Sudan country paper: *Livestock production systems in Sudan- research needs and priorities*

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Introduction

Sudan is the largest country in Africa, with an area of 2.44 million square kilometres, extending from 4°N to 22°N. It has a population of 25 million, mostly living in rural areas. Climatic conditions are diverse, with average rainfall varying from less than 25 mm in the north to 1500 mm in the south. The main rainy season is between July and September. Mean daily temperatures vary from a maximum of more than 40°C in the north to a minimum of 6°C in Jebal Marra in the west. There are extensive plains of ironstone in the south, clay soils in the central plains, and sand in the north and west, with a few mountainous areas in the south, east and west. The River Nile runs through the country from south to north, a distance of 2258 km. In 1996, agriculture, which provides employment for about 75% of the population, contributed 48% of GDP and 73% of export earnings. Most important industries depend on agricultural products as raw materials.

Agro-ecological zones

Sudan can be divided into six agro-ecological zones, whose major plant communities have been described by Harrison and Jackson (1958) and by Wickens (1991).

Desert

The desert, with rainfall of less than 75 mm, covers 27% of the country. Vegetation, which is virtually absent except on water courses, consists essentially of ephemeral grasses and herbs known as ‘gizu’, following rare rain showers in winter. These succulent plants provide grazing, mainly for camels, during the dry period from November to February.

Semi-desert

The semi-desert, covering 18% of the country, extends along a wide belt from the border with Chad to the Red Sea coast. Rainfall is between 75 and 300 mm, and vegetation is mainly scrub and grassland. Dominant trees and shrubs include Acacia tortilis, Capparis decidua, Leptadenia pyrotechnica, Maerua crassifolia and Salvadora persica with Acacia mellifera, Balanites aegyptiaca, Capparis decidua and Ziziphus spina-christi on clay soils and water courses. Herbaceous species include Aristida spp., Blepharis spp., Cenchrus spp., Cymbopogon nervatus, Panicum turgidum and Schoenefeldia gracilis. Because of successive droughts and overgrazing,

some desirable species such as Blepharis linarifolia and Cadaba farinosa have disappeared in many areas of the range

Low rainfall savannah

The low rainfall savannah, with rainfall between 300 and 500 mm, covers 24% of the country, with 340,000 ha on clay and 240,000 ha on sandy soils. It is characterised by open woodland in some areas and by open grassland in others. The dominant trees are Acacia spp. such as A. mellifera, A. nubica, A. seyal, A. senegal and A. tortilis. Other species include Anogeissus leiocarpa, Boscia senegalensis, Cadaba glandulosa, Capparis decidua, Commiphora africana, Dalbergia melanoxylon, Faidherbia albida, Grewia tenax, Indigofera oblongifolia, Tamarix articulata, Terminalia spp. and Ziziphus spp. Herbaceous species include Aristida spp., Blepharis spp., Cyperus rotundus, Shoenefeldia spp. and Zornia spp.

High rainfall savannah

The high rainfall savannah, which covers 11% of the country, has rainfall from 500 to over 1000 mm. Acacia species such as Acacia polyacantha and A. seyal are dominant, but broadleaved trees are also found, including Anogeissus spp., Combretum spp., Dichrostachys cinerea, Lonchocarpus laxiflorus, Sclerocarya birrea, Sterculia setigera and Terminalia spp. Herbaceous plants include tall grasses such as Brachiaria spp. Cymbopogon spp. and Hyparrhenia rufa, and the shorter Aristida spp., Blepharis spp., Cenchrus biflorus, Ipomoea spp., Setaria spp. and Zornia spp. on sandy soils.

Mountains

The mountain zone covers 6% of the country and includes Jebel Marra, the Nuba and Imatong Mountains, and the Red Sea Hills. The vegetation in these areas is quite diverse.

The flood zone

Vegetation in the flood region, 14% of the country, is dominated by Cyperus papyrus, with associated Echinochloa pyramidalis, Phragmites australis and Typha latifolia.

Livestock resources

Sudan has the second largest animal population in Africa. In 1997, the contribution of livestock to GDP was estimated at 20%, representing 42% of the contribution of the agricultural sector (Ministry of Finance and National Economy 1997). Earnings from the export of live animals and meat in 1996 were US$ 135.7 million.

In 1994–95, there were 103 million livestock, of which 30 million were cattle, 37 million sheep, 33 million goats and about 3 million camels. Western Sudan has the most livestock (40%), followed by southern Sudan (27%) and central Sudan (23%). The majority of breeds are raised within tribal groups and often carry the name of the tribe. They are well adapted to the harsh

environment and often trek long distances in search of feed and water. Productivity is low but can be improved with good management in more favourable conditions. Cattle are mainly descended from Bos taurus, or zebu. In central Sudan they are generally kept for milk, and in western Sudan for meat production. Sheep are of the Sudan Desert type, with live weights up to 70 kg and excellent meat and carcass characteristics. Goats, mostly of the large, black Nubian type, are found in central Sudan and are kept for milk. There are two types of the single-humped camel, one kept for riding and the other as a pack or baggage animal. Camels are exported mainly for meat.

Feed resources

About 90% of livestock are raised in traditional pastoral systems, mainly in the western states of Kordofan and Darfur, and in the southern states. Rangelands occupy an area of 110 million hectares. Sudan also produces about 18.6 million tonnes of crop residues (AOAD 1994). Green fodder cultivation, however, is less than 126,000 ha. Rangelands provide about 86% of feed for livestock, crop residues and agricultural byproducts 10%, and irrigated forage and concentrates 4%. The rangelands suffer from overstocking in some areas and understocking in others, from bush fires, deforestation, uneven distribution of water sources, and the encroachment of both traditional and mechanised agriculture.

Animal production systems

The major production systems are described here:

Nomadic

Livestock, mainly camels and sheep, with some goats, are raised entirely on natural rangelands. Households move with their animals and have no permanent base on which to grow crops. They spend the rainy season in the northern, semi-desert zone and during the dry season, move further south into the savannah. Income is derived from the sale of animals, meat and milk in the form of white cheese.

Transhumant

In the transhumant agropastoral system, households depend mainly on livestock, mostly cattle, with some sheep and goats, although there is some cropping. In western Sudan, households migrate north during the rainy season and return to the savannah during the dry season. In the central and eastern states, migration is towards the Nile during the rainy season and back during the dry season.

Sedentary

The sedentary system exists where there is rainfed, arable farming in settled villages. Some livestock, mainly small ruminants, are kept, but the animals are less important than the crops. Sorghum, sesame and cotton are grown on clay soils, and millet and groundnuts on sandy soils.

Migratory agropastoral

A migratory agropastoral system is found in southern Sudan, where livestock are raised in traditional rainfed agricultural systems in settled villages. Livestock are moved away from the Nile in the period of flooding and back when the floods recede.

Sedentary irrigated crop–livestock system

Permanently settled farmers in the irrigated areas of central Sudan grow cotton, sorghum, groundnuts and wheat, and also raise livestock, especially small ruminants. Livestock, although less important than crops, are a supplementary source of income, which is used to hire labour for agricultural work before the harvest. Productivity is low and animals depend heavily on crop residues, industrial by-products and the grazing of limited areas of fallow and the sides of canals. Intensive cow's milk production is becoming more common within the large irrigation schemes, and these areas are seen as promising for future expansion of livestock production.

Other systems

Other animal production systems include ranching, feedlot operations and peri-urban backyard livestock production. Ranching is a recent trend in Sudan. Animals are raised for meat on natural rangelands in western Sudan in Kordofan and Darfur, and in Butana in Kassala State. Poor range management within the ranch is, however, a major constraint. Feedlots have existed for over 30 years. Animals, mainly beef cattle, are brought on the hoof from western Sudan and fattened in Khartoum State on sorghum grain, oilseed cakes and roughage, with gains of up to 1 kg/day in cattle and 0.35 kg in sheep. Near and within urban areas, goats and poultry fed on household waste are kept for domestic supply.

Constraints on production

In spite of the great potential of livestock and Sudan's self-sufficiency in meat and other livestock products, the following constraints on production are important:

- Overgrazing in some areas, particularly around settlements, while vast areas are undergrazed because of lack of water for the animals
- The great distances that animals often have to walk from water points to graze; Fadlalla (1987) estimated that walking required 30% of the daily energy intake of lactating sheep during the dry season
- Expansion of agriculture, particularly mechanised farming, into traditional grazing land, which has led to reduction in grazing areas and in many instances to the blocking of traditional migration routes and water points, causing conflicts between transhumant and settled farmers
- Seasonal nutritional deficiencies
- Prevalence of disease, particularly tickborne diseases, and parasites, leading to early culling of cattle
- Poor veterinary services
- Poor husbandry

- Inefficient utilisation of crop residues, including poor integration of livestock in the rotation of acacia (A. senegal) and arable crops
- Lack of processing of feeds and export of by-products
- Difficulty of marketing and processing milk from 90% of the milking animals in nomadic and traditional systems, far from the centres of consumption
- Lack of infrastructure such as research, extension, roads, education, health services and livestock markets.

Government policies for the livestock sector

The Ten-Year National Comprehensive Strategy plan for 1992–2001 aims to ensure food security by increasing livestock production. The key elements for livestock development are:

- a threefold increase in livestock production and major increases (w 20) in the export of animals and meat
- diversification, intensification and integration of animal and crop production, with cautious encouragement of a gradual shift towards permanent settlement of migrant pastoralists
- protection of the traditional sector from marginalisation and resource degradation
- development of extension, training and information services. The abolition of controls on the price of local and imported commodities and the privatisation of public enterprises are expected to increase livestock production, lower prices and encourage the private sector. The policy also includes
- the improvement of veterinary services, the control and eradication of diseases and parasites, and the development and production of veterinary drugs
- the improvement and expansion of fisheries and aquaculture industries
- improvements in marketing.

Research issues and priorities

Research can be divided into the following major categories:

Natural resources

About 90% of animal production is in rangeland. Research on communal grazing lands has its limitations, but this should not prevent scientists from addressing some of the following:

- classification of the large number of plant species, both woody and herbaceous, in the rangeland, according to livestock preference, other economic uses, nutritive value, role in preventing wind or gulley erosion, tolerance of fire and grazing pressure, and suitability within the system, using both previous research data and indigenous knowledge
- use of plant species in range rehabilitation, methods of propagation, water requirements and productivity
- identification of plants containing anti-nutritional factors
- investigation of water-harvesting techniques in soils with problems of crust formation.

Farming systems

Research, particularly into rainfed and irrigated sedentary systems, should include

- introduction of legumes into crop rotations to improve both soil fertility and human and animal nutrition
- effects of planting legumes or gum arabic trees on fallow land
- selection and introduction of winter forage legumes to bridge the feed gap during the dry season and make efficient use of irrigation. At present, most legumes, apart from perennial lucerne, are grown during the summer, when they compete with other crops for land and water
- the grazing tolerance of A. senegal at different stages of growth, and the productivity of crops sown under or with it
- use of other trees, including Adansonia digitata, Balanites aegyptiaca, Grewia tenax, Tamarindus indica and Ziziphus spina-christi
- use of trees and ground cover to improve soil-water status
- more efficient utilisation of crop residues, including varieties, handling, processing and storage, and the addition of a nitrogen source to improve quality.

Animal husbandry

- management of mating to concentrate births when grazing is adequate
- effect of strategic feeding of different species before mating to enhance conception, and before parturition to improve the chances of survival of both dam and offspring and to increase milk production
- energy cost of walking for different animal species, assessment of the efficiency of new management systems, in which water is transported to livestock at grazing, and optimum watering frequency for various livestock species
- effect of supplementary feeding on dairy camel performance
- mineral deficiencies in the rangelands and the economics of mineral supplementation.

Breeds

The performance of indigenous breeds under optimum management conditions should be studied.

Socio-economics

Studies should be made to describe and evaluate existing systems, define constraints and develop appropriate methods to alleviate them.

Diseases

Studies are needed on

- impact and costs of control of tick-borne diseases, internal and external parasites
- diseases transmitted by biting flies.

Processing

- need to improve efficiency and hygiene. At present, for example, because of poor road conditions and the remoteness of grazing areas, surplus milk has to be processed into cheese or ghee.

National research capacity

In 1996, the Ministry of Animal Resources was given a mandate to oversee the development of the livestock industry, the improvement of range and pasture, the control of disease and the strengthening of research. Sudan is self-sufficient in vaccines. Animal production research is carried out by a number of institutions, including the Animal Production Research Corporation, which has four centres—for veterinary, animal production, fisheries and wildlife—and is also responsible for regional veterinary diagnosis and research laboratories, livestock research stations, the Agricultural Research Corporation and the National Centre for Research. There is also some research in the universities, in the faculties of veterinary science, animal production and natural resources. There are about 140 scientists, specialising in various aspects of animal production. Research is, however, limited by the lack of international contacts and access to international publications, by inadequate finance for laboratory equipment and costs, and by the lack of external training.

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