

Minireview Article

Overview of zotechnical technologies in traditional poultry farming in West Africa and Togo

ABSTRACT

Aims: To take stock of zotechnical technologies implemented to improve the productivity of traditional poultry farming in West Africa and Togo, in order to capitalize on proven innovative practices.

Methodology: Inventory of zotechnical technologies through a literature review. The synthesis consisted in analyzing knowledge published in scientific journals and the activity reports of agricultural extension structures.

Results: Traditional poultry farming in West Africa and Togo is of multidimensional importance at the same time nutritional, socio-economic, socio-cultural and religious. It is characterized by the use of local poultry breeds for egg and meat production. Birds often live freely around dwellings, feeding on food scraps, insects and agro-industrial by-products, and drinking from water collected in discarded utensils. The main zotechnical technologies available and applicable to improve productivity are: semi-divagation rearing; construction of traditional improved poultry houses (PTA) equipped with feeders and drinkers, regular distribution of feed and water, feed supplementation, use of adapted improved poultry breeds, respect of sex ratio and use of chick houses.

Conclusion: The dissemination of these technologies and their adoption by traditional poultry farmers is a major challenge to be met in order to improve productivity and thus fight poverty and satisfy the animal protein needs of populations.

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Keywords: Traditional poultry farming, Constraints, Productivity, Zotechnical technologies.

1. INTRODUCTION

In Togo, as in many African countries, traditional poultry farming based on empiricism is often considered as a gathering activity, as opposed to modern poultry farming based on the application of scientific technologies [1]. Traditional poultry farming can therefore be practised by everyone, as it does not require any prerequisites or major investments [2]. It is the most suitable form of livestock farming for small rural farms, as it presents less constraints in terms of feed, water and other inputs [3].

Traditional poultry farming is of multidimensional importance in nutritional, socio-economic, socio-cultural and religious terms. In nutritional terms, it remains an alternative for reducing protein-calorie deficits, especially in rural areas [4]. In socio-economic terms, it represents one of the few opportunities for savings, investment and protection against risk for low-income rural populations [5, 6].

This type of farming is mainly practised in rural areas, where each farming family has a relatively small number of poultry [7]. The animal material most commonly used is the local hen, reared in the wild around concessions using rudimentary techniques [8]. In Togo, traditional poultry farming accounts for 80% of the national poultry population, estimated at 26 million heads [4]. It is characterized by the roaming of poultry, the mixing of species

(guinea fowl, ducks, hens, etc.) and the small size of farms (less than 50 birds in most cases). In addition, productivity is low due to major constraints such as poultry housing, poultry house equipment, feed and reproduction management. To overcome these constraints and meet the productivity challenge, technologies are deployed. The term "technology" refers to all the endogenous or exogenous tools, techniques, methods, processes and knowledge whose combination makes it possible to produce or transform [9]. Zootechnical technologies such as poultry management methods, installed infrastructure and layout, breeding management and feeding practices adopted by traditional poultry farmers would be an effective solution for improving the productivity of traditional poultry. This synthesis takes stock of these zootechnical technologies deployed to improve productivity in traditional poultry farming in West Africa and Togo, offering a critical analysis and prospects for their deployment.

2. ZOOTECHNICAL TECHNOLOGIES IN TRADITIONAL POULTRY FARMING

2.1 Farming methods

The poultry rearing method refers to the overall management system of the poultry farm. Poultry rearing systems in Togo fall into three categories: free-range, confinement and semi-liberty or semi-claustration [10].

Free-range, which is widespread, is characterized by the complete freedom of poultry to roam freely in search of food. There may or may not be a habitat. Birds, mostly in small number, are released in the morning and locked up in the evening when there is a habitat [11]. Rarely do they receive a few grains in the morning. This type of farming requires large areas and offers few means of controlling production parameters [12]. This type of rearing does not require major investment, but rearing parameters are poorly controlled and productivity remains low. It is well suited to the conditions and resources of rural breeders. However, it encourages the spread of disease and exposes poultry to predators, bad weather and nutritional deficiencies in both quantity and quality, especially when their immediate environment lacks agricultural or domestic food waste [13].

On the other hand, confinement is a type of poultry management in which the birds are enclosed in a henhouse. This system is the most widespread in modern and semi-modern poultry farming. In the traditional farming system, it is characterized by the presence of a henhouse surrounded by a fence that limits poultry movements [14]. This type of poultry management allows for better control of rearing parameters and higher productivity, but requires investment and a minimum level of knowledge of rearing techniques. Hygiene management and prophylaxis programs are improved to limit the spread of disease. This is the mode practised by the commercial livestock farms (EC) promoted by the Togolese government through the agricultural sector support project (PASA) in its sub-component 2, "relaunching the livestock sub-sector" in 2020 [10].

Semi-claustration, which combines both claustration and roaming, lies between these two types of livestock farming. The animals are in semi-liberty. The poultry are housed in a well-constructed henhouse. This henhouse can be fenced off. Every morning, the chickens are released and fed from feed troughs and water troughs placed in front of the coop. The birds are then set free to roam in search of insects and other food supplements in the wild. In the rainy season, these birds don't usually wander far and often return to the coop in case of danger or to drink [15]. In this system, the poultry are more secure, with control of rearing parameters and improved productivity, but a minimum investment and some knowledge of rearing techniques are required. However, these birds may be prone to theft or disease contamination, as hygiene and prophylaxis are limited [13].

Semi-claustration is a compromise between the other two methods that can be popularized in the context of traditional poultry farming in Togo, taking into account the breeds of poultry raised, the means available and the level of knowledge of farming techniques among

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farmers. The local poultry breeds raised in Togo need a little space for exercise. They are hardy and adapt well to the natural environment. What's more, the level of knowledge of breeding techniques among rural breeders does not allow them to manage a fully enclosed operation. Finally, their means are very limited, so total confinement would be difficult to replicate in these environments. For this reason, semi-claustration combined with the improved traditional poultry house (PTA) is the most popular method of developing traditional poultry farming in Togo [10].

2.2 Livestock housing and equipment

Studies have shown that in the Gambia, only 10% of farmers own poultry houses [16]. In Burkina Faso, 11% of rural poultry farmers had access to improved facilities [17, 18]. Similar results were observed in Togo, where 9% of farmers in the north had no specific shelter for their poultry, who took refuge in the evenings on trees, roofs, attics or disused buildings [19]. Increasingly, poultry farmers are providing their chickens with housing. They often use makeshift habitats [15,20]. These are essentially the lower parts of granaries, arrangements of branches in habitat, the superimposition of a few bricks, old tires, canaries, barrels and some old utensils converted into hen houses, as reported by Lobi [21]. They are also small huts made of wood or earth (Fig.1). These habitats, very common in rural areas, protect poultry from bad weather, but remain fragile and sometimes expose them to animal and human predators as well as discomfort, with sometimes mixtures of ages and species. These habitats do not facilitate cleaning and disinfection operations.

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Fig.1. Some types of traditional poultry house in Togo

Alongside these traditional poultry houses, the improved traditional poultry house (PTA) is developing. This type of housing uses mostly local materials [19]. It can be built of rammed earth, cement or wood (boards, racks, etc.) with a straw or sheet metal roof, depending on the farmer's means. The floor is made of cement, for easy cleaning and disinfection, and the wall is completely plastered. The PTA (Fig.2), popularized in Togo since the 1990s, comprises at least two rearing compartments: one for hens and their chicks (Chick house) and the other for adults (pullets, cockerels, roosters and hens), with a common fenced yard [22,23]. This second compartment is equipped with nesting boxes for laying and brooding. This type of poultry house makes it possible to: (i) protect poultry from rain, sun and certain predators (snakes, rodents, birds of prey); (ii) keep a close eye on poultry; and (iii) feed and water them properly. The PTA is built next to the concessions, well ventilated and well equipped. Unlike the traditional henhouse, which requires almost no expenditure, the PTA, however modest, requires financial resources.

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Fig.2. PTA models [10].

The type of housing illustrated in Figure 2 is the one popularized in Togo by those involved in the development of traditional poultry farming [10]. It is continually evolving to adapt to the environment and the farmer's means, while maintaining the following guiding principles: (i) protection and safety of the animals; (ii) sufficient space for the farmer to enter easily; (iii) aeration; and (iv) separation of ages and species.

As far as equipment is concerned, whatever the type of farming practised, suitable equipment are used. In the free-range system, the farmer rarely provides special equipment to manage the rearing. Poultry are fed on the ground or in old, abandoned containers. They find water in abandoned cans, old utensils or pieces of broken pots. In the semi-free-range or confinement system, with traditional or improved traditional poultry houses, various types of rearing equipment are used, with varying degrees of technical sophistication. The main types of equipment are: (i) feeders to serve feed; (ii) drinkers to serve water; (iii) nesting boxes to serve as egg-laying areas; (iv) perches to allow birds to perch on them (thus increasing the usable space and enabling more birds to be kept in the same area) [24, 25].

Feeders and drinkers are by far the most common equipment used by breeders. There are several types of feeders, the most common of which are: (i) circular metal feeders; (ii) modern linear wooden feeders; (iii) linear tree trunk feeders (solid wood or bamboo); (iv) gourd feeders (suspended or placed on the ground); and (v) devices for serving greenery to poultry. Feeding troughs are also made of local materials (wood or salvaged materials), protected by a top bar to prevent animals from stepping inside [14]. We recommend around 50 cm per adult bird around a feeder. To avoid wastage, the space accessible to the feed is limited to the size of the chicken's head.

As with feeders, semi-modern plastic and clay troughs are also being introduced. Soviadan et al [25] reported that 69% of farmers benefiting from the PASA project in Togo used semi-modern feeders and drinkers. They also showed that the non-use of semi-modern equipment by farmers benefiting from the project had a negative impact on productivity.

Increasingly, in the PTAs, farmers are using laying boxes, which are nests prepared to enable hens to lay and incubate eggs. There are several types of nesting box, mainly made of canary, wood or basket. There should be one nest for every three hens. The shape and layout of nesting boxes vary, but they should be around 30 cm square and 40 cm deep, in order to facilitate the isolation of the broody hen. AVSF recommends a nest opening of around 25 cm. In all cases, nests are lined with straw bedding [26]. PTAs are also equipped with perches that reproduce the natural life of free-ranging poultry. For the farmer, these perches make it possible to increase the density in a poultry house. It is recommended to provide a perch of about one meter for every 10 birds. The perch should be 50 cm from the ground [14].

2.3 Reproduction and stock management

Comment [AW5]: Age groups

Poultry reproduction management techniques popularized in traditional breeding units are based on a number of good practices such as: (1) choice of breeders, (2) observance of the sex ratio, (3) selection of eggs for hatching, (4) specialization of hens for brooding or chick management, (5) synchronization of laying and hatching, (6) use of incubators, (7) chick management without mother hens, and (8) renewal of male and female broodstock [27]. The profitability of the unit depends to a large extent on the management of reproduction and numbers. Among the good practices listed above, the most widely used are: sex ratio, renewal of male and female broodstock, use of **improved** broodstock, chick separation and use of the chick nursery.

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2.3.1 Sex ratio

This is the optimum number of females to one male in a breeding operation for adequate reproduction. This number varies from one species to another. The variation of the sex ratio within a species depends on the breeder's objective. The sex ratio is 1 cock for every 10 hens in the case of chick production via egg brooding by the mother hens. This sex ratio is more like 1 cock for 8 hens when chicks are produced using an artificial incubator (electric, solar, gas or oil-fired), as the cock is more required to produce fertile eggs at all times. Respecting the sex ratio ensures good egg fertilization and, in turn, good hatching of vigorous chicks, as Nickolova [28] has shown with Muscovy ducks. It also avoids fights between adult roosters (when the number of roosters is very high) and the laying of unfertilized eggs by hens (when the number of roosters is too low).

2.3.2 Renewal of male and female broodstock

Once male and female broodstock have been selected and used for breeding, they become exhausted over time and are renewed after a period of two years, usually from other well-monitored poultry farms [14,29]. This operation also helps to avoid inbreeding, as males risk crossing with females from their own offspring, and conversely, breeding females risk crossing with cocks from their own offspring. Compliance with this provision helps maintain the genetic vigor and efficiency of the breeding nucleus, and the viability of the products.

2.3.3 Use of breeder stock

Local breeds are known to be small and slow-growing [11]. Consequently, some poultry breeding support projects have conducted programs to introduce exotic breeds to improve the format of the local hen [11,20]. For example, in the Kolda region of Senegal, farmers are trying to improve the performance of their poultry by pairing specific roosters with carefully selected hens, based mainly on certain criteria such as robustness, muscle development and size. This process involves introducing females from different farms to a male of an improved breed. In some cases, to reward the owner of the rooster, the crossbreeder offers him cereals, while no compensation is given when exchanges are made between relatives or friends [20]. Similar practices have been observed in Burkina Faso, where the aim is to improve the size of local hens by integrating exotic breeds [11].

2.3.4 Chick separation and use of the chick house

High chick mortality has always been identified as one of the major constraints of traditional poultry farming. To remedy this problem, chicks are separated from their mothers and kept in a brooder [20,30,31]. This involves isolating the chicks in a particular compartment, generally without the mother hen, and keeping them there for around two months. The PTA, which comprises two compartments, one of which is dedicated to the chicks, is indispensable for implementing this practice. This technology is suitable for increasing chick survival rates and accelerating the rate of egg production by local hens. [32] have shown that chick separation

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can increase the survival rate of six-month-old chicks from 23.9% to 65.1% (PTA), an improvement of 41.24%; the number of breeding cycles from 3.4 to 5.6 per year; and annual egg production from 35.3 to 57.6.

2.4 Feeding and watering poultry

Proper feeding is necessary to fully exploit the genetic potential for growth or egg production, and is important for the health and well-being of the animals.

In Togo's villages, chickens are rarely fed [8]. They are often left to roam and receive little feed supplementation. In this case, the supplementation is based on millet bran or kitchen waste [15, 19, 25]. Watering is rare and is done in old utensils. Water quality is not a concern for farmers. Two (02) main poultry feeding systems can be distinguished: foraging in the wild and occasional distribution of supplementary feed.

2.4.1 Feeding in the wild

Feeding in the wild is an inexpensive and almost effortless process for the breeder, who leaves the birds to their own devices. Indeed, living in complete freedom, birds roam around all day in search of food. According to [11], most traditional poultry farmers in Burkina Faso rely essentially on foraging. Poultry feed on meal scraps, insects, earthworms and agricultural residues found in fields, grain threshing areas and granaries. As Talaki [8] points out, it is rare for farmers to agree to feed their birds, with the exception of chicks, hens in the brooding period and adults ready for sale.

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2.4.2. Occasional feed distribution

This poultry-rearing technique is the most widespread in Togo and is characterized by supplementary feeding. Poultry receive a handful of millet, sorghum or bran thrown in the morning and rarely in the evening [10]. Guinea fowl and ducks, depending on their age, are given the same diet as chickens. Often all avian species of different ages are mixed and fed in the same way. In some cases, two types of rations are fed, one for chicks and the other for adults. In this case, the chicks are fed cereal bran, cereals (millet, sorghum, corn), termites, maggots, etc. [11, 20]. The quantities distributed vary according to the farmer's means, the season and the size of the flock. Farmers can use agro-industrial by-products (wheat bran, beer dregs, tuber husks, etc.) to feed their poultry. This food supplementation is available daily and served in feed troughs to the birds, which are usually semi-free-range [15, 33, 34]. A study by AVSF [14] shows that traditional poultry farmers in Mali, Senegal and Togo who have set up improved traditional poultry houses (PTAs) favor the use of products such as corn, millet, termites, fish heads, legume leaves (such as pigeon pea and Leuceana), spent grains from local beverages, eggshells and oyster shells, as well as various meal scraps and peelings (tomatoes, papaya, yams, beans, etc.) to improve poultry productivity. Similarly, the "Volailles de Boussé" project in Burkina Faso highlighted innovative initiatives by farmers to increase the productivity of their local hens. These innovations include the collection of termites to feed chicks, the recovery of oyster shells to improve calcium intake, the use of fish meal and spent grain, the germination of cereals to increase their protein content, and the establishment of a collective field dedicated to growing cereals [14].

2.4.3. Watering

Poultry need more water than feed. Two to four times as much water is needed as dry feed, depending on the season and climate. In the dry season, the need for water is greater, even though water is scarce. Conversely, in the rainy season, the need for water is limited, as

water is more readily available. We must therefore ensure that there is never a shortage of water around the poultry houses in the dry season. Water must be available to the birds at all times, and distributed in clean troughs that are washed daily [34]. It is recommended that water be changed daily, or even twice a day [14].

3. CONCLUSION

This literature review has provided an overview of zootechnical technologies used in traditional poultry farming in West Africa and Togo. Traditional poultry farming in Togo is characterized by ancestral practices and little use of zootechnical technologies. The integration of these innovative technologies appears to be a promising solution for improving the productivity and sustainability of farming systems. Practices such as improving housing and equipment, using cereals and residues to feed poultry, and managing reproduction and stock can boost poultry productivity. They are within the reach of low-income households and they allow to valorise available local resources. Thus, by combining tradition and innovation, poultry farming can become an essential lever for improving the living conditions of rural populations while preserving local poultry biodiversity.

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