
Animal Recording Schemes in Senegal

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The history animal recording activities in Senegal dates back to the 1940s when the first livestock research station was established for the genetic improvement of the local Gobra Zebu breed. A second breeding station was established in the 1960s in the southern part of the country with the objective to improve the trypanotolerant Ndama cattle and Djallonke sheep. Most of the work on animal performance recording was done using nucleus herds reared on station. A second type of recording schemes were launched in the 1980s with the view to generating information on animal performance, management systems and environmental characteristics. The majors objectives were to investigate the relationship between animal productivity and a number of factors of variation under village conditions, to generate a data and information base that could be used by planners for design of development projects and programmes, and to characterise indigenous breeds. This paper describes major animal recording programmes that were or are being implemented in Senegal with a focus on their objectives, organisational structure, constraints faced and future directions.

The livestock industry in Senegal comprises cattle, sheep, goats, equidae, poultry and swine. With the exception of commercial poultry and intensive dairy farming, the herds and flocks are made up of indigenous breeds and their crosses. The ruminant population in Senegal is estimated at 2.5 millions cattle, and 5.9 millions sheep and goats. Main characteristics of livestock production systems found in Senegal are determined by climatic conditions and to what extent capital and land are used in the production process (extensive vs. intensive production systems). With respect to these criteria livestock production systems can be grouped in four major classes.

It is found in the drier northern semi-arid areas where the average annual rainfall ranges between 200 and 400 mm. It is extensive in nature. Because of the scarcity of food and water, this system makes extensive use of land resources through transhumance to feed and water animals. Fulani pastoralist secure their living mainly through milk consumption and cash

1. Introduction

2. General background of the livestock sector in Senegal

2.1 The pastoral production system

generation from small ruminants and cattle offtake. The Gobra zebu breed and Sahelian type of small ruminants are reared in this system. The pastoral production system is the major supplier of slaughter animals to meet national demand of cattle and small ruminant meat.

2.2 The mixed crop-livestock production system in semi-arid areas

In more humid parts of semi-arid areas where rainfall is sufficient for successful cropping land is used both for cropping and for animal production purposes. There is a synergetic association between crop and livestock activities. The use of draught animal power from cattle and equine for cropping and transport is a common practice and crop residues constitute valuable feed inputs to the livestock sector. Multipurpose cattle are reared on an extensive land use basis for milk, meat, power and manure production. Animal genetic resources are made up of zebu types of cattle (Gobra Zebu) and Sahelian types of sheep and goats. A stabilised cross between zebu and Ndama cattle (*Bos taurus*), the Diakoré breed, is found in intermediate areas between Zebu and Ndama zones. Average cattle herd size is 39±21 with a minimum of 6 and a maximum of 119 head of cattle (Faye, 1993).

2.3 The mixed crop-livestock production systems in sub-humid areas

These areas are infested with tsetse flies that transmit trypanosomiasis. As a result, trypanotolerant Ndama cattle (*Bos taurus*) and Djallonké sheep and goats are main animal genetic resources found in these areas. Ndama cattle are multipurpose animals that produce meat, milk, power and manure for the restoration of soil fertility. High population pressure has caused extensive land clearing in this areas with a reduction of trypanosomiasis risk. Therefore the population of more susceptible breeds and species such as equidae has increased dramatically in recent years. Pasture and cropping lands are still more abundant in the sub-humid zones. Average cattle herd size is 65 animals with a minimum of 15 and a maximum of 225 animals. Animals graze natural pastures during the day and they are tethered at night in crop fields for the deposition of manure. Feed supplementation with concentrate is applied on a limited scale. However, crop residues such as groundnut hay are fed to cattle during the dry season.

2.4 Intensive and semi-intensive production systems

These include commercial poultry, cattle and sheep fattening systems and dairy farming systems that have expanded remarkably lately in peri-urban areas where market opportunities have attracted investment in these sectors. These management systems make limited use of land resources, they are capital intensive and they are mainly based on purchased feed inputs (forage and concentrates).

A number of animal recording programmes have been implemented in the past in different ecological zones. A common feature of the animal recording activities is that they are all of them carried out by the Senegalese Institute for Agricultural Research (ISRA) with sometime the collaboration of the department of Livestock of the ministry of agriculture. Both on-station and on-farm animal recording activities are conducted with various objectives pursued.

On-station livestock recording programmes were based on the establishment of nucleus herds and/or flocks reared for breeding purposes. The objective of these programmes was to produce breeding stocks (cattle, sheep) to be introduced into villages for the genetic improvement of local breeds. Two main livestock research stations were established in the semi-arid zone at Dahra in 1938 for Gobra Zebu and Sahelian sheep and goats breeds, and in the subhumid zone at Kolda in 1969 for the genetic improvement of trypanotolerant Ndama cattle and Djallonke sheep. On both of these stations mass selection for beef purposes was applied on the offspring of about 250 breeding females naturally mated to selected bulls. Male offspring were tested and ranked on the basis of their body weight growth performances. Production data including reproduction, mortality, live weight and milk production as well as linear measurements were recorded.

Since the early 1980's comprehensive livestock systems research programmes were implemented in various locations in the country using the farming systems approach to agricultural research. This included diagnostic, design and experimentation components of the systems approach with the view to coming up with appropriate solutions to constraints facing the livestock industry. On-farm livestock performance recording schemes were integral components of these research activities. They aimed at the evaluation of the productivity of cattle, sheep and goats under village management systems and under various resource base and disease situations, and marketing opportunities for livestock products.

Because of their trypanotolerance, Ndama cattle constitute a unique animal genetic resource which forms the basis of large ruminant agriculture in many parts of West Africa where trypanosomiasis is endemic. Multipurpose Ndama cattle are kept in the mixed crop-livestock farming system at Kolda as supplier of food (milk), cash through offtake for meat, power for cropping and transport, and manure for the restoration of soil fertility. The Ndama contribute therefore a great deal to the income and welfare of millions of farmers in mixed crop-livestock production systems in West Africa. Research efforts have been directed toward a better knowledge on the production characteristics of these genetic material

3. Organisation and description of animal recording programmes

4. On-station animal recording schemes

5. On-farm animal recording programmes

5.1 On-farm Ndama cattle performance recording

through cattle herd monitoring schemes. Two major on-farm Ndama cattle recording programmes were (programme 1) or are being (programme 2) implemented in Senegal.

5.1.1 Programme 1

A herd monitoring scheme was conducted between 1988 to 1993 with a view to assessing the relative importance health, nutrition and management factors that constrain the productivity of Ndama cattle kept under traditional husbandry systems. The ultimate aim was to develop strategies to make better use of this genetic resource to meet the growing demand for animal products in West Africa. This study took place in the Casamance region of southern Senegal to investigate causes of variation of Ndama cattle productivity and the stability of the trypanotolerance trait under village management systems.

A total of 531 village Ndama cattle were continuously monitored. Animals were individually tagged on both ears. At the start of the programme each animal's age and the number of calving of each adult female was estimated by farmers. Animals were managed under traditional village conditions and therefore were subjected to natural tsetse challenge. Monitoring of tsetse flies population distribution and seasonal variation was set up to determine trypanosomiasis risk. Data recording included also blood and faecal sampling for the determination of internal and blood parasites. Animals were weighed each month using an electronic scale (Barlo, Australia) and milk offtake for human consumption was measured using a graduated tube by technicians during monthly routine visits in herds. Information on herd dynamics including date of birth, mortality and animal transactions (purchases, sales, exchanges and transfers) were routinely collected during monthly herd visits.

5.1.2 Programme 2

A second on-farm performance recording for Ndama cattle programme deals with the evaluation of the productivity of this breed in two levels of management systems (low and medium input systems). The low input system consists of the extensive livestock management system with limited purchased inputs. With the medium input systems farmers combine improved habitat, health care and better feeding for selected cows during the dry season for milk and manure production or for fattening.

About fifteen hundred head of village Ndama cattle, in 15 herds at 8 villages are visited weekly. Animal identification combines ear-tagging and iron branding. Farmers are enthusiastic to iron brand their animals because this acts as a deterrent to thieves. Data collected include birth, death, exits, milk yield and diseases. The intensity of the monitoring scheme i.e. the number of variables recorded and the frequency or recording varies with the management system. More information are recorded with the intensified management system oriented to milk production. For the intensified management system, animals are routinely weighed. Milk

offtake for human consumption is measured each week by enumerators based in villages using graduated tubes. Enumerators record also events related to herd dynamics (birth, death, sales) that occur between two visits. Surveys are also conducted to collect information regarding the quantity of food supplement given to animals and all other inputs (food, drugs, labour) and output prices (live animals, milk, rental of draught animals).

This programme includes also a breeding component for the genetic improvement of Ndama cattle using open nucleus breeding systems. In 1992 an open nucleus breeding system with screening of breeding females for replacement for the genetic improvement of Ndama cattle was initiated in Senegal. Screening of outstanding females was based on-the-spot measurement of their performance. Decision regarding selection of cows is based on both information provided by the animal owner regarding the performance of its cow and measurement by technicians of milk produced during two consecutive days.

During the first screening operation 326 herds totalling 5 387 lactating breeding females were visited. Three hundred and sixty seven animals were identified as outstanding cows by farmers in terms of milk production. Measurement of milk yield of these cows and subsequent correction with respect to factors of variation of daily milk yield led to the selection of 50 cows to be introduced on-station for mating and for more stringent performance recording.

A comprehensive monitoring scheme has been implemented for cattle, sheep and goats through a joint ISRA/EMVT programme since 1983. This programme, "Productivité et Pathologie des Petits Ruminants, PPR" was designed as a tool for a multidisciplinary evaluation of traditional livestock production systems. The objectives were to evaluate the productivity of small ruminants and cattle breeds under different management systems and to investigate the effects of various factors such as breed, disease, and management system on productivity.

This programme dealt mainly with sheep and goats; however, the method and the software developed are applicable to cattle, equine and swine. For instance this system has been used for an extensive breed characterisation programme that involved about 800 village cattle in the Sine Saloum region between 1983 to 1990.

Sheep and goats recording took place in three sites and a total of about 8 000 head were involved in 1992. Data on herd/flock dynamics, health (faecal and blood sampling, clinical signs), management systems, live weight, milk production are routinely recorded.

5.2 On-farm small ruminant performance recording

Information generated with this programme was used for the selection of animals that were going to be used for the implementation of an on-station research programme designed to investigate the resistance of Djallonké sheep to endo-parasites.

6. Information support systems used in animal recording

Animal recording systems described previously combine a number of devices (field sheets, cards, books, computer programmes) for data storage and management. Field sheets are filled by enumerators and they thoroughly checked for errors before data entry. Examples of field sheets are inventory, individual identification and transfer sheets. Data base management programs such as DBASE or common spreadsheets are commonly used for data storage and management. On-farm animal performance recording programmes use also softwares such as IDEAS which was developed by ILCA, now ILRI. The most comprehensive and well documented programme developed for animal recording in Senegal is PANURGE (Faugère and Faugère, 1993). This programme is designed to manage data on herd dynamic, individual animals characteristics (live weight, body condition, castration, ownership etc.) animal health and management systems. In addition preliminary simple data analyses can be performed with the possibility to transfer the data into ASCII files for further elaborate analyses.

7. Achievements

On-station animal recording programmes for the genetic improvement of indigenous cattle and sheep breeds have been operated for many years. On-farm livestock performance evaluation have also been implemented for a number of years for the characterisation of local breeds. As a result a great deal of experience has been gained by scientists and technicians regarding recording procedures and data storage and analysis.

Infrastructures (fenced pasture lands, facilities) available in many livestock research stations combined with results obtained regarding the characterisation of local breeds and the experience gained in conducting on-farm animal recording programmes in a number of ecological zones and for different species and breeds could form the basis for the development of sound programmes of genetic evaluation of animals.

8. Funding of animal recording activities

The majority of animal recording programmes described here are state-funded with the support of external donors. Where the main objectives of the animal recording activities are research oriented, farmers do not see the immediate benefits. In such situation it is necessary to give incentives to farmers so that they accept to participate in the programme because they incur some costs for participating in terms at least of their time used. It is a common practice to provide free health care and some supplement to secure the continued participation of farmers. When it comes to animal recording programmes for the genetic evaluation of breeds, work in

Senegal shows that farmers could contribute to the cost of the operation, but this needs to be done in a progressive way. When farmers are convinced of the potential benefits they could gain then it would be easier to make them support a part of the animal recording costs.

Lack of infrastructure or well trained technicians and scientists do not pose any major problem at present in Senegal to run genetic evaluation programmes. The most critical issue facing these programmes is stable funding. Genetic improvement is slow and expensive and therefore decision makers must be convinced of the efficiency and impact of breeding programmes so that they can commit resources for these programmes on a sustained basis.

Animal recording activities should involve producers who benefit from them through their efficient organisations if these programmes are to be successful and sustainable. Producer organisations currently existing in Senegal do not include genetic evaluation programmes in their agenda and this constitutes a major constraint for the stability of animal recording programmes developed by research institutions. Indeed, new agricultural policies are oriented towards less state intervention and government owned institutes have suffered serious budget cuts that adversely impacted the stability of animal recording programmes.

The design of efficient genetic evaluation programmes in Senegal will have to address two issues. First, the heterogeneity of management systems found in villages is likely to introduce a bias in the genetic evaluation because of the increased environmental variability. Second, there is a need to develop proper correction factors for traits measured on-farm under different circumstances. The analysis of data and synthesis of information generated through various animal recording programmes could be used to compute correction factors.

An open nucleus breeding system has been established since 1992 in Southern Senegal for the genetic improvement of Ndama cattle for milk and for more resistance to trypanosomiasis. The programme went through some problems because lack of funding. However preliminary results in terms of organisational achievements are encouraging. Screening procedures to identify replacement breeding females needs to be improved and the establishment of a milk recording system is planned in certain areas. Improvements of health and feeding management during the dry season has caused a dairy industry to evolve in areas around cities. Farmers running these enterprises are getting organised to get feed and veterinary supplies and to market their milk. Because of the complex nature of this programme and many constraints faced, it is imperative that scientists,

9. Constraints

10. Future programmes for animal recording and genetic evaluation of animals

extension workers and farmers be brought to work together if a more effective open nucleus breeding programme is to be established in the future.

11. Reference

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