

## REPRODUCTIVE PERFORMANCE OF ARBIA (ARABIA) GOAT AND BREEDING MANAGEMENT IN SOUTH-EASTERN ZONE OF ALGERIA

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**Abstract :** In order to determine the reproductive performance of the Arbia goat as well as the farm management practices, the study was carried out in Algeria Southeast regions. For the data collection, the method of surveys of farmers on the different parameters of breeding and breeding behavior was adopted. According to this study, it is generally found that the traditional system remains the dominant practice, the farms are mixed, 31.57% of the goat herds are of more than 45 heads (male and female) of different categories; the average age is 3.5 years for goats and 2.5 years for goats. The sex ratio for all farms is estimated at 11 goats per male. For the reproductive performance of the studied goat, the fecundity, prolificacy, fertility, abortion and mortality rates were respectively: 112.38%, 136.09%, 92.20%, 11.29% and 18.69%. It can be deduced that the reproductive performance obtained reflects the practices quality of the breeders towards their animals and it is closely linked to the breeding conditions. A little improvement of the operations carried out allows an improvement of the reproductive and productive performances at the same time.

**Key words:** reproduction performance, Arbia goat, breeding management, Algeria

## PERFORMANCES DE REPRODUCTION DE LA CHEVRE ARBIA (ARABIA) ET GESTION DES ELEVAGES DANS LA ZONE DU SUD- EST DE L'ALGERIE.

**Résumé :** Dans le but de déterminer les performances reproductives de la chèvre Arbia ainsi que les pratiques de gestion des élevages l'étude a été réalisée dans les régions du Sud-Est de l'Algérie. Pour la collecte des données on a adopté la méthode des enquêtes auprès des éleveurs sur les différents paramètres de conduite d'élevage et de reproduction. D'après cette étude, il ressort généralement que le système traditionnel demeure la pratique dominante, les élevages sont mixtes, 31.57% des tailles des troupeaux caprins sont de plus de 45 têtes males et femelles de différents catégories; l'âge moyen est de 3.5 ans pour les chèvres et de 2.5 ans pour les boucs. Le sex-ratio pour l'ensemble des élevages est estimé à 11 chèvres par bouc. Pour les performances de reproduction de la chèvre étudiée, le taux de fécondité, de prolificité, de fertilité, d'avortement et de mortalité étaient respectivement: 112.38%, 136.09%, 92.20%, 11.29% et 18.69%. On peut déduire que les données de reproduction obtenues reflètent la qualité des pratiques des éleveurs vis-à-vis leurs animaux et sont étroitement lié aux conditions d'élevage. Une moindre amélioration de l'ensemble des opérations effectuées permettent une amélioration des performances reproductives et productives à la fois.

**Mots clés:** performances reproductives, chèvre Arbia, conduite d'élevage, Algérie

## Introduction

The goat herd in Algeria consists mainly of the major types Arbia, Mekatia, Mozabite and other minor populations. It is estimated at 5007894 head in 2017 [1]. This herd is owned by private breeders (rural population) for the most part. Despite the importance of this species as a source of animal protein, it has not benefited from sufficient studies to characterize and develop this type of breeding. Reproductive potential is one of the main factors determining the effectiveness of herd production. The work undertaken aims at describing the practices of the behavior of goat farms and to evaluate the zootechnical performances of reproduction of the goat Arbia most widespread in Algeria but of unknown reproductive potential.

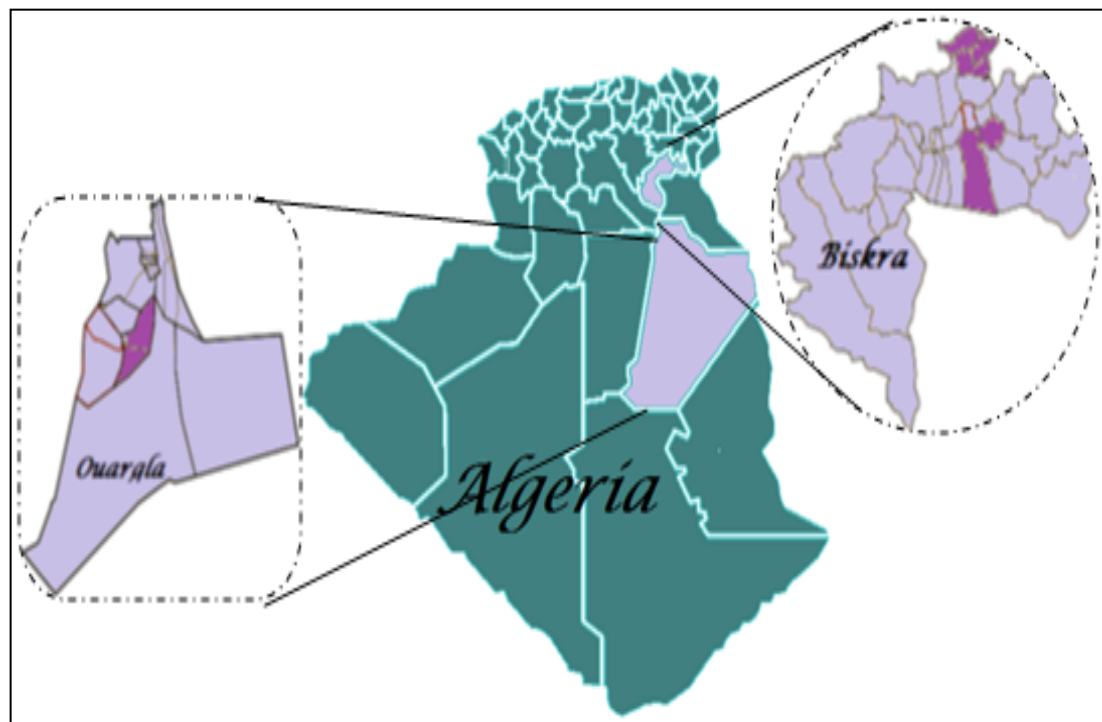
## 1. Material and methods

To determine the performance of the Arbia goat and to give a more precise picture of the main practices characteristic of goat farms in the study area presented on the figure 01, twenty-seven were the number of flocks studied, the animals were of different age and sex. Breeders' choice to participate in the survey was based on the accessibility of the farms and the flocks' size. The study was based on surveys. The information collected was on the management of the farms (numbers, animal's categories, etc.) and the zootechnical performances (of fertility, prolificacy and other reproductive parameters).

Regarding the data processing; a descriptive analysis was done using the Excel.07 program.

### 1.1.Study area

The areas concerned by the study are shown in Figure 01:



**Figure 1-** Study areas presentation

## 2. - Results and discussion

### 2.1. - Farm management practices

Table 01 shows some characteristics of the farms:

**Table 1** - Main farms characteristics

Variables	Modality	Fréquency (%)
<b>Breeder age</b>	≤30	5.26
	30 à 50	63.15
	≥50	31.57
<b>Principal activity</b>	Breeding	33.33
	Agriculture	50
	Other	16.66
<b>Animal species</b>	Different species	94.73
	Goats only	5.26
<b>Goats herd size</b>	≤15	21.05
	15 à 30	21.05
	30 à 45	26.31
	≥45	31.57
<b>Mobility</b>	Sedentary	10.52
	Transhumance	89.47
<b>Veterinary practices</b>	Yes	89.47
	No	10.52

#### 2.1.1. Goat breeders

Our study shows that the people (herders) practicing this activity are at 63.15% the group that the age is between 30 and 50 years and only 33.33% have animal husbandry as their main activity. Pastoralists account for 89.47% of transhumant animals (periodic movement during the summer) to overcome the seasonal problem of the food unavailability. This practice is widely used in this type of production system [2, 3]

#### 2.1.2. Animals characteristics

Goat farming often accompanies the sheep species (93.75%) as in the steppe environment [4]. The goat plays a guiding role for the herd [5]. It is characterized by the absence of herds consisting exclusively of goats. This mixture may be due to the resemblance of the diets of the two species. Goats are local populations and some exotic breeds, small in size compared to sheep, 31.57% of goat herds are over 45 heads between both sexes and of different ages, most of herds consist of females that are kept for the milk production intended mainly for the breastfeeding of kids, for

self-consumption or sometimes for sale, goats kids to increase the herds number. Goat's milk can replace breast milk in the newborns feeding; giving energy to growing children [6]. It is considered as one of the most complete and balanced foods according to [7, 8, 9].

The kids are sold or slaughtered at the early ages (less than one year), this result confirms the one obtained by [10] in semi-arid Algerian mountains where the sale is at the age of 6 to 9 months. Unlike female goats that are used for herd renewal with a minimum of one future parent kid [11, 12]

confirm the females' preference for The male goats are in the minority (maximum 3) according to the results of [13], which explains why pastoralists reduce the number of male goats in order to reduce the expenditure on food, care etc ... In addition concerning the meat quality; that of the old male goat is not appreciated by the consumers.

The animals lack loops or signs of identification but the breeder has the ability to identify these animals by different criteria specific to him such as the color of the dress.

### 2.1.3. Livestock building

The breeding system is of the traditional type; the goat shelter takes place in enclosures (zeriba) or substandard hangars next to the exercise areas. The majority is built with low ventilation conditions and no mechanization possibilities to remove manure regularly. The litters are made of straw. Feeding and watering equipment are traditional.

The used buildings type explains the lack of investment in breeding infrastructure, which is a very important parameter. The control success of the aspects of the animals feeding and the sanitary state is closely related to the building or to the housing conditions ensuring it well being [14].

### 2.1.4. Feeding

The animals' occupants have not a feeding plan or rationing in accordance with the needs of the animals; Food is most often related to the breeders habits and especially to the food availability. The animals are driven everyday to the natural pasture which guarantees most of their food (free forage units). The rest of the ration is provided by concentrates (barley) as well as straw, bran. Byproducts of date palm crops such as date scrap. Date kernels are added to the feed in some breeders as mentioned by [15, 16]. Dry palms and dates pedicels are also used. They have a chemical

production and multiplication.

composition similar to that of straw and this is confirmed by the studies of [17, 18], giving an added value to the diet. Bread is used by some breeders. The distribution of these different products is different in quantity from one breeder to another. Complementation improves both growth and reproductive performance [19, 20]

No preparation of the animals is carried out for mating by food supplementation (flushing or steaming) and during the important physiological deadlines like the end of gestation period and goats' kids breastfeeding. The lack of care of this practice is at the origin of poor reproductive performance (fertility, prolificacy ...) and weight loss and / or mortality of pregnant and lactating females and kids because of the food deficit. Hence the major interest in the preparation and maintenance of animals at mating guaranteeing the success of the latter and consequently the reproductive performance improvement such as fertility [21]. This energy-type preparation rather than protein, mineral-vitamin supplementation may also be considered. It is in the weeks leading up to the mating. Taking into consideration the sperm formation duration and its transit through the genital tract. This is likely to guarantee a fertilizing mating. An adequate nutrition is considered as one of the key factors in giving importance to a production system [22]. Complementation is necessary in case of the orientation of the rearing system towards specialized high-level livestock production such as milk [23, 24] Beneficial effect of concentrated feed intake in the case of low feed value of feed for the basic ration for milk-producing animals [24] or for meat production [25]. Regarding the watering mode; most of the respondents give ad libitum water to their flocks throughout the year, which is reported by [26]. The majority have water resources that meet their needs. The purchase of water is the solution in case of deficit for those who do not have this resource.

### 2.1.5. Reproduction and herds renewal

For reproduction, it is completely at random in all people affected by the diagnosis. Free mating and the presence of male goats at all times with goats are the characteristics of all farms; they result in births throughout the year which gives the results of [27]. Goats' artificial insemination for genetic improvement is not practiced. Male goats are either from the flock even from the offspring (self renewal). According to [28] who found that the selection criteria are mainly: the size, the coat color, the rapid growth, the type and the orientation of the horns and the libido. While for females; goat kids' growth, size, maternal quality, and twinning rate were the primary choice reasons. However, this attitude of self-renewal may be the cause of consanguinity problems negatively affecting the productive performance of the herd. The animal purchase from local markets is also practiced, and in both cases they are selected according to the general conformation, size and vigor that seem a reasoned choice. Most of the surveyed breeders do not change their reproductive animals with their congeners. The goat change frequency during multiple reproductive cycles may be the cause of presence of consanguinity problems [29].

The breeder proceeds to the reform of certain animals with multiple reasons which can be diseases or malformations. This is confirmed by [26] who argues that the decrease in fertility, the goat health state, malformations and defects due to inbreeding problems are the reasons for the reform of the goats of reproduction. The age of goat reform varies from 5 to 9 years, according to [30]. The reform of the goats is conditioned by the number of births made by this one at its owner. The age at reform is the reproductive life of the goat, which is kept as long as possible as long as it is a good reproductive.

The increase in homozygosity is one of the risks of inbreeding resulting from the preservation of populations with small

number [31]. The disappearance of genetic variation helps the expression of inbreeding depression which in turn reduces the evolutionary potential of a species by reducing adaptive skills, reducing the ability to control diseases and decreasing resistance to biotic and abiotic changes in the environment [32]. [33] indicate that inbreeding depression can increase the risk of extinction of small populations by increasing the mutations occurrence, and then decreasing the animals survival and fecundity.

### 2.1.6. Health care practices

Regarding health; 89.47% of farmers who use the veterinary services for the occurrence of a pathology and for periodic vaccinations of animals against certain diseases. Most breeders take advantage of the veterinarian arrival at the time of vaccinations to dispose of the sick animal, outside these periods and in case of an animal disease the breeder resorts to traditional means and practices of treatment or slaughter the animal directly.

The main health problems reported by breeders and which are heterogeneous from one breeder to another are digestive disorders such as kids diarrhea, or related to reproduction (dystocia, abortions), mastitis, foot rot and external parasites (scabies, lice and ticks) are also present.

Diseases have a multiple negative impacts on herd production and productivity, such as animal death and weight loss, slower growth, low fertility, decreased physical power. The absence of inventories and the animals state sanitary monitoring is the characteristic of all the farms as well as the record sheets of the previous pathologies (the diagnosis and the veterinary treatments). In order to allow the animal to have better reactions towards the aggressions of the environment, it must be in perfect health; this necessarily involves a program that includes a certain measures number such as a balanced diet, proper deworming, routine vaccination, an environment hygiene in which the animals live [34].

## 2.2.- Reproductive zootechnical parameters characteristics

Reproductive success is of paramount importance and is a prerequisite for increasing the livestock production. Its effectiveness can be estimated by several parameters such as fertility, abortion rate,

and prolificacy [35]. Assessment of the reproductive characteristics of local breeds is an important element in categorizing its productive and reproductive performance. These traits depends more on the environmental control and less on the genetic control [36]. Table 2 present the results of the study of some reproductive parameters on Arbia goat:

**Table 2** - Reproduction parameters of the Arbia goat

Parameter	Mortality rate	Fecundity rate	Prolificacy rate	True fertility rate	Apparent fertility rate	Abortion rate
Average (%)	18.69	112.38	136.09	92.20	82.17	11.29

### 2.1.7. Young goats mortality

The young goat mortalities cases are of the order of 18.69%. This proportion is a little high compared to the Bedouin goat from the Beni-Abbes region ( $12.2 \pm 5.1$ ) studied by [37]. The main causes of these losses are the under-nutrition (no steaming during the gestation last months) and the climatic conditions (the inadequate period of kidding that coincides with the cold winter and the food scarcity which characterize this period).

According to [38], the kids' survival rate is affected by the birth type, with a higher survival rate associated with the single births kids compared to triplets and quadruplets.

The mortality rate is affected by the health status of the herd, the causes are multiple and it can be diarrhea of pathological origin and / or food resulting from the bad behavior of herds food (especially the nursing females), contagious diseases, septicemia and / or infectious diseases resulting from the breeders practices (no care is given to the newborn and the hygienic conditions of the place of birth predispose the births to the infection but also the non separation of the females from the rest of the herd during the kidding). The non-separation of youngs from the rest of

the herd can be one of mortality causes [39]. According to [40] embryonic mortality can be attributed to the young age of the animal, to genetic abnormalities or to a uterine environment that is unfavorable to the embryo development. Losses vary with breed (important in prolific ones) and increase with ovulation rate and stress level. It is also influenced by many parameters: the flock, the goat and the birth weight.

### 2.1.8. Fecundity rate

The capacity of goats to reproduce (fecundity rate) is estimated at 112.38%. This rate is close to that recorded by [41] (120%) in the Arbia population and 105% in Mekatia, and in the Creole and Murciana breed (125% and 130% respectively) [42]. But it is lower than the M'zabit rate (140%). It is too low compared to the rate recorded by the [43] (250% at M'zabit).

Fecundity is influenced by the manner in which the flock is reared (mating method) and breed or genetic type and even the area. Conversely, we speak of infecundity. Other factors (age, physiological stage, ...) can be used to determine fecundity: age at the first birth, environment (rearing conditions), diet, and climatic conditions.

### 2.1.9. Prolificacy

The prolificacy performance is at 136.09%; it is lower than the rates of 180% and 200% respectively obtained by [41] and the [43] for the M'zabit population. While the rates obtained by the same authors for the Arbia and Mekatia populations are lower than ours and are 110% and 125% respectively. The Anglo-Nubian goat is very prolific (250%) [44] compared to our study.

Prolificacy is an important component of herd productivity, it is conditioned by: year and season of birth and parity [38, 45] where prolificacy increases with parity until the 6th and stabilizes thereafter. Mating time (season), environment, age and breed are also important. It is particularly dependent on ovulation rate, embryo mortality rate, breed (the genotype that is probably inbred because of the origin of the parent who is often from the herd), the age and weight of the goat to mating.

Farrowing number, season and flushing can also influence this rate. A balanced diet at both the energetic and the protein level is necessary for the good start of the heat and consequently the improvement of the prolificacy and the decrease of the embryonic mortalities.

### 2.1.10. Fertility

The average rate of gravid or pregnant goats to the total number of goats put to reproduction (true fertility) is of the order of 92.20%. It is close to the rate of the Angora breed (95%) [42] and the one recorded by [41] which is 90% for Arbia and less than 100% for Mekatia and also 100% for Saanen [42]

Fertility is one of the reproductive parameters upon which the herd productivity depends. It is a good indicator of the success of the mating and also reflects the ability of the female to give or not a product. A low rate reflects the poor breeding conditions such as the reproduction management of the livestock

precisely (the poor monitoring of the latter does not allow a good detection of heat [46, 47] and other factors directly or indirectly influencing the feeding management (quality and quantity) and lack of hygiene leading to diseases and reproductive problems of the goat or the misadaptation of animals to the surrounding environment. It is conditioned by other factors such as female weight and genetic factors.

### 2.1.11. Abortion

The ratio of aborted females to pregnant females shows the abortion rate. In this study it is estimated at 11.29%. [37] found a close abortion rate ( $13.8 \pm 3.3$ ) for the Bedouin goat. [48] consider that a level of 2-5% is a normal rate in small ruminants.

Poor development of the fetus leads to increased embryonic mortality. Abortion is closely linked to livestock management [49]; Nutritional causes are most important in goats (energy deficient diet in late gestation periods) especially in young goats or it is high in primiparous and according to the number of litters (high rate in females with triple fetuses that those with single or double fetuses) [50]. Poor hygiene practices that favor the development of certain abortion-causing diseases such as salmonellosis and chlamydia [30].

The best prevention of abortions is to eliminate stress for pregnant goats caused by its transporting, to provide an adequate nutrition quantitatively and qualitatively balanced and vaccination against certain diseases [51].

### 2.1.12. Sex ratio

The sex ratio for all the visited farms is 11 goats per male goat, which is not far from (1:15) that of the study of [37].

In general, the sex ratio depends on the rearing system, for example in an extensive or traditional breeding. The recommendations are 25 breeding females per one reproductive male [52].

Also it varies according to the breed, the age and the reproduction method. For age and method of reproduction; it is recommended to provide 1 adult male goat for 25 - 30 female goats on free reproduction, and 5 to 6 times per day while the hand mating. When using young males of the year, this ratio must be halved because the young male goat does not have sperm reserves.

### 2.1.13. Reproductive animal average age

The average age of female's goats is about 3.5 years (41 months), while for male's goats it is around 2.5 years (27 months). It is less than 5 years the goats' average age in the region of Tiaret found by [53]. Goat age affects fertility, abortion and prolificacy rates, as well as the percentage of goat mortality. The young age of the females can

be the explanation of the low of the fertility and the prolificacy rates.

### Conclusion and recommendations

The goat production system with mixed production remains the most dominant in the studied regions. The diet is based on pastoral areas that provide almost all the animals needs. The reproduction is totally random and does not obey any control or program. Health practices are not periodic but rather occasional. This will certainly help to understand better the reproductive behavior of animals considered under a traditional breeding system. Besides improvements in the general management of the animals (feeding, control of the conditions and periods of the setting in reproduction and the health side ...), or even the adoption of the breeding in intensive system, it is also recommended to choose rigorously the females of renewal. Also the development of a selection scheme for this goat. This certainly contributes to the improvement of zootechnical performances, especially reproduction.

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