
The Development and Maintenance of Animal Recording Schemes for Low to Medium Input Production Environments: a Case Study of Sheep Recording in Morocco

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Arid and semi-arid areas in Morocco cover about 68% of total agricultural land and contribute more than 50% of crop production. In this environment water resources are determined by a low to medium rainfall, and the level of production is quite limited and highly variable. Poor infrastructure, and insufficiency of public and private investments are also constraints for production. In this system livestock takes a primordial place in agricultural farms, and plays various functions such as:

- High contribution to agricultural GNP (to 37.7%).
- Employment of 2/3 of rural population.
- Important role in agro-industry sectors (leather, wool, milk).
- Constitutes a permanent bank for most farmers.

The main livestock product is meat, of which 96% is produced by sheep, cattle and, goats. The numbers of these species change from year to year with annual climatic conditions latest estimates are:

2.9 millions heads of cattle;
16.7 millions heads of sheep;
2.7 millions heads of goats;

The dairy improvement plan started in 1975 has resulted in significant changes in the national herd structure. The numbers in the improved breeds, grew by 32%. In Morocco, three genetic types are raised.

- Improved breeds: are essentially milk animals such as Pie-noir Frisonne, Holstein, Montbeliard, and Taranthese. All are imported. They make up 8% of the total.
- Local breeds: They are rustic animals and well adapted to local conditions, but with low level of production. They constitute 80% of the herd.
- Mixed breeds are a kind of crossing between imported and local breeds. They make up 12% of the total.

1. Introduction

2. Numbers

3. Structure of national herd/flock

3.1 Cattle

3.2 Sheep

In Morocco there are various local breeds of sheep. Each is adapted to different local conditions/area of the country.

These breeds are:

- Timahdit. (Middle Atlas area) 1.2 Millions heads.
- Beni Guil (Oriental area) 2.3 Millions heads.
- Beni Hsan (North area) 300 000 heads.
- Sardi (Central area) 750 000 heads.
- D'man (South area) 200 000 heads.
- Boujaad (Phosphate area) 80 000 heads.

These breeds are subject to specific action of genetic improvement in their environment.

Imported breeds. They are 20 flocks of 5 000 heads. Such as : Ile de France, Merinos, Noir de Velley, and Cosdulot raised in intensive systems and used for crossing with local ewes for meat production.

3.3 Goats

There are many genetic types in the goat herds in Morocco. Not yet well defined, they are used in mountain areas specially for meat production.

4. Sheep development strategy

The sheep production development is based on the plan of National Economic Policy. The target group of the program is the rural farmers.

The sheep production program has the objective to increase production by:

- Genetic means.
- Range management means.
- Health means.

4.1 Recording schemes

In order to increase sheep production by genetic means, the following strategy was adopted.

- Development of a selection scheme for each breed taking in account its production in the areas concerned.
- Valorization of local breeds by the development of crossing techniques with imported breeds.
- Support of the existing selection farms to insure extension and to distribute selected rams.
- Establishment of professional organizations to be actively involved in development programs.
- Involvement in applied research.

To achieve this strategy, it was necessary that an animal recording system be established.

Animal species involved: Animal recording is used only in sheep and imported breeds of cattle. The traits measured for cattle are related to milk production and quality of milk.

For Sheep: As a first step, a farm for selection was established in each breed environment. The purpose was not only to safeguard the local breeds in Morocco, but also improve their productive performances. For this purpose, selected and certified rams are produced, and distributed at subsidized prices to the farmers.

Since twenty years ago, the government has been interested in encouraging producers to practice selection techniques. Associations and farmers groups were then created in these environments. For instance, the National Association of Sheep and Goat was created for small ruminants.

This paper will investigate animal recording system for “Sardi” breed .

“Sardi” is a breed of big size. It is known as a good user for poor pastures. The animal has a white face with black spots on the muzzle, and the eyes, the legs, the neck and the flank extremes are without wool. The male has big horns. The performances of the breed are:

| | |
|--------------------------------------|-------------------------------------|
| Weight of mature ram | 90 to 110 kg |
| Mean weight of mature awe | 50 kg |
| Mean weight at 10 days of age | 7 kg |
| Mean weight at 30 days of age | 12 kg |
| Mean weight at 90 days of age | 25.2 kg |
| Daily rate of growth (10 to 30 days) | 250 g |
| Daily rate of growth (30 to 90 days) | 220 g |
| Fertility | 97 % |
| Prolificacy | 110 % |
| Fleece weight | 1.4 kg for ewes; 2 to 3 kg for rams |

“Sardi” breed lives mainly in the Central Economic Region of the country South of Settat Province, North of Tadla plain, and Kelaa Province). This region is characterized by an arid climate with seasonal drought from May to September.

Precipitation: The mean rainfall varies from 200 to 250 yearly with erratic distribution over time.

Temperature: The mean temperature varies from 10°C in January to 33°C in July. The maximal temperature records sometimes 40°C, and the minimal temperature varies from 3°C to 6°C depending on the altitude.

5. Sardi characteristics, qualities and environment

5.1 Characteristics and qualities

5.2 Sardi breed environment

Soils: The Soil is quite a limiting factor in Sardi environment. Its low depth, poor fertility, and harsh texture reduce the means for cropping. The type soils are subject to water and wind erosions.

Vegetation: The natural vegetation of the region is composed of several herbaceous species mainly annual with short growing season from November to March. Therefore, the ranges are of fair conditions, and contribute t only 50% of total nutrition needs of the animals.

5.3 Herds numbers

The livestock herd structure in Settât Province where the selection farm of Kra-Kra is located is composed of:

- 83 500 heads of cattle;
- 850 000 heads of sheep;
- 15 000 heads of goats;
- 17 00 heads of camels.

These numbers show that sheep are the dominant species raised in Settât Province. “Sardi” breed contribute 38% to the sheep population.

The highest portion of sheep is raised in the south of Settât . The flock size distribution is:

- 87.2 % have between 0 at 50 heads;
- 9.6 % have between 51 at 100 heads;
- 3.2 % have more than 100 heads.

The percentage of the “Sardi” breed in the flock near the farm varies from 40% to 90%. Because of its high marketing quality many farmers introduced “Sardi” breed in their herd flock.

For the purpose of maintaining and improving “Sardi” breed productivity and profitability of, the government has created a farm for Selection for each breed in the region concerned with this breed. In Sardi environment this Selection farm is Kra-Kra.

6. Kra-Kra sheep selection farm

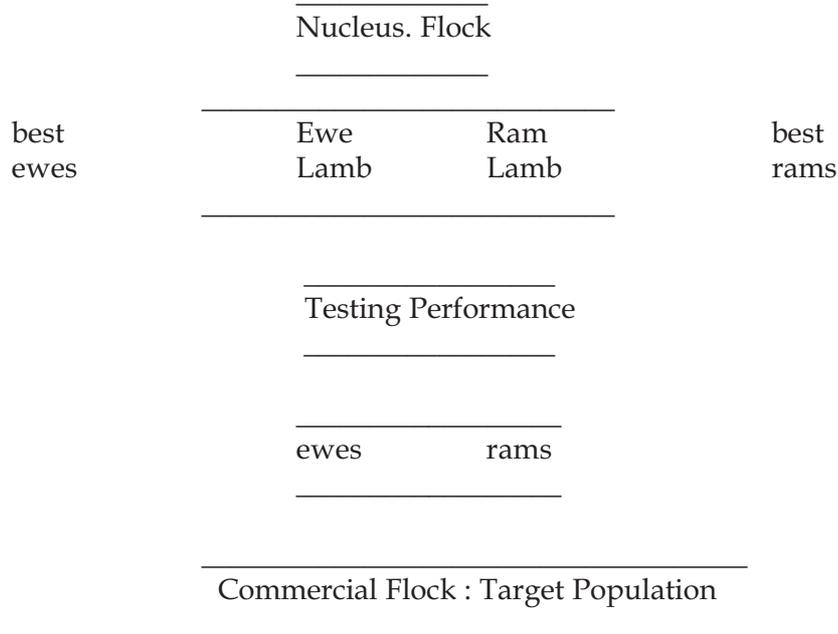
6.1 Objectives

The Sardi breed development program started in 1953 based on the requirement of national objectives to satisfy the meat market and to:

- Save Sardi breed.
- Increase the local production.
- Increase the performance of Sardi breed.
- Offer extension services of sheep production techniques.
- Offer extension services of range management techniques.

To achieve those objectives, the farm has now between 250 to 350 ewes and 6 to 9 rams. Because of the importance of Sardi breed in this area, the ministry of agriculture has established this farm to improve breeding and production. In this sense genetic actions were given a particular attention.

6.2 Schemes



Based on the above objectives, and selection scheme, the breeding programs is:

- Determination of traits influencing genetics technique available for serving the desired improvement.
- Now it is important to define traits emphasized for selecting both rams and ewes.

The following should be taken as general guidelines for ram traits.

- Acceptable conformation.
- Growth rate.
- Sexual aggressiveness.
- Breed criteria.
- Hardy and rough.

Ewe traits:

- Ideally a year round breeding.
- High fertility.
- Good milk.
- High size.
- Hardy.

The general implementation is:

- Select superior stock based on records.
- Screening base population for top quality ewes and identifying and selecting high producing ewe to be included in the elite or nucleus flock. Screening is done both through records and visually.
- Mate base population with selected rams derived from the nucleus stock.

In this farm, selection program is as follows;

- Control of breeding: period from 15 June to 15 August. Mating groups of 50 ewes and one ram are made. The ewes of one group are marked by one number.
- Control of birth: the period of birth is from 15 November to 15 January with 85 % in December.
- Control of body weight: to determining body weight at specific ages and ADG weights are measured each 21 days from birth to 120 days
- At 4 or 5 month after weaning, the first selection is made for to eliminate the undesirable individuals (Not acceptable breed characteristics).
- At 15 to 18 month of age, the National Committee ranks animals such as:
 - Rams:
 - √ Superior Rams are kept for reproduction in the farm, the number of this category is very Small: 1 to 4 a year.
 - √ First, second and, third categories sold to farmers at encouraging prices.
 - √ The refused rams are sold to be slaughtered.
 - Ewes
 - √ There are two (2) categories of ewes, the selected ewes are kept in the farm for reproduction and the refused ones sold to farmers. The National committee also certifies animals used for breeding.

6.3 The animal categories

Ewes and rams and their offspring (male, female) are the animals categories involved. In the recording process, the traits measured are related to the parent and their offspring (phenotype, conformation, weight at specific ages , daily growth rate), but no progeny testing is followed.

Selection of rams and ewes in the farmers' flocks follows the same procedures as that at Kra-Kra state farm. Selected rams produced by ANOC farmers sold for breeding command US\$ 250-600 price.

6.4 Purpose of the recording scheme

The success the program for genetic improvement of animal productivity is related to the recording process and control of production performances, and the environment factors. This allows for making many corrections or estimate parameters needed for better decisions (health, nutrition, breeding period, management ...etc.).

The identification starts with a tag on the left ear at birth. This allows controls of the lambs from birth to 4 or 6 month of age, then the animal are tattooed in the right ear generally with a number of 4 numeric codes. The first numeric of this code shows the year of birth.

6.5 Animal identification

The traits emphasized for animal selection are weight at birth, weight at specific ages, average daily weight gain, fertility, prolificacy, and other criteria or traits.

6.6 The traits measured

- Weight at birth: heavy lambs at birth grow faster. Birth weights reflect the feeding conditions of pregnant ewes during the last month of pregnancy.
- Weight at specific ages: they are indicators for individual growth and allow intervention at the right moment. The weight of animal are taken at 10, 30, 70 and 90 days of age. The data collected are used to determine, daily growth rate, and earning body weight.
- Daily growth rate: lambs will grow well only if their mothers have enough milk. The ADG between 10 and 30 days is affected by the amount of milk consumed. With this parameter, we can know if the ewe has had good feeding or not during a lactation period. Therefore, it is important to supplement a ewe at right time.
- Other traits measured:

Total productivity = Numeric production x the mean of weight of lambs sold.

- Fertility.
- Prolificacy.
- Wool production.
- Number of ewes by rams.
- Age at the first mating season.
- Number of families lambing twice a year.

All these necessary information is recorded in a lambing registers, declaration cards for mating and birth registers. For daily body weight, animals are weighed regularly at 21 days intervals.

Feeding is one of the most important aspects of livestock production. Applying correct feeding principles would help to achieve the expected target of production. In this farm, it is important to note that the management and feed requirement varies in relation to class and age groups of sheep. It is recommended that sheep farms having more than 600 heads should attempt to separate, their animals into various classes or groups. Adoption of proper feeding and other management practices would only then be possible to obtain a satisfactory level of productivity. In this farm two case can be presented.

6.7 Nutrition

- Normal year: the supplementation is necessary during mating season for more than two months. Each ewe receives 300 gr to 500 gr of concentrates feed by day and the rams receive 1 000 gr/day. Other supplementation is also required during the last month of and the first month of lactation. In this case each ewe receives 500 gr to 750 gr of nutritive feed/day.
- Drought year: all year long animals are fed with 500 gr of nutritive feed and cereal straw ad libitum. But the quantities can be significantly increased during critical periods (mating season, pregnancy, and lactation...).

6.8 Health program

Combination of regularly scheduled activities and good herd management designed to maintain optimum animal health and to achieve optimum production: Herd health should be defined as preventive on the farm. For the herd health program to be successful it is important to keep good and reliable records that can be used. The objectives are achieved by applying the concept of target of performances which is the level of animal health and production that is considered to be optimum and will yield the best economic return on investment. For that a health calendar is observed.

- Antiworming worms 4 times by year.
- Treatment against external parasites 2 or 3 times by year.
- Vaccination against enterotoxemia.
- Vaccination against clavelias.

6.9 Pedigree

Each year the National Committee selects the animals of the breed . The selection is based on the criteria recorded and the animals phenotypes. After animals ranking, this committee establishes pedigree for the animals accepted.

6.10 Types of analysis

- At farm level the analysis of crude data concerns calculating the means of the criteria measured and their comparison to the standard of the breed.
- At the central level, studies are now undertaken to establish “ index” of genetic values of each trait measured.
- The data are available on registers in the sheep selection farms.

6.11 Results

Since 1972 the farm produced about 3 000 selected rams used not only in Sardi flocks but also in other level in Morocco and other countries such as Tunisia, Senegal, Gabon.

- Daily growth rate is now 250 gr/day when it was only 140 gr/day in 1972.
- Weight at specific age is: 12 kg at 30 days. When it was only 8.0 kg.
- 25.2 kg at 90 days . When it was only 17.0 kg.

- Fertility grew from 85 % in 1972 to 97 % now
- Prolificacy increased from 102 % in 19972 to 110% in 1997
- Wool production increased from 08 kg in 1972 to 1.5%.
- The number of animal selected increased from 1981 to 1997

The production of selected rams by sheep select in Farm (F.S.O.K) satisfies organizations to produce selected rams. For this reason the government support group formation.

Sheep meat is the most preferred by consumers among all meats.

- Religious aspects: each family slaughters yearly one sheep at the Biram “Aid Al Adha” day.
- Sheep valorize poor feed resources more than other animals.

Taking these considerations into account , it was necessary to organize the producers. The first association was created in 1967 (Association of farmers for Selecting Breeds of Sheep). This association became in 1980, the National Association of Sheep and Goats (A.N.O.C).

The A.N.O.C is managed by an administrative council composed of farmers selected in general annually and of two representatives of ministry of agriculture.

In order to achieve the A.N.O.C objectives, the council is structured to suit the breed and production channels.

The main objective of A.N.O.C is the improvement of farmers income by increasing meat production of sheep and goats in a variable socio- economic systems and to valorize the producer’s/farmer’s job in difficult environment. These objectives are described in government orientation to satisfy the market meat. The action undertaken at the farmer level concerned two aspects.

The repartition is shown in the following table.

| Species or breed | Goats | Boujaad | Sardi | Beni Guil | Timahdit | Imported | Total |
|------------------|-------|---------|-------|-----------|----------|----------|-------|
| % | 5 | 10 | 17 | 18 | 39 | 11 | 100 |

7. A.N.O.C.

7.1 Introduction

7.2 Objectives of the A.N.O.C.

7.3 Repartition of A.N.O.C. farmers

7.4 A.N.O.C. identification by number

| | |
|-------------------------|-------------|
| Number of farmers: | 1 500 |
| Other farmers: | 4 900 |
| Groups Number : | 27 |
| Number of heads : | 550 000 |
| Rams and ewes produced: | 13 700/year |

The sheme is actually implemented in the area by government officers who visit each flock twice a month. However, ANOC has actually started to have its own employees.

7.5 Regional organization

| | |
|------------------------------|--|
| North. Sector goat livestock | 2 Provinces |
| Midl Atlas. | East Sector |
| Timahdit Breed | Beni Guil Breed |
| 5 Provinces | at 4 Provinces |
| A.N.O.C. | |
| South. Sector D'MAN Breed | 2 Provinces |
| Atlantic Sector | South Center Sector |
| Imported breed and Crossing | Sardi and Boujaad Breed at 5 Provinces |

7.6 The activity of A.N.O.C.

These activities have the objective to produce selected rams and ewes for improving the traditional herd flock.

- Improvement of numeric productivity.
- Improvement of ponder productivity.

7.6.1 Improved of ponderal productivity

This aspect included what is related to the genetic improvement. The Scheme is the same as the program at the state Sheep Farm.

7.6.2 Improvement of ponderal productivity

This aspect included all actions, such as:

- Health program.
- Nutrition program.
- And assistance techniques.

To achieve this objective at the government farm level and other farms, more support is required.

The selection scheme is actually efficient, but concerns only farmers inscribed in the program of performance controls. The number of participating farmers needs to be increased.

In order to reduce high cost, farmers should play important roles in:

- Identification of animals.
- Lambing declaration.

- Lambing registers.
- Performance measurements.

The government supports group creation by subsidizing farmers on the basis of number of animals kept on the farm. Selected rams can be sold to various state farms at attractive prices.

Also, farmers take advantage of feed transport and feeds. Therefore, the scheme is easily accepted but the number of the farmers practicing selection in groups increases slowly from year to year.

Actually, the strategy in animal recording is to encourage farmer groups and associations. The charge to groups of farms are only little percentage and they get a subsidy for each ram or ewe they produce, beside;

- The free herd health program.
- The technical assistance.

Technical Support: A.N.O.C and DLG. in South Center organize information meeting, about health, nutrition, good animal housing for producers.

- Assist in animal selection.
- Training of technicians involved in selection program.

The number of total farmers in the region is 60, 36 of them are ANOC farmers, 15 do not belong to organized groups and 9 are from the area immediately outside the farm region.

The number of recorded rams and their repartition by breed at the national level are shown in the following table:

| Period/Breed | 1967 to 1983 | % | Yearly means | 1984 to 1993 | % | Yearly mean |
|-------------------|-----------------|------|-----------------|-----------------|-----|----------------|
| Beni Guil | 741 | 6 | 41 | 1 480 | 9.3 | 148 |
| Timahdit | 2 374 | 19.1 | 132 | 6 804 | 42 | 680 |
| Sardi | 2 022 | 16.3 | 112 | 2 501 | 16 | 251 |
| Boujjad | - | - | - | 398 | 2.4 | 40 |
| D'MAN | 7 | - | -- | - | - | - |
| Total local breed | - | - | - | 50 | 3 | 5 |
| Imported breed | 5 144 | 41.4 | 285 | 11 242 | 7.0 | 1 124 |
| Total all breed | 7 270 | 58.6 | 404 | 4 898 | 30 | 490 |
| | 12 414 | 100 | 689 | 16 140 | 100 | 1 614 |

7.7 The government and farmer involvement

7.8 Type and nature of extension

7.9 Results

7.9.1 Number of recorded animal

The number of recorded animals has grown from 915 ram lambs and 1 048 ewe lambs in 1983 to the about 2 728 and 7 195 , respectively in 1993, making respectively 14% and 20% of increase yearly.

Comparatively to the period of 1966-83 the number increased by 30% for males and 40% for females.

7.9.2 Evolution of productivity parameters

The ponderal productivity of the breeds was significantly improved in farm advised by A.N.O.C. comparatively to national herd average. Technical interests were given to health, nutrition, reproduction and selection improved the ponderal productivity ass shown in the following table:

| Parameters | Non ANOC Breeders before - after | ANOC Breeders before - after |
|------------------------------|-------------------------------------|---------------------------------|
| Rate of numeric productivity | 65 - 75 % | 98-105% |
| Rate of mortality (young) | 7 - 11 % | 2-5% |
| ADG (10-30 d) | 70 - 120 g | 160-220 g |
| Age at marketing | 5 - 8 mo | 4-6 mo |
| Weight at time of sale | 20-23 kg | 25-28 kg |

The production of selected rams by A.N.O.C. members satisfies now about 20% of the total needs against only 6% in 1983.

8. The reason for introducing and maintaining scheme

Improvement of numeric and ponderal productivity depends on the scheme of genetic selection and other environment factors (health, feed, housing etc.) and to keep good and reliable records that can be used to monitor and evaluate the targeted performances.

Records can be as simple as the individual life time sheep card used in the meat herd. Also major events are recorded, when do they occur and what action taken are recorded.

Every contact person knows the visiting schedule for the year with a checklist to help him in check the farm condition, animal nutrition, animal health, production, reproduction and so on. He takes necessary action needed such as clinical examination, treatments, vaccination, weighing, pregnancy diagnosis, drenching and treatments, vaccination, weighing, pregnancy diagnosis, drenching and analysis to make appropriate recommendations.