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Journal of Animal & Plant Sciences (J.Anim.Plant Sci. ISSN 2071-7024)
Vol.55 (3) : 10186-10192 https://doi.org/10.35759/JAnmPlSci.v55-3.2

Typology of indigenous chicken breeding system in Tunisia

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Keywords: Feeding, Surveys, system**,** traditional poultry, Tunisia.

Submission 14/02/2023, Publication date 31/03/2023, http://m.elewa.org/Journals/about-japs

1 ABSTRACT

The traditional poultry system is remarkably widespread in rural areas, suburban and even urban areas of Tunisia. This article in fact deals with the current situation of traditional poultry production, mainly performance, breeding housing, hygiene and prophylaxis and reproductive parameters. Surveys of 125 families were conducted in three regions of Tunisia. According to these surveys, the breeders interviewed are small farmers (68.5% women and 31.5% men) who were supposed to be the main managers of the holdings. 47.9% of them were younger and 52.1% were over 50 years old. Regarding education levels, 87.7% of owners are illiterate, the majority of them are women and are over the age of 60, while 8.2% received primary education. Generally, the aforementioned farmers have not received any agricultural or technical training; everything is either learned through experience or inherited from their parents and ancestors. The multiple factor analysis and hierarchical classification reveals the presence of two operating systems. A traditional breeding system for self-consumption, and a Traditional marginal farming. The first type involves 22.5% of the breeders and includes farmers raising poultry namely to meet the needs of the farm or household, rather than for commercial sale. The second type is Traditional marginal farming represented by 77.5% of the farmers; it refers to a method of raising hens primarily for commercial sale, using traditional methods/techniques and locally available resources.

2 INTRODUCTION

Village or family poultry farming, in most developing countries, is found in rural areas but also in suburban and urban areas. On the other hand, industrial poultry farming is practiced in and around urban centers. Family poultry farming requires low levels of inputs, significantly contributes to food security, poverty reduction, and sustainable management of natural resources and represents a source of employment for disadvantaged groups (Khan, 2004). In Tunisia, traditional management of local chickens is held by farmers to meet their daily needs without concern for genetic improvement. Due to the low performances recorded, some farmers, mainly new promoters, are trying to practice certain crosses, which have often been abandoned due to the total lack of rigorous control and records. Very little quantitative data is available on traditional poultry management systems in Tunisia. As in several other countries, farmers generally practice an extensive system mainly marked by a total lack of balanced feed, adequate housing and appropriate veterinary care and treatments. In recent years, the development of certain production units has been based on a quasi-

semi-intensive system. These systems give chickens the advantage of behaving naturally without the influence of any artificial or external factors. Under these conditions, poultry are able to master their nutritional needs based on available resources. The watering is done by well water, chlorinated or not, or with drinking water (Fotsa, 2008). Currently little precise information is available on traditional poultry production is available. The extensive farming method and the importance of subsistence agriculture make this sector difficult to define and until the 1990s, no drastic action was taken to promote the traditional local poultry sector (Bergaoui, 1990). According to GIPAC (2010), this sector produces 5,400 tons of poultry meat and 216 million eggs per year, which represents approximately 16 and 20% of poultry meat and eggs respectively. Unfortunately, no policy has been put in place for the management of local poultry genetic resources and this sector is particularly affected by genetic erosion, in the Maghreb as in the rest of the world, due to the generalization of the use of hybrid birds (Bessadok *et al., 2003*). Currently, a real demand for special products from heritage chicken breeds is increasingly registered among consumers. Therefore, serious interest is given to the valorization of local poultry breeds for both egg and meat production. In this article, we discuss the current situation of breeding system in Tunisia.

3 MATERIEL AND METHODS

3.1 Choice of chicken breeders and data collection: A study was conducted to determine the typology of the Tunisian chicken breeding system. A questionnaire based on the model developed by Aroua el al. (2021) in collaboration with the Higher School of Agriculture of Mateur (ESAM) was used. The survey took place over a one-year period, 2021 and surveyed 250 farmers with 2220 chickens across 3 regions, El Kef, Jendouba, and Siliana. These regions make up nearly 50% of the total chicken population in the country (GIPAC, 2010). Data collection was done using the "snowball" method, and breeders were asked for personal information such as age and education as well as information about their poultry breeding, and feeding practices.

3.2 Statistical analysis: The data collected during the study of poultry breeding systems in Tunisia was analyzed using Microsoft Excel 2007 software. A descriptive statistical analysis was conducted to examine the information on the farmers, feeding, hygiene, reproduction, The data was then further analyzed using multiple factor analysis (MFA) and hierarchical clustering (HCA) to identify the various types of poultry breeding systems.

4 RESULTS AND DISCUSSION

4.1 Socio-economic context: Results from the descriptive analysis. The results of this study suggest that small-scale farming is primarily managed by women, 68.5% of the interviewed farmers being women. Additionally, the majority of these farmers were over the age of 50, with a small percentage being younger (47.9%). The study also found that the majority of the farmers were illiterate (87.7%), with only a small percentage having received primary education (8.2%). This lack of formal education is likely because these farmers have not received any agricultural or technical supervision, and have instead learned through experience or inherited knowledge from their parents and ancestors. The results of this study are similar to those found in a previous study by Mahammi et al. (2014), which found that the majority of farmers were also women, and had similar levels of education and experience. The study by Mahammi et al. (2014) found that 72.9% of breeders were women, and that the age of the breeders varied between 14 and 76 years old, with an average of 45 years old. With regard to the level of education, seven breeders (14.6%) were illiterate, 28 (58.3%) had received a primary education, 10 (20.8%) had a secondary education, and three (6.3%) had a university level. The study also found that among the female farmers, two were working in the field of

education, while the others were homemakers. Regarding the male farmers, four were retired, seven had agricultural activities, and two (14 and 15 years old) were still in secondary school.

4.2 System production

4.2.1 Housing: Habitat is an essential factor for chickens to ensure their safety and well-being. It provides them with a secure environment to lay eggs and brood hens, as well as protection from theft, adverse weather, predators, and lower night temperatures. In many developing countries, farmers practice an extensive system, which means that chickens are usually accompanied with other animals such as sheep, goats, and cattle or other farmyard animals. During the day, chickens are left to forage for food and water, and at night, they are confined to nocturnal shelter (Figure 1). The type of habitat provided for chickens is important for their health and productivity. It should be spacious enough to allow the birds to move around freely and have access to food and water. The shelter should also be well-ventilated and provide protection from the elements, such as wind, rain, and extreme temperatures. Additionally, the habitat should be designed to minimize the risk of predators, such as foxes, hawks, and cats. The habitat should also be designed to provide a comfortable environment for the birds. This includes providing adequate bedding material, such as straw or wood shavings, to keep the birds warm and dry. The bedding should be changed regularly to prevent the buildup of bacteria and parasites. Additionally, the habitat should be kept clean and free of debris to prevent the spread of disease. Finally, the habitat should be designed to provide the birds with access to food and water. This includes providing feeders and waterers that are easy to access and refill. Additionally, the habitat should be designed to provide the birds with access to natural sources of food, such as insects, worms, and seeds (Fosta 2008).

Figure 1: Shelters for local hens in Tunisia

4.2.2 Feeding: In rural areas, the main source of poultry feed is based on locally available resources such as worms, mollusks, insects, stones, grasses, and various types of waste mixed with the earth. While farmers may provide additional supplements such as grain waste, wet or dried livestock waste, and household waste, there are no mineral or vitamin supplements being added to the feed. This lack of proper nutrition can lead to high mortality rates among roosters and adults, and can contribute to low productivity in terms of meat and egg production. These findings are similar to the results of other studies conducted in other countries, such as the work done in Zimbabwe by Mapiye and Sibanda (2005) and Halima

(2007), which found that hens could supplement their diet by finding glasses and shells in soil and waste. These chickens are left to forage during the day and are confined to moderately expensive sheds at night. They receive supplementation with fodder grains, and hay, but lack a properly balanced diet as well as mineral and vitamin supplements, which can affect their productivity. It is important to note that these results indicate a significant problem in the rural poultry industry, as the lack of proper nutrition can lead to significant health and productivity issues. To improve the situation, it may be necessary to invest in education and training for farmers on proper poultry nutrition, as well as providing access to mineral and vitamin supplements. Furthermore, there may be an opportunity to improve the poultry feed supply chain by providing small-scale farmers with better access to high-quality feed ingredients, such as properly formulated feed pellets, which can help to ensure that their flocks receive the proper nutrition they need to thrive. Additionally, implementing a better management technique such as free-range chickens could help to improve the productivity of the poultry industry and reduce the mortality rates.

4.2.3 Hygiene and prophylaxis: Generally, animals of different ages are housed in close proximity. This aggravates the lack of veterinary care and the weak protection against the pathologies encountered in this breeding system by inducing polymicrobial contamination in poor quantitative and qualitative feeding conditions. Therefore, various ailments of poultry aviaries are commonly observed and cause several infectious and parasitic diseases, which often exhibit seasonal onsets. Under such conditions, chick mortality could reach 30-50%. The problems most frequently cited by the breeders surveyed are massive mortalities without any preliminary signs and which often appear in the hot season. Also, a dozen of breeders reported experiencing an epidemic that ravaged almost all of their herds (Newcastle disease) during the period of our investigation. These results agree with Guère (2009) who suggested that the most common causes of death in rural areas are Newcastle, fowl pox, pasteurellosis and infectious coryza. Newcastle disease is the most deadly and can ravage more than 70% of livestock. It causes the economic losses mainly in small rural farms (Fotsa *et al., 2007*). With only vaccination against this pathology, it is possible to reduce mortality by 40 to 60% (Kingori *et al., 2010*). The importance of vaccination is to be treated. Indeed, Raach *et al., (*2011) showed that the mortality rates of 0% and 3.75% respectively in chicks at the age of two weeks and adults at the age of eight weeks from poultry local areas when the national vaccination program was applied. In our survey, breeders often resort to traditional pharmacopoeia by using treatments based on certain tree barks, fruits and leaves in the form of decoctions and infusions in drinking water. Only 30% of breeders surveyed reported the occasional use of drugs and veterinary care.

4.2.4 Reproductive parameters: The results of the statistical analyses show that the majority of breeders, 56%, do not buy poultry from outside sources to improve their flocks. Instead, they rely exclusively on their own poultry for replacement. The remaining 44% of breeders do purchase chickens from outside sources, such as neighbors, but they only use local breeds of chicken. Furthermore, farmers prefer buying adult birds rather than young ones. When it comes to selecting birds for purchase, the most important criteria for breeders in all villages is body size/weight. This is followed by a number of eggs laid and disease/heat resistance. This is likely because body size/weight is a good indicator of the bird's overall health and productivity, while the number of eggs laid and disease/heat resistance are important factors in determining the bird's ability to produce eggs and survive in the local environment. Overall, the results of the statistical analyses show that breeders are selective when it comes to purchasing poultry, and they prioritize local breeds and adult birds. This is likely because local breeds are better adapted to the local environment, and adult birds are more likely to be productive and healthy.

4.2.5 Native chicken performance: Native chickens are an important part of the rural sector in Tunisia, but they are not providing the expected production due to environmental and genetic constraints. These chickens are heterogeneous, meaning that there are no standardized characteristics or performance, making it difficult to predict their behavior. Growth is slow and egg production is erratic, with hens laying anywhere from 3 to 7 eggs per week. Sexual maturity is reached at 5 months for the female and 6 months for the male, and the age of the first egg can vary between 5 and 6 months. Mating is haphazard, leading to unwanted inbreeding, and incubation is done naturally by all hen farmers, with less than 1% occasionally practicing artificial incubation. This lack of standardization and control makes it difficult to improve the performance of native chickens, and improved exotic breeds often outperform them. In order to improve the performance of native chickens, it is important to focus on environmental and genetic constraints. This could include improving the quality of feed and housing, as well as introducing better breeding practices. It is also important to focus on improving the health of the chickens, as this can have a significant impact on their performance. Finally, it is important to ensure that the chickens are well managed, as this can help to improve their productivity.

5 Typology of breeding system: The results of this study suggest that a multidimensional analysis was necessary to identify the different types of asinine breeding systems. The projection of variables on the first two axes of the Multi-Dimensional Scaling (MFA) represents nearly 52% of the total variability. The first axis is strongly linked to the total number of breaded chickens. The second axis is related to the chicken sale place. The spatial distribution of farmers (Figure 2) shows the presence of two groups, but the differences between these groups have not yet been identified. To determine these differences, a hierarchical ascending classification (HAC) was applied, which resulted in the identification of two different types of breeding (figure 3).

5.1 Type 1: "A traditional breeding system for self-consumption ": It involves 22.5% of the breeders and includes farmers raising poultry for the primary purpose of providing for the needs of the farm or household, rather than for commercial sale. This type of breeding system is characterized by the use of traditional practices and locally available resources, rather than modern, intensive methods. It may involve the use of local breeds, minimal use of commercial feed and veterinary care, and a focus on sustainability rather than maximum productivity. This type of breeding system is typically found in rural or subsistence farming communities, where the availability of resources and market opportunities are limited.

5.2 Type 2 "Traditional marginal farming": It is represented by 77.5% of the farmers; it refers to a method of raising hens primarily for commercial sale, using traditional practices and locally available resources. This type of breeding system is typically found in rural or subsistence farming communities, where farmers may not have access to modern technology or commercial feed and rely on traditional knowledge, skills and practices that are passed down through generations. In these systems, hens are often raised in a natural environment, allowed to forage and graze, and may be kept in small flocks. Unlike modern commercial egg production systems, traditional breeding systems for sale purpose do not rely heavily on intensive methods and the use of specialized equipment. The farmers may not use commercial feed, vaccines, or other inputs that are commonly used in large-scale commercial egg production. The breeds used in this system are often local breeds that are well adapted to the local environment, are hardy, and have good resistance to diseases. The main advantage of traditional breeding systems for sale purpose is that they are well adapted to the local environment, and are often more sustainable than commercial systems. They also provide farmers with a reliable source of income, and can help to ensure food security for the household. However, traditional breeding systems for sale

purpose can also have some disadvantages. For example, yields are often lower than commercial systems, and the animals are often less productive. Additionally, the lack of veterinary care and modern technology can lead to higher mortality rates and reduced productivity.

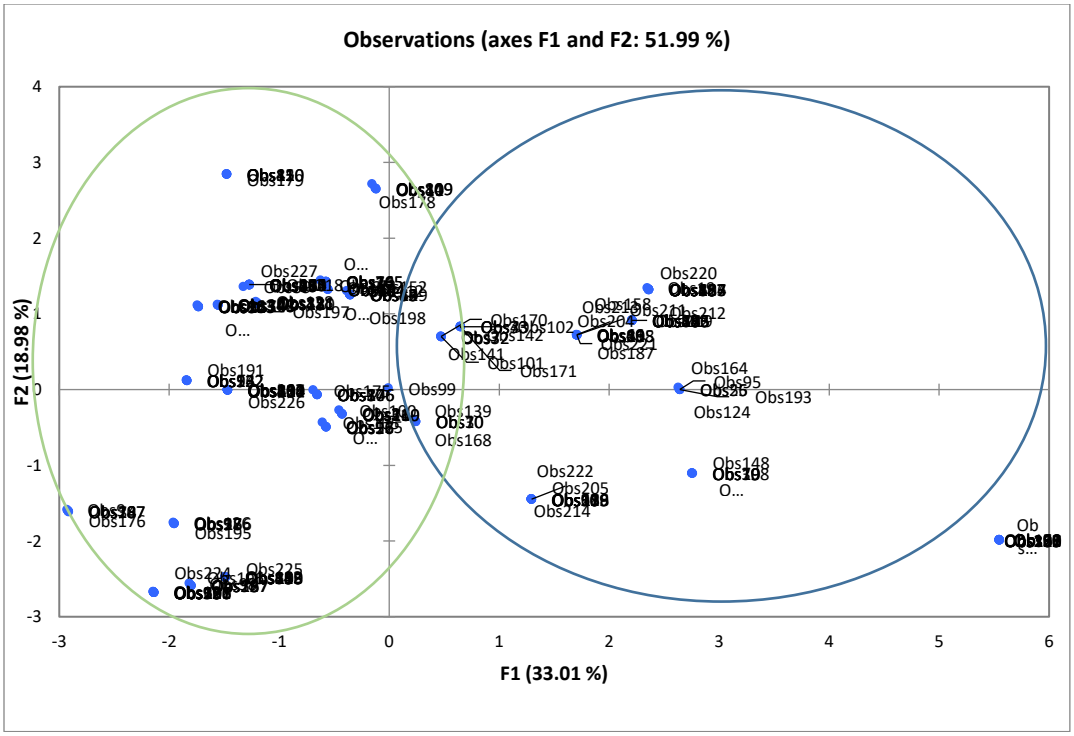

Figure 2. Spatial representation of breeders by MFA

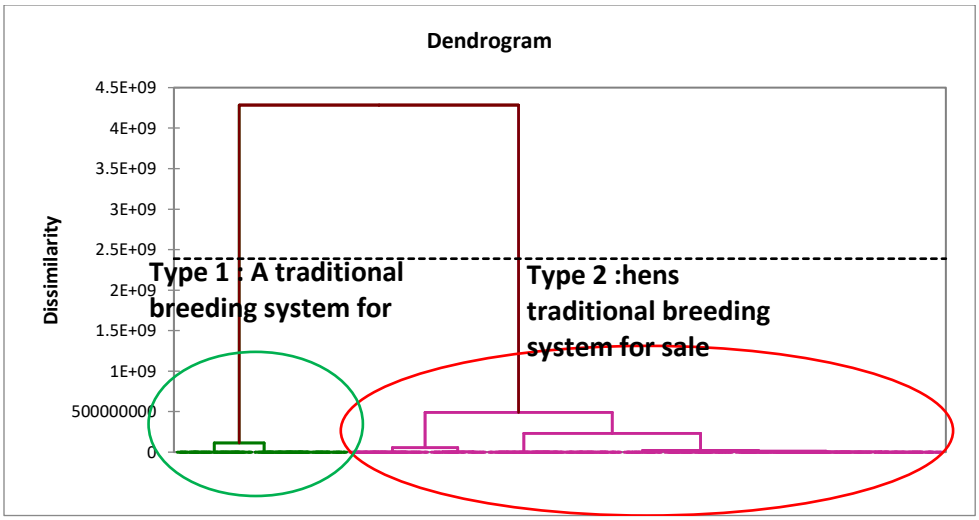

Figure 3: Hierarchical classification tree farmers

CONCLUSION

This study has highlighted the limited scope of the poultry industry in Tunisia, with traditional breeding systems predominating over modern and commercial systems. The traditional breeding systems are characterized by their reliance on locally available resources and traditional knowledge and practices, rather than modern technology and commercial inputs.

These systems tend to be small-scale, with low productivity and yields, and are mainly used for self-consumption rather than commercial sale. The limited scope of the poultry industry in Tunisia can be attributed to several factors. One of the main factors is the lack of resources, infrastructure and knowledge. Many farmers may not have access to modern technology and commercial feed, which can limit the productivity and yields of their flocks. Additionally, the lack of market opportunities, such as lack of access to local or international markets, can also limit the potential for growth in the poultry industry.

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