
Peul, Touabire and Djallonke sheep breeding programmes in Senegal

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This paper reports on the plan, design and operational aspects of sheep breeding programmes established in Senegal since the mid 1970s. In the 1950s and early 1960s, a research station in each of the two agro-ecological zones (semi-arid and sub-humid areas), was created with the objective to increase the productivity of local sheep and cattle breeds through the genetic improvement of these livestock. Two sheep breeding programmes based on selection within breed have been implemented in Senegal since 1975. Cross-breeding programmes were also undertaken using exotic European or Moroccan breeds but these experiences were not maintained and unfortunately they are not documented. This report will therefore concentrate on the two selection programmes of Sahelian and Djallonke sheep. Information reported in this paper has been gathered from the annual reports of the Centre de Recherches Zootechniques de Dahra, Senegal and the Centre de Recherches Zootechniques de Kolda.

The first breeding programme aimed at improving the Sahelian sheep breeds (Peul and Touabire), was established in northern Senegal in a state-owned research station. A similar programme took place in Southern Senegal with the objective to genetically improve the trypanotolerant Djallonke sheep breed. Both programmes were based on selection within breed.

The production systems under which both the Djallonke and the Peul breeds produce, could be defined as extensive low input systems. Animals graze natural pastures all year round. Roughage from cereal crop residues is also fed after grain harvest. Pasture quality is fairly good during the rainy season but quantity and quality are limited during the long dry season. Concentrate supplementation is not common for these two breeds on extensive management systems and therefore, nutrient requirements are not met in many months of the year. Water supply is also a major constraint for the vast majority of the Peul breed. Parasitic pressure is high for the Djallonke sheep and farmers seldom deworm their animals. It is estimated that ten to 50 percent of weight losses are attributed to the

Introduction

Description of the programmes

Breeds

Input level of the production system

helminth infestation. Vaccination against major epidemics such as Peste des Petits Ruminants is not systematic and therefore high mortality rates are observed.

On the other hand, the Touabire breed is subject to intensive management by farmers. These animals are usually kept on-farm and are fed groundnut or cowpea hay and concentrate. Sheep fattening to supply good quality rams during religious ceremonies (Hedoul Adkha) is a common practice where the Touabire breed are preferably used for their high growth rate, big format and white coat colour. Therefore, the production system for Touabire sheep could be classified as a medium input system.

Number of animals

The population of Peul sheep in the area covered by the breeding programme maybe estimated at over 500 000 head. For Djallonke sheep, the population concerned is estimated at 200 000 head.

The nucleus flock reared on station was about 300 head for the Peul breed, 200 head for the Touabire breed, and 300 head for the Djallonke sheep. The extension of the breeding programme to village flocks in 1984 expanded the selection base to about 900 head of Peul sheep.

Targeted population and system of dissemination of the improved genetic material

Village flocks that were close to the breeding station were first targeted in this breeding programme. Attempts were made to establish an efficient dissemination system of the improved genetic material. Rams selected on the station from the nucleus flock were rented on an annual basis to farmers participating in the breeding programme.

Establishment of the breeding goal

A top-down approach was used to establish breeding goals. National livestock development policies emphasised the need to increase meat production in Senegal in the 1970s. Breeding goals were set by Government technicians through the interpretation of national objectives to increase meat supply. Breeding sheep for meat purposes was seen as a means to improve productivity to meet the increasing demand for meat in the country. Farmers were not involved in any stage of the process of the design of the breeding plan. Farmers objectives and characteristics of the livestock production system were not taken into account. It is true that farmers place great importance on rapid growing stock. However, features of the farming environment may have directed technicians to traits, for instance, that would improve adaptability of the breed in harsh environments with high ambient temperature and humidity, high worm burden and trypanosomiasis risk for the Djallonke sheep. The Peul breed has also to trek long distance to search for water and fodder and during years of drought these animals may be subjected to transhumance.

The sheep breeding programmes started in 1975 at Dahra for Peul, Touabire and Djallonke sheep breeds. From 1975 to 1980, only performance recording took place in the nucleus flock to gain more information on the breed characteristics. There was not actually any breeding design in operation. Culling procedures were just applied on old and non fertile animals. In fact, at the inception of the programme, the original idea was set for a cross-breeding scheme between Peul and Touabire sheep, both local stocks. These two breeds were mated and cross-breeds were reared on site. However, the design of the cross-breeding scheme was not explicit on the use of the crosses. In 1980 the decision was made to terminate cross-breeding activities and to undertake selection within each breed. As a result, a breeding plan was designed with the following features.

Nucleus flocks established in state-owned research stations produce improved stock that was supposed to be distributed to surrounding flocks. At weaning at four months of age, males are selected on the basis of their body growth rate and conformation. In addition to these two criteria, selection at 12 months of age should also take into account reproductive traits such as semen quality. Selected males were planned to be progeny tested. Best rams were destined to the station nucleus flock while others were sold to farmers. Replacement females were selected at four months on the basis of their body growth rate and conformation. Elite females to be parental stock of candidate rams were selected using their reproductive performances (fertility rate) after their first three lambings.

By 1984 major modifications occurred in the design of the breeding programme. Due to the limited number of females on site that constrain the possibility to progeny test candidate rams, the recording system was extended to village flock so that the selection base could be larger. Young males were planned to be bought from village flocks at four to five months of age. Both young males from the station flock and from village flocks would be tested for four months for growth rate. Selected rams would be disseminated into village flocks at 15 months of age. It was planned that rams could rotate from one flock to another.

Although both programmes planned to use artificial insemination, neither of them actually used it. Similarly, the assessment of semen quality was never performed.

The extension of the recording system to the surrounding flock was operated after ten years of programme implementation when scientists realised that the selection base on station was not sufficient for the application of progeny testing of candidate improved stock. The increase in the number of dams would ensure greater variability and would allow greater genetic progress.

Changes in the design of the breeding goal

Traits included in the breeding goal

The breeding programme for all sheep breeds was designed for meat purposes. Adaptation to the environment was not for instance taken into account for the plan regarding Djallonke sheep that are reared in areas with high parasitic pressure and the prevalence of trypanosomiasis.

Selection criteria

Peul and Touabire

Selection of replacement females was based on their own growth performance and on reproductive capacity of their parents. Females with highest growth rate (zero to 30 days) and good conformation and being daughters of dams with high fertility rates were selected for replacement.

Males are first selected at weaning at four months of age on the basis of their growth rate. Selected young males at weaning are then subjected to performance testing for four months. Growth rate during the performance test and conformation at 15 months of age are the final criteria used to select rams.

The original plan also included final selection of rams on the basis of the performance of their offspring through a progeny testing procedure that would involve both on station and village flocks. However, this aspect of the breeding programme was not implemented because of the limited number of offspring per ram due to the reduced number of ewes on station.

Djallonke sheep

Growth rate at weaning at six months of age and white coat colour were used to select males. Selected animals undergo a performance test for six months and animals with the highest growth rate and best conformation (largest height at withers) were selected at 12 months of age.

Dissemination of improved genetic material

For Peul and Touabire breeds, rams were actually distributed into village flocks on a rental basis. Farmers paid 5 000 FCFA (approximately US\$10) per ram. For Djallonke sheep, the programme did not succeed to get to the stage of disseminating the improved stock. Due to management problems, high mortality rates were observed in the nucleus flock. Therefore, almost all females available were required as a replacement in the nucleus.

Population breeding structure

A nucleus flock was established based on purchases but this did not involve any screening. However, homogenisation of animals was done by removing those that did not exhibit major traits of the breed. White coat colour was set for the Djallonke sheep as a major trait of the breed. During the first years of the programme a closed nucleus was operated. In 1984, the need to involve village flocks was felt. According to plans, genetic material should flow to both directions, to and from the breeding structure. Village flock that benefited from selected rams was supposed to supply

the breeding station with young males that will be tested on station. On the other hand improved genetic material produced on station would preferably enter monitored village flocks.

Due to the top-down approach used in designing the breeding programme, farmers were not involved in the planning stage. Their participation was seen to accept the improved genetic material produced at the research station. With changes in the design, farmer participation was extended to ensuring that their stock was at the disposal of technicians for performance recording but they were not practically involved as main actors in the breeding programme.

Major financial inputs to the breeding programme were provided by the Government. Infrastructure establishment and maintenance, technical staff and the cost of the village recording systems were incurred by the state-owned research station.

Farmer and Government involvement

Research in the area of reproduction in support to the breeding scheme (investigation on the required quantity of PMSG following treatment with vaginal sponge to synchronise lambings) as well as experiments aimed at improving the feeding systems, were undertaken at the same time.

Support system

The establishment of the recording systems required training of technicians in charge of the work in village flocks. This was secured by the research station that also supported, on a subsidised basis, basic health care routines such as vaccination and deworming of animals in monitored village flocks. The supply of concentrate was also part of an incentive package for farmers to participate in the programme in a sustainable manner.

In 1983 as part of a national programme designed to monitor performance of sheep and goats in Senegal, a large recording system was established in the Dahra area where the Peul breeding scheme was taking place. This involved 71 farmers and 958 animals. Although the recording system was not set for breeding purposes, this could serve as a basis for the establishment of a breeding plan involving village flocks. In fact, in the southern areas where Djallonke sheep are raised, the monitoring structure was used to screen animals that appeared to be resistant to helminth in connection with a research programme aimed at investigating the genetic resistance of Djallonke sheep to helminth infection.

The monitoring system, although not destined to support a breeding programme, was successful in terms of supplying basic information of breed characteristics, farmers' objectives and practices as well as identifying alternative solutions to identified technical constraints.

Reasons for introducing the scheme

The genetic improvement of local breeds was seen as a main strategy formulated within the context of prevailing agricultural policies in the 1970s geared towards the intensification of production systems. The specific objectives of the breeding programmes were to:

- improve sheep productivity;
- increase meat supply;
- reduce imports of sheep from neighbouring countries to celebrate religious ceremonies such as Tabaski (Hedoul Adkha).

Critical factors of the breeding scheme

Government willingness and commitment to support the scheme was critical for its initiation. Moreover, breeding experiments were already undertaken for cattle and the extension of the breeding programme to sheep was easier as infrastructure and manpower were already there.

Over time, the scheme was not maintained for both programmes in the north for Sahelian sheep and in the south for Djallonke sheep. The major reasons for this failure were the reduction in state funds to support these programmes. Structural adjustment programmes largely reduced the capacity of research stations to maintain breeding programmes. As a result of budget cuts, the personnel of breeding stations were laid off and funds were no longer available to assure village flock monitoring in terms of logistic means and subsidised vaccination and concentrate supply.

Limited and unstable trained manpower was a compounding factor that greatly constrained efficiency and maintenance of the breeding programmes.

It is also probable that the evaluation of these breeding programmes during the course of action could have assisted in redesigning the schemes but this was not done. In connection to this, the lack of accountability to failure or success of schemes was a major problem.

Future direction and required changes for successful design and operation of the breeding scheme

Many aspects of the breeding plan would need revision if a successful programme is to be established in the future. There is now a sizeable body of scientific and technical information gathered during the last decades that could form the basis for sound design of a successful breeding scheme. In addition the availability of more qualified national scientists would be a positive factor to realise this objective.

The definition of breeding goals takes into account not only adaptability traits but also farmer participation. The economic evaluation of the goals is the number one priority. Failure to select criteria on an economic ground has been a major drawback of past breeding programmes.

The involvement of village flocks was initiated but this was not sustained because of the shortage of financial and logistic resources but mainly

because farmers were not sufficiently involved in the design and operation. Effective participation of farmers will require that they organize themselves to take charge in a collective manner, of tasks and costs associated with the programme and benefit from it. There was no producer association that could influence decision-making processes in areas where the breeding schemes were implemented.

Schemes should be as simple as possible in order to be implemented properly. Selection should be made at one stage and the number of criteria should be limited.

Breeding systems should be designed according to existing farming systems (intensive high input, medium and low inputs systems; market demands, prices of animals and meat). In this respect, selection within breed is a sound strategy for the Touabire breed in medium and high input systems in urban and peri-urban areas and in rural areas where husbandry conditions are improved. The Touabire breeds present traits that make production of profitably in medium and high input systems suitable. High prices paid for animals with good format and body conditions justify investment in breeding and other required inputs and this is already being done by a few farmers in urban and peri-urban areas. Performance recording in these flocks would allow the selection of young males to be tested and selected on station on the basis of their body growth performance.

Selection in low input systems should take into account adaptability traits according to specific locations and breeds. For the Peul breed in low input systems, selection within breed could take into account growth rate and reproductive performance that includes lamb survival. Another trait of importance for the Peul breed is the ability of animals to maintain body conditions in an environment with variable nutrient supply.

Many farmers keeping the Peul breed in Northern Senegal have large flock size, approximately 500 head. It would be possible to support these farmers so that they perform better breeding decisions than they are already making.

It is crucial that livestock development policies encourage the establishment of private professional breeding flocks either owned individually or by groups of farmers that will benefit from the scientific and technical assistance provided by research and extension institutions.

Selection within breed is also suitable for the Djallonke sheep with emphasis on adaptability traits such as resistance to disease and ability to use roughage.

Cross-breeding between Touabire or Bali-Bali, a breed from Niger, is also worth considering in medium input systems.

Estimation of genetic change

Genetic change was not estimated. However, genetic parameters of economic traits have been estimated.