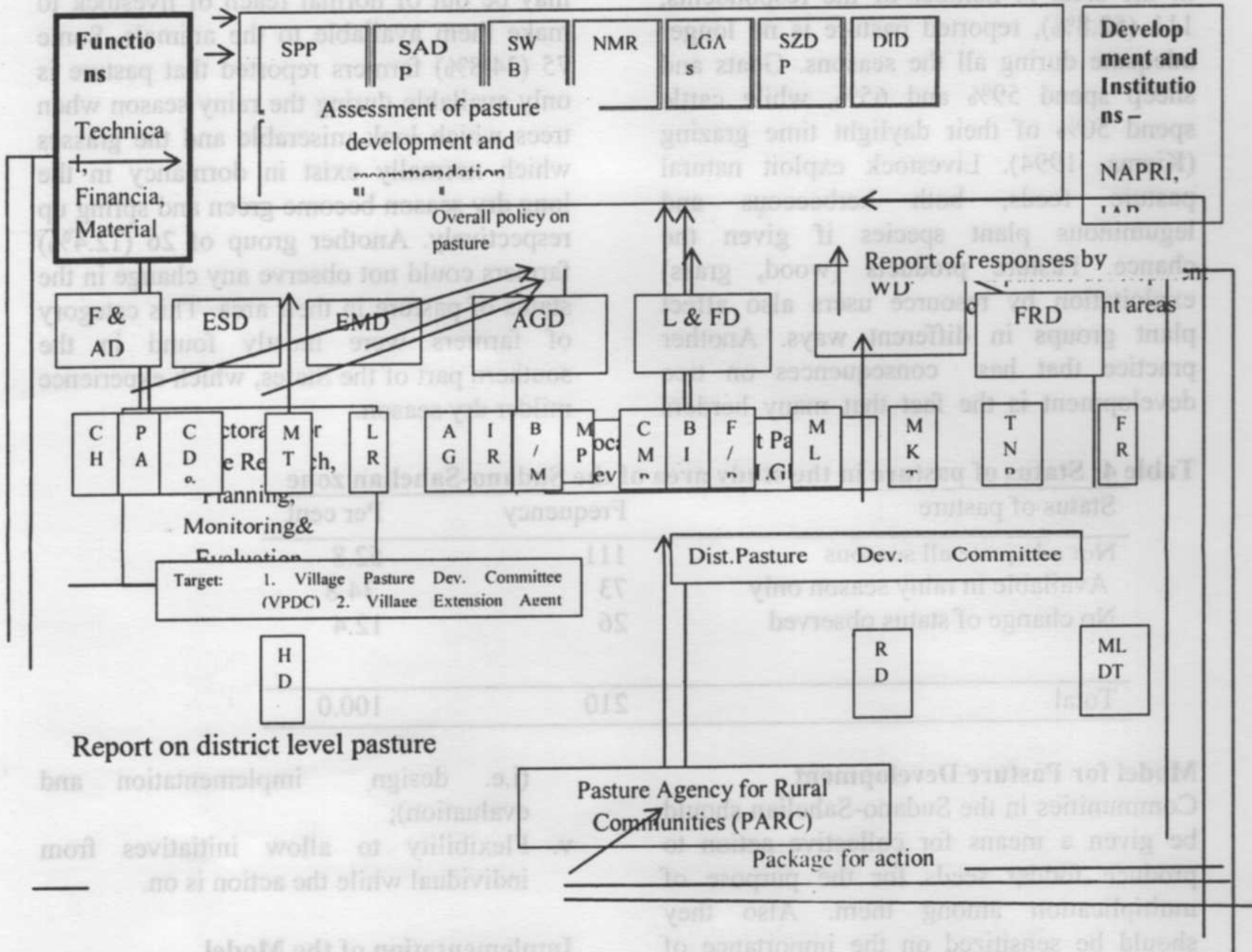
At level 1, all government agencies involved in development activities will come together to offer extension, technical and administration services.

At level 2, various departments are created to serve grass root development associations which will be formed for collective participation of farmers.

At level 3, village pasture development associations will be formed and through

which sustainable pasture development will be achieved.

Fig. 1: Organizational Model for Pasture Development in Sudano-Sahelian Nigeria



Key

Level 1

- SAP = State Pasture Project
- SADP = State Agricultural Development Programme (pasture extension service)
- SWB = State Water Board
- MNR = Ministry of Natural Resources
- LGAs = Local Government Areas
- SZDP = Sudano-Sahelian Zone Development Programme
- DID = Directorate for Infrastructural Development
- NDA = National Orientation Agency
- NGOs = None Governmental Organizations

Level 2

- F & AD = Finance and Administration Department
- ESD = Extension Services Department
- EMD = Environmental Monitoring Department
- AGD = Agricultural Department
- L/FD = Livestock and Fishery Department

- WD = Works Department
- FRD = Forestry Resource Department

Level 3

- CH = Community Health
- PA = Public Awareness
- CD & C = Community Development and Clubs Organization
- MT = Meteorology
- HD = Hydrology
- LD = Land Resources
- AG = Agronomy
- IR = Irrigation
- B/K = Beekeeping
- MP = Mulberry Production
- CP = Community Pasture
- B/I = Breed Improvement
- FP = Fish Pond
- WL = Well
- RD = Road
- MKT = Market
- TNR = Tree Nursery
- W/LOT = Wood Lots

FR = Forestry Reserve

4.3 Components of Model

The government development agencies are at the apex of the structure. They should be formed from existing institutions in the States. The model however, proposed State Directorate for Pasture Research, Extension, Monitoring and Evaluation (DPREM&E) to be established in the state governors' Office. The *directorate* can report directly to the governor on the state pasture in the State.

The DPREM & E would be *charged* with the following responsibilities:

1. Plan and undertake a community research and extension in various dimensions of pasture in the State in liaison with identified Departments and Institutions.
2. Monitor the state of pasture development in the State.
3. Advise the government and the Pasture Development Agencies on all policy guidelines for sustained pasture development in the State.
4. Monitor, evaluate and coordinate activities of Local Government Pasture Agency for Rural Communities (PARC) and report the same to the Federal and State Governments' development institutions.

To enable DPREM&E carry out its responsibilities effectively, it should be given a full *mandate* to carry its basic adaptive research, extension, *monitoring and evaluation* of activities in pasture in the State and liaise with any relevant body or community. *In addition* to research, extension, monitoring and evaluation sections, finance and *administration* section should be established to take care of financial and administrative affairs of the directorate. For successful functioning, DPREM&E should be well equipped, well-funded by the government and have experts in various fields of pasture development.

At local government level, the model proposed the Establishment of Local

Government Pasture Development Committee (LGPDC) which reports to the development institution concerned. The LGPDC uses general guidelines issued by the development institutions to formulate local government policies on pasture development for implementation by the Pasture and Agency for Rural Communities (PARC). The membership to this committee should include:

- i. The local government chairman who should automatically be the *chairman* of the committee in their respective local government areas.
- ii. The head of agriculture in the local government shall be the secretary of the committee.
- iii. Leaders of development associations and clubs such as Women's Associations, 'Elders' Group, Farmer's Cooperative Society, etc.
- iv. Leaders of fishermen, Miyetti Allah Cattle Breeders, hunters, blacksmith, etc.
- v. Forestry officer of the local government.
- vi. Agricultural officer of the local government.
- vii. Community development officer of the local government.
- viii. Local water board manager of local government (if any)
- ix. Area irrigation engineer (if any).
- x. Sanitary health officer (if any) of the local government.
- xi. Two elected persons from each district to represent district communities at local government level.
- xii. National Orientation Agency Officer,
- xiii. Opinion leadership from local principals of local secondary and headmasters of primary schools and counselors will also be members of the committee.

Where no associations exist, the local government council will see to the formation of one. Community Development Agencies such as National Orientation Agency, Information Department Offices, etc., are to be involved in the organization of such associations.

The next level at local government is the proposed Pasture Agency for Rural Communities (PARC). This is the implementing body for all the policies agreed upon and passed from local government Pasture Development Committee (PDC). The PARC is to be headed by a Director who is assisted by Departmental heads. The proposed departments are:

- i. Finance and Administration;
- ii. Social Services;
- iii. Environmental Monitoring;
- iv. Agriculture;
- v. Livestock;
- vi. Works;
- vii. Pasture Resources.

Responsibilities of PARC

Finance and Administration Department

The department is responsible for administrative and financial management support of the agency. It should liaise with the DPREM&E for financial assistance and should be responsible for receiving the money realized from sales of fodder seeds of the agency

Extension Services Department

This department should be a link between the target population and the agency activities. Extension agents from the State government's development agencies such as SAP, SADP, SZDP, etc, should be by this department. The head of the department is capable to organize, educate and mobilize the rural communities into collective action on pasture and other relevant community development activities. The department should monitor the causes of inter communal conflicts between the farmers and herders with the means of finding a lasting solution.

Environmental Monitoring Department

The department is charged with the responsibility to collect meteorological, economic and hydrological data at local government level and analyze them. The department also charged with the management of land resources and carry out occasional environmental impact assessment

in the L.G.A. This department issues signals about possible environmental hazards.

Agricultural Department

This department works directly with DPREM&E for research in the introduction of new crop and fodder varieties.

Livestock and fisheries Department

This department should extend research findings at solving the problems of herders and general animal rearing in the area. The department should be charged with duties of identifying range lands and ways of maximizing their carrying capacities.

Since fishing is one of the most popular activities in the area, the department should also be charged with fisheries activities helping the farmers construct fish ponds and introduction of new fish species and formulation of cheap fish feeds. She should liaise with FRMP for financial and material assistance from both the state and federal governments.

Works Department

The department is charged with maintenance of the PARC machinery and tools. It also works on technology aimed improving the environment, production of fuel efficiency on local stores and solar energy harnessing those that are functional in the rural areas to reduce over utilization of fuel wood. She should also work on improvement of Ox-drawn ploughs and cart using local materials, development of housing scheme using local materials, road development through self-help organization and portable water supply. This department should work directly with DPREM&E and jointly with extension services department.

Pasture Resource Department

The department should work directly with DPREM&E and liaise with the National Animal Production Research Institute (NAPRI) for research towards genetic improvement of seeds of local fodder crops and diversify their potentials. The department is to establish community fodder seed production at strategic locations and

over-see the maintenance of natural pasture reserves. Also, it should design and help to develop community and individual woodlots and extend the technology for harnessing fuel-wood on a sustained basis without much damage to the ecosystem.

The Structure and Organization of the Model

These structures and organizations are government institutions and agencies for Rural Development, DPREM&E, LGAPDC, PARC and DPDC. The staff of the bodies is made up of government officials, the next two bodies are composed of members of the public who are to be organized in collective action (i.e. the target population). The two bodies are the village Pasture Development Committee (VPDC) and village Pasture Extension Agents (VPEA). They will have ten members from each village unit or units and the village extension agent. The village extension agent will be the secretary and the village extension agent reports to the APRC Social Services Department along with DPRMP extension agent.

At district level it also comprises ten elected members. The District Agroforestry Development Committee (DPDC) liaises with the VPDC. It is also linked with LGPDC through their respective chairmen acting as liaison officers. Both VAFDC and DAFDC provide input advice on policy needs before taking decisions.

Problems of Operation, Implementation and Suggested

The major operational problem of rural development model of this type is expected to include:

- i) Leadership particularly at the village and district levels;
- ii) Mistrust among members, especially of the leadership and
- iii) The adoption pace of the rural communities. Most problems associated with rural development are leadership, organizational framework and cultural conservatism (Kandawire, 1980).

From the organizational points of view, the model is structured to give a sound framework but the leadership roles may pose some problems especially at village and district levels. Conservatism may pose problem since the views of the respondent showed strong willingness to embark on self-help projects. All interest groups should be well represented in leadership.

1. Finance

Despite the anticipated contributions of the rural communities in managing the pasture project to be established, fund is still needed to run the project. Some secondment allowances may be paid to village extension agents of ADPs, etc.

Recurrent costs should be paid by the L.G.A. concerned while capital should be shared between Federal, State and Local Governments. The rural communities would be making their contributions in kinds. Loans should be channeled through the VPDC, it will also serve as guarantors for the loans.

2. Conflict of Roles

Conflict of roles between development agencies may arise. But it can be solved by designing work programme for each agency concerned.

3. Individual's Contributions

The model therefore aims to pool together the financial, material and human resources in the area for effective pasture development. These can be achieved by bringing all development agencies together and integrate their functions for effective development.

Conclusion

The study identified both human and environmental problems militate against pasture development in Sudano-Sahelian zone and it can be rectified if the proposed pasture plan is well implemented.

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