Non-industrial poultry farming in Morocco: A survey study in the Rabat-Salé-Kénitra region

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Abstract

Traditional poultry farming is an important alternative for the increase in the animal protein contribution in the rural environment. Surveys were carried out in 98 poultry farms in four provinces of the Rabat-Salé-Kénitra region to characterize the traditional poultry farming in this region. These surveys focused on the characteristics of the farms (socio-economic status of the farmer, the farming method, and the composition of the poultry, the avian species, the infrastructure, the business, the feed, the diseases, the mortality rate and the treatments used). The analysis of the collected data showed that women are primarily responsible for poultry farming (80%); 94.9% of the surveyed breeders have no technical training in poultry farming; the experience in the surveyed farms varies between 10 and 50 years (p <0.0001); high numbers of poultry are included in the majority (49%) between 20 and 100 individuals; poultry feed in the study areas was based primarily on natural resources (28%), followed by bran (23%) and wheat (22%); the most common diseases in the "Beldi chicken" are coccidiosis (22%) and avian influenza (21%), followed by *E. coli* (16%) and smallpox (11%). The majority of breeders practice traditional treatments (63%), whereas only 37% of breeders used veterinary treatments (p <0.001). Thus, poor production performance is recorded in these farms: a median mortality rate of 10% is related to the characteristics of the farms and farmers (Technical training, level of hygiene practiced in farms, etc.). Diseases, lack of supervision and financial means are the main constraints of the sector.

Keywords: Traditional poultry farming, poultry diseases, traditional treatments, surveys, food, Rabat-Salé-Kénitra

L'aviculture non industrielle au Maroc: Une étude par enquête dans la région de Rabat-Salé-Kénitra

Résumé

L'aviculture traditionnelle constitue une alternative importante à l'augmentation de la contribution en protéines animales en milieu rural. Des enquêtes ont été menées dans 98 exploitations avicoles réparties sur 4 provinces de la région de Rabat-Salé-Kénitra afin de caractériser les élevages avicoles traditionnels de cette région. Ces enquêtes ont porté sur les caractéristiques des élevages (état socio-économique de l'éleveur, mode d'élevage, la composition de la basse-cour, les espèces aviaires, l'infrastructure, la commercialisation, l'alimentation, les maladies, le taux de mortalité et les traitements utilisés). L'analyse des données recueillies a montré que les femmes sont les principales responsables des élevages avicoles (80%); 94,9% des éleveurs enquêtés n'ont aucune formation technique en aviculture; l'expérience dans les élevages enquêtés varie entre 10 et 50 ans (p<0,0001); les effectifs de volailles élevés sont compris en majorité (49%) entre 20 et 100 individus; la nourriture de la volaille dans les régions étudiées était basée essentiellement sur les ressources naturelles (28%), suivi par le son (23%) et le blé (22%); les maladies les plus répondues chez le poulet Beldi sont la coccidiose (22%) et la peste aviaire (21%), suivis par *E. Coli* (16%) et la variole (11%). La majorité des éleveurs pratiquent des traitements traditionnels (63%), alors que seuls 37 % des éleveurs avaient recours aux traitements vétérinaires (p < 0,001). Ainsi, de faibles performances de production sont enregistrées dans ces élevages: une valeur médiane du taux de mortalité de 10 %, a une relation avec les caractéristiques des exploitations et des exploitants (Formation technique, niveau d'hygiène pratiqué dans les élevages etc..). Les maladies, le manque d'encadrement et de moyens financiers constituent les principales contraintes de la filière.

Mots clés: L'aviculture traditionnelle, maladies avicoles, traitements traditionnels, enquête, alimentation, Rabat-Salé-Kénitra

INTRODUCTION

In Morocco, poultry production is provided by two sectors of unequal importance, the industrial and the traditional. This production contributes to more than 50% of meat consumption, an average of 17,4 kg per capita per year, and 140 eggs per capita per year (FISA, 2016).

The traditional avian sector plays a very important socio-economic role (family self-consumption and treasury for the rural women). In fact, its production remains relatively stable, around 50000 tons of white meat and 800 million eggs. It is exposed definitely less to the extension risks of the avian flu starting from a hearth contaminated considering that it is not prone to the transport conditions between areas (BIT-IAA N°23-2012).

In addition, in recent years, this sector has experienced an unprecedented renewed interest following its integration into human development programs as income-generating activities, especially for rural women. This interest was reflected in the establishment of hatcheries in several regions of Morocco and the financing of farm chicken farming projects, more specifically in the framework of the National Initiative for Human Development (INDH); as well as the Government, the Agricultural Credit of Morocco and the Inter-professional Federation of the Avicolous Sector (FISA) were appropriate to sign a new Contract-Program which cancels and replaces the Contract-Program signed in April 2008, and in order to work together with the upgrade and the development of the avian sector as a whole by 2020, and this through the

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realization of concrete actions and targeted concerning the various links of the sector (FISA, 2011).

In this perspective, the need for better understanding the characteristics of these traditional farms is necessary to identify and evaluate the constraints that hinder the development of this production. The present study aims to make a current diagnosis likely to highlight the main characteristics of the traditional poultry farming in the Rabat-Salé-Kénitra region. The study has the following objectives:

• To describe the main characteristics of the traditional poultry farming through surveys of breeders;
• To identify the constraints hindering the development of this type of breeding in the region;
• To suggest ways of improvement.

MATERIALS AND METHODS

Study area

The study was carried out in the Rabat-Salé-Kénitra region of Morocco. This area is considered among the most important regions that host traditional livestock farms near urban areas. It also offers a large market for product business.

The Rabat-Salé-Kenitra region covers an area of 18,194 km^2 representing 2.56% of the national territory and has 4,581 million inhabitants (HPR 2014), with a density of 251.8 inhabitants per km^2. This region is located in the central west region of Morocco (Map 1). It is bounded to the North by the Tangiers-Tetouan-Al Hoceima region, to the East by the Fez-Meknes region, to the South by the Beni Mellal-Khénifra region and the Casablanca-Settat region, and to the West by the Atlantic Ocean.

The region has three prefectures: Rabat, Salé, and Skhirate-Témara and four provinces: Kénitra, Khémisset, Sidi Kacem, and Sidi Slimane. The number of municipalities is 114, including 23 urban and 91 rural, representing approximately 7.6% of all municipalities at the national level.

Survey

This study was carried out from June 2016 to March 2017 and consisted in the collection of a set of information from 98 farmers at their own homes through a questionnaire. The study was carried out in four provinces in the Rabat-Salé-Kénitra region, namely Skhirat-Temara, Sidi-Slimane, Khémisset, and Salé. The information concerned various aspects such as:

• *Information specific to the breeder farms*: The status of the breeder, the type and level of education and the length of time spent in poultry farming.

• *Information on breeding*: The composition of the farmyard, the avian species, the farming method, the infrastructure, the production, the business, the diet (feeding), the diseases, the morbidity and mortality rate and the treatments used.

Data analysis

The data were organized using Microsoft Office Excel 2007 software. They were subjected to descriptive as well as inferential statistical analyses to determine the general characteristics of the poultry farming. Quantitative variables were tested for normality, the distribution was non-normal. Then, we performed a chi-square test of equality of proportions for the qualitative variables.

The Kruskal-Wallis non-parametric test was used to calculate the medians and to determine the influence of the qualitative variables on the quantitative variables. An exact Fisher test was used to find out if there is an association between the qualitative variables. These analyzes were done using the SAS software (SAS, 2006).
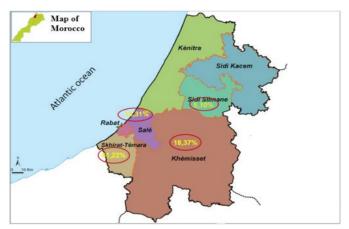
RESULTS AND DISCUSSION

Characteristics of breeders and poultry farming

In this study, we carried out a chi-square test of the equality of proportions to determine the general characteristics of the poultry farming. The null hypothesis (H0) is the equality of proportions for the different levels of a given qualitative characteristics. If the p-value is less than 5%, H0 is rejected, and the proportions are significantly different.

Characterization of the farms

Table 1 shows that 61.2% of the farms belong to the Skhirat-Temara province, while only 5.1% belong to the province of Sidi-Slimane. The number of farms differs between the four provinces (p<0.0001).

The survey revealed that, in general, the backyard is maintained by women (Table 1). In fact, they possess 80%, compared to 20% for men, with great difference among the provinces (p<0.0001). This predominance would be justified by the state of poverty of women and children as described in other geographical areas (Ndegwa and Kimani, 1996).

Map 1. Provinces and Prefectures of the Rabat-Salé-Kénitra Region (*General monography of the region of Rabat-Salé-Kénitra, 2015*)

Characterization of the farmers

The results showed that most of those responsible for the farm management consider this activity as the main activity (76.5%), while 23.5% practice it only in a secondary way (p<0.0001) (Table 1).

94.9% of the surveyed breeders have no technical training in poultry farming, while only 5.1% of breeders have a technical training (p<0.0001) (Table 1). Regarding the level of education of the poultry farmers, it is generally low since 57.1% of the farmers are illiterate, while only 8.2% have a university level (p<0.0001) (Table 1).

The experience in poultry farming of the surveyed people varied between 10 and 50 years with an average of 27.9 years. According to table 1, 74.5% of the surveyed breeders have a great experience in breeding that exceeds 20 years while 10.2% have an experience of fewer than 10 years (p<0.0001).

Characterization of the livestock

The composition of the farmyard is largely varied. However, it is mainly represented by chicken (74%), followed by turkey (14%), and other species (guinea fowl, pigeon, etc.) (12%) (p<0.0001). This showed the importance of chicken in the socio-economic life of households in this region (Table 1).

The flock size is predominantly (49%) between 20 and 100 individuals, while those with more than 100 represent approximately 27.6% (p<0.0040) (Table 1). All the farms are duct to the ground.

The "Beldi" chickens, raised in Morocco, are not local strains but rather very heterogeneous populations, which had undergone a very important interbreeding since 1920, date of creation of the first poultry station of Meknes, with the introduction of races such as Sussex, Rhode Island Red, Barred Plymouth Rock, New Hampshire, etc. (Barkok, 2007; Revue du Secteur Avicole, 2008).

Since then, farm chicks produced by national hatcheries produce a small, very hardy local chicken (Beldi) with an average weight between 1 and 1.5 kg. The chicken produces between 60 and 100 eggs per season of production. It is a very brooding breed. Chickens do not exceed 1.5 kg live weight at 5 months of age (Revue du Secteur Avicole, 2008).

The study showed that the most dominant avian species are red (26%) and Hjar-louad (24%), followed by black (23%) and Nouar-lfoul (18%). Other populations were also noted, but at relatively lower frequencies (p<0.0001) (Table 1).

Food

The poultry food in the study area is based mainly on natural resources (28%) and the owners do not supplement until they become insufficient (especially in winter), or for chicks. Supplementation is mainly cereal grains and byproducts (barley, corn, wheat and wheat bran) and secondarily, wet bread and vegetable peels.

According to table 1, the food distributed to chickens in the summer varied from one (25.2%) to three (41.8%) foods (p<0.0007). It is based mainly on natural resources (28%), followed by bran (23%) and wheat (22%). Other foods are also used, but at relatively lower frequencies (Figure 1, top left).

The food distributed in the winter varies between 3 (9,2%) and 4 foods (39,8%) (p<0.0003) (Table 1). It is based primarily on natural resources (16%), wheat (16%), vegetable peels (16%), wet bread (16%) and bran (15%).
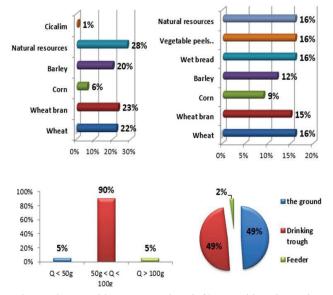

Figure 1: Food in summer (top left), Food in winter (top right). Quantity of feed distributed / day / Subject (bottom right), Distribution of feed and water (bottom right)

Table 1. Characteristics of breeders and Poultry Farming

Variables	Frequency (%)	p (Chi² test of equality of proportions)
Province	Skhirat-Temara (61.2%), Sidi Slimane (5.1%)	<.0001
Sex	Female (80.0%), Male (20.0%)	<.0001
Breeder status	Main activity (76.5%), Secondary activity (23.5%)	<.0001
Technical training	No (94.9%), Yes (5.1%)	<.0001
Level of education	Illiterate (57.1%), University education level (8.2%)	<.0001
Seniority in poultry farming	> 20 years (74,5%), < 10 years (10,2%)	<.0001
Species exploited	Chicken (74.0%), Turkey (14.0%)	<.0001
Size	50 < Size < 100 (49.0%), Size > 100 (27.5%)	0.0040
Breeds	The red (26.0%), Hjar louad (18.0%)	<.0001
Number of foods distributed in summer	3 (41.8%), 1 (25.2%)	0.0007
Number of foods distributed in winter	4 (39.8%), 3 (9.2%)	<.0003
Frequency of food distribution	2 times/day (77.0%), 3 times/day (23.0%)	<.0001
Number of poultry houses	1 (59.2%), 0 (1.0%)	<.0001
Wall construction material	Brick and stone (30.5%), Wood and wire mesh (3.2%)	<.0001
Roof construction material	Sheet metal and wood (49.0%), Concrete (5.2%)	<.0001
Number of diseases	3 (50.0%), 1 (2.0%)	<.0001
Treatments used	Traditional (63.0%), Medical (37.0%)	<.0001
Number of traditional treatments used	3 (65.3%), 5 (3.1%)	<.0001
Number of antibiotics used	1 (26.5%), 2 (12.2%)	0.0359
Washing and disinfection	No (63.1%), Yes (36.9%)	0,0164

Other foods are also used, but at relatively lower frequencies (Figure 1, top right).

The feed is distributed twice a day by 77% of the surveyed breeders and three times a day for the rest of the breeders (p<0.001) (Table 1). The food is distributed manually, with the quantity varying between 50 and 100g/day/individual poultry (Figure 1, bottom left). These foods are distributed on the ground or in very old containers (Figure 1, bottom right). The well water is used in the farms without any physicochemical or bacteriological analyses.

Description of the poultry houses and their building materials

The results of the survey showed that 59.2% of the farms consist of a single hen house, while 1% of the farms surveyed do not have adequate and specific poultry houses (p<0.0001) (Table 1). In fact, poultry spends the whole day outside in search of food and wanders in the fields and nearby farms. These are generally cramped and do not adequately protect animals from weather, predators and pathogens.

This study has shown that all the farms have buildings with dirt floors. The most common constructions are made of brick and stone (30.5%) for the walls. The roof is generally made of sheet metal and wood (tree branches) (49%) and very rarely concrete (5.2%) (Table 1).

Diseases

Table 1 shows that 50% of breeders have three diseases, while 2% have one disease(p<0.0001). The majority of breeders (63%) practiced traditional treatments, whereas only 37% of breeders used veterinary treatments (p<0.001). 65.3% of the poultry farming use three traditional treatments, while 3% of the breeders use 5 treatments (p<0.0001). Only 12.2% of the breeders use two veterinary drugs in their breeding.

According to the results of the survey, we found that the most common diseases in the Beldi chicken are coccidiosis (22%) and avian pseu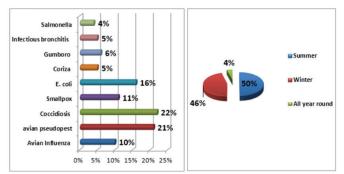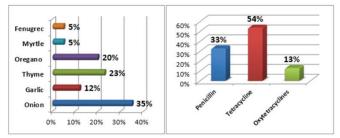do post (Newcastle) (21%), followed by *E. coli* (16%) and smallpox (11%). Other diseases have also been noted, but at relatively lower frequencies (Figure 2). These diseases are concentrated in both summer and winter and appear respectively in 50% and 46% of the farms (Figure 2).

Herbal medicine is frequently practiced by breeders. Indeed, the study showed that the most used treatments were onion (35%) and thyme (23%), followed by oregano (20%) and garlic (12%). Other treatments were also noted, but at relatively lower frequencies (Figure 3). For veterinary treatment, farmers use tetracycline (54%) and penicillin (33%).

Hygiene and preventive measures

Only 36.9% of breeders were used to clean the barn, while 63.1% of the breeders did not wash (p<0.0164) (Table 1). Directly after manure removal, farmers begin cleaning their buildings by sweeping and watering the soil and walls with water. Farmers who wash the hen house disinfect with quicklime (48%). 43% of poultry farming limit themselves to washing with water alone or combined with bleach. The rest uses a commercial detergent product (9%).

Business

In addition to self-consumption, the farmers sell their products. The business of animals is generally made throughout the region. However, some farmers sell their products locally at the souk (local markets) (28%) of the rural municipality, or on the farm to local dealers (26%) while 36% of breeders sell their products at home and also at the souk.

The analysis of the collected data showed that 60% of the breeders sell their products throughout the whole year whereas 40% concentrate their sale during the winter, spring, and summer. Chickens are sold for an age between 6 months and 1 year for 80% of the breeders, while 20% of them sell their animals at an age greater than one year.

Roosters are sold at an average price of 76.5 Dh (Dirham) per individual, while chickens are sold at an average price of 50 DH per individual. 90% of the eggs are sold at a price between 1.50 and 1.75 Dh/egg.

Constraints to development

Despite its considerable socio-economic importance, the traditional sector was, however, often neglected and considered as a secondary activity in agriculture and livestock
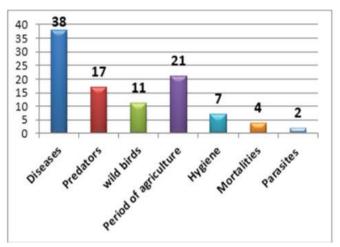

Figure 2: Disease Type (Left) and Illness

Figure 3: Treatments used (left) and applied antibiotics (right)

Figure 4: Problems of raising Beldi chicken

rearing for its low income. Diseases represent the main constraint that hinders its expansion added to food and socio-economic constraints. Infectious diseases (38%) are responsible for considerable losses. Predators (17%) such as wolves, dogs, cats, raptors, wild birds, crushers by vehicles, equines and humans are also considered to be major problems in traditional poultry farming (21%) (Figure 4).

Assessment of the quantitative characteristics of the poultry farming

Since the data are not following a normal distribution, quantitative characteristics were summarized using the median and the median absolute deviation (MAD). Table 2 represents the median values of the quantitative characteristics of all the 98 poultry farms. It shows that the median value of the sales rate is 50% with a MAD of 20%, whereas the median value of the consumption, morbidity and mortality rates are 10% with a MAD of 5%. The median agricultural area is 2 ha with a MAD of 0.5 ha. It varied from 0.5 to 10 ha. We note that the size of the workforce does not depend on the size of the area. This is explained by the availability of courses.

For the poultry house area, the median value is 20 m² with a MAD of 11 m² while the median distance between farms at the nearest farm is 100 m with a MAD of 50 m.

Evaluation of the quantitative characteristics of the poultry farming for different levels of the qualitative characteristics

Again, since the normality of data was rejected, the non-parametric Kruskal-Wallis test was used to check if median values of each of the quantitative characteristics are equal or different for the different levels of the qualitative variables.

The null hypothesis (H0) is no difference between the median values of the quantitative characteristics corresponding to different levels of the qualitative characteristics. If the probability value is less than 5%, then H0 is rejected and the medians are considered to be different.

In table 3, we provided only the minimum and maximum median values of the quantitative characteristics of each qualitative variable.

Analysis of the data revealed that the median values of all the quantitative characteristics (sales rate, consumption rate, morbidity rate, mortality rate, farm capacity, poultry house area, and distance from the nearest farm) were significantly different and varied according to the qualitative characteristics (breeder status, technical training, level of education, etc.).

Table 2. Median values of the quantitative characteristics of poultry farming

Variables	Sales rate (%	Consumption rate (%)	Morbidity rate (%)	Mortality rate (%)	Farm capacity (ha)	Chicken area (m²)	Distance to nearest farm (m)
Median	50	10	10	10	2	20	100
MAD	20	5	5	5	0,5	11	50

Table 3: Median values for quantitative characteristics and qualitative variables

Quantitative Features / Qualitative variables	Qualitative characteristic	Sales rate (%)	Consumption rate (%)	Morbidity rate (%)	Mortality rate (%)	Farm capacity (ha)	Chicken area (m²)	Distance to nearest farm (m²)
Breeder status	Core business	90	5	18	15	2	20	100
	Secondary activity	50	10	10	10	2	15	70
Technical training	Yes	60	10	10	10	2	39	150
	No	25	10	20	20	2	16	100
Level of education	Illiterate	50	15	15	15	2	20	100
	Primary education level	80	5	10	10	2	20	100
	Secondary education level	60	10	10	10	2	18	30
	University education level	50	10	12	15	2	16	125
Seniority in poultry farming	< 10 years	30	10	20	20	2	36	150
	>20 years	60	10	10	10	2	16	100
Washing and disinfection of the chicken coop	Yes	60	10	10	10	2	36	150
	No	50	10	15	12	2	15	100
Number of diseases	Number of diseases	3 (60) 9 (25)	2 (20) 9 (10)	9 (60) 1 (7,5)	9 (50) 1 (10)	8 (3.5) 9 (1.5)	2 (36) 3 (15)	1 (150) 3 (75)
Number of traditional treatments	Number of traditional treatments used	3 (60) 2 (40)	3 (20) 2 (10)	1 (30) 4 (10)	2 (37.5) 4 (9.5)	4 (2.5) 5 (1)	1 (36) 4 (18)	2 (150) 4 (75)
Number of antibiotics	Number of antibiotics used	2 (60) 1 (50)	1 (20) 2 (10)	1 (20) 2 (12,5)	1 (15) 2 (10)	1 (2) 2 (2)	1 (36) 2 (20)	1 (150) 2 (100)

Status of the breeder

Table 3 showed that the sales rate for a farmer with poultry farming as the main activity (median = 90%) is almost twice of that who practices it only in a secondary way (median = 50%) with equal farm capacity (median = 2 ha)

Thus, sales rate overrun explained the difference between the median morbidity and mortality rates, which are 18% and 15% for the main-activity farmer versus 10% and 10% for the secondary-level farmer (given the difference in flock size). On the other hand, the rate of consumption is weak in the stockbreeder who practices poultry farming like a main activity (median=5%).

The median distance separating the farmer who has a secondary activity from the nearest farm is 70 m, while the distance separating the farmer who has a main activity from the nearest farm is (median = 100 m), which does not respect the breeding standard that requires a minimum distance of 1 km[1].

Technical training

From table 3, we concluded that with an equal farm capacity (median of 2 ha), the technical level of the farmers remains the key parameter for the development of the poultry activity. Thus, farmers are required to undergo technical training to improve their sales (median values of 25%) for stockbreeders which have not formation technical at (median values of 60%) for stockbreeders which have followed formation technical), and to reduce rate of morbidity ((median values of 20% for the stockbreeders which does not have a technical training at (median values 10%) for the stockbreeders who followed a technical training) and of mortality ((median values of 20%) for the stockbreeders who do not have a technical training at (median values of 10%) for the stockbreeders who followed a technical training).

Level of education

The results of this study showed that for the same farm capacity (median 2 ha), the breeder who has a primary level of education has the best sales rate (median 80%) against average sales rates for academics and illiterates (median 50%). This is mainly due to the seniority and expertise of the former.

For its consumption rate, the primary farmer does not exceed 5% and controls his morbidity, and mortality rates (median 10%). In contrast, the illiterate has the highest rates of consumption, morbidity and mortality (median 15%). As for the university, the median mortality rate is 15%.

For the farmer with secondary education, the median distance between the nearest farms of 30 m is smaller than that required by the breeding standards.

Experience in poultry farming

The results in table 3 showed that the median sales rate for breeders exceeding 20 years is around 60%, compared to

30% for those who do not exceed 10 years of experience. The table also showed that all herders have median consumption rate of 10%, while the experienced breeders (> 20 years old) have a median morbidity and mortality rate of 10%, lower than that of those having 10 years of experience (20%). The poultry house area of the first (median = 16 m²) is smaller than that of the breeder who has less than 10 years of experience (median = 36 m²).

For the distance separating the farms from the nearest farm, the two breeders respect the distance required by the standard with a value greater than or equal to 1 km.

Washing and disinfection of the poultry farming

The results of the surveys showed that the farmers who practice cleaning and disinfecting the poultry house, and who respect the hygiene measures have a median morbidity and mortality rate of 10%, lower than that of the farmers who do not practice any washing (medians of 15% and 10%).Consequently, the sales rate is quite high among farmers who wash and disinfect (median = 60%).

Number of diseases

The analysis of the results showed that the morbidity and mortality rate increase significantly with the number of diseases, the median rates are 60% and 50% for the breeders who have 9 diseases, and 7.5% and 10% for breeders with only one disease. This explained the increase or decrease in the rate of sale and consumption.

The table also showed a smaller henhouse area (median of 15 m²) and a distance between the nearest breeding lower than that required by the norm (median of 75m), this can increase the number of diseases (4), which influences the rate of morbidity and mortality.

Number of traditional treatments used by breeders

The study showed that farmers using 3 or 4 traditional treatments have a high sales and consumption rate (median of 60% and 20%), and a low morbidity and mortality rate (medians of 10% and 9.5%) compared to breeders who use only 1 or 2 treatments who have a rate of sale and rather low consumption (medians 40% and 10%), and a high rate of morbidity and mortality (medians 30% and 37.5%).

Number of antibiotics used

Table 3 showed that farmers who used 2 antibiotics had a high sales rate (median of 60%), and a relatively low morbidity and mortality rate (median of 12.5% and 10%), and also a low consumption rate (median of 10%)compared to the stockbreeders who use only one antibiotic with a rather high rate of sale (median 50%), and one of high rate of morbidity and mortality (medians 20% and 15%). Also, a high rate of consumption (median 20%).

Association of qualitative characteristics of the poultry farming

In this study, we performed the exact test of Fisher to find out if there is an association or, on the contrary, independence between the qualitative characteristics, as well as to quantify the level or the degree of association if it is necessary.

The null hypothesis (H0) is that there is no association between any two qualitative characteristics. If the prob-

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[1] Arrêté du Ministre de l'Agriculture, du Développement Rural et des Pêches Maritimes n° 2129-05 du 15 décembre 2005 fixant les distances minimales à respecter entre une ferme d'élevage avicole et une autre, ou entre une ferme d'élevage avicole et un couvoir ou entre deux couvoirs).

ability value is less than 0.05, the H0 is rejected and the characteristics are associated. Then we can quantify the level of this association using the Cramer V value.

From table 4, we concluded that there is an association between:

• The provinces and the number of chickens of the farms (p<0.0001). This association is very strong (Cramer V = 0.4556). For example, in the Sidi Slimane province, 100% of the farmers have a flock size ranging between 50 and 100 individuals as opposed to those of the Khémisset province of which 78% have a flock size ranging higher than 100 individuals.

• The provinces and the level of education of the surveyed breeders (p<0.0001). This association is strong (Cramer V = 0.3736). For example, in the Skhirat-Temara province, 65% of the breeders are illiterate as opposed to those of the Salé province, 67% of which have a level of primary education.

• The level of education and the status of the surveyed breeders (p<0.0001). This association is very strong (Cramer V = 0.6096). For example, 95% of the illiterate farmers practice poultry farming as the main activity as opposed to breeders who have a secondary level of education, 56% of whom practice it only in a secondary way.

• The provinces and the number of diseases encountered by breeders (p<0.005). This association is strong (Cramer V = 0.3231). For example, 40% of the breeders in the Skhirat-Temara province have three diseases as opposed to those of the Salé province of which 80% have three diseases.

• The number of traditional treatments used by the surveyed breeders and the number of diseases encountered (p<0.0001). This association is very strong (Cramer V = 0.4975). For example, 50% of the breeders who practice two treatments have only one disease as opposed to those who use only one treatment of which 22% have three diseases.

• The number of antibiotics used by breeders and the number of diseases encountered (p<0.0001). This association is very strong (Cramer V = 0.8093). For example, 47% of the breeders who uses only one antibiotic have three diseases as opposed to those who use two antibiotics of which only 16% have three diseases.

• The poultry house washing practiced by the surveyed breeders and the number of diseases encountered (p<0.0001). This association is very strong (Cramer V = 0.5527). For example, 74% of the breeders who do not wash and disinfect the poultry house have at least three diseases as opposed to those who practice washing and disinfection of which 16% of whom have two diseases.

• The provinces and the number of feeds distributed to chickens by the surveyed breeders (p<0.0001). This association is very strong (Cramer V = 0.3716). For example, the food distributed to chickens varies from a food with 3 food for 47% of the stockbreeders of the province of Skhirat-Temara in opposition to those of the province Sidi Slimane of which 80% distribute 4 food.

• The status of the farmer and the number of feeds distributed to the chickens (p<0.0001). This association is very strong (Cramer V = 0.4238). For example, 92% of the stockbreeders having poultry farming as the main activity distribute at least three feeds to chickens as opposed to those who practice it in a secondary way of which 44% distribute only one food.

DISCUSSION

The predominance of women (80% of cases) observed in our survey is related to the fact that the raising of local hens is a traditionally female activity in most African countries (Bell *et al.*, 1995) to fight the poverty that generally affects women and children (Khan *et al.*, 1994). These results confirm those obtained by Mahammi (2014) and Kondombo (2003) who indicated that poultry farming in village or family settings is mainly an activity for women and children. This is also the case for Ouédraogo et al. (2010) who conducted their study in Sourou province, North-West region of Burkina Faso, and revealed that the majority of farm owners (79%) are men. However, poultry farming is mainly the work of women (82% of cases).

Poultry farming is the main activity of the surveyed breeders. This result is in contradiction with the general tendencies of the work of Mack et al. (2005) and other developing countries like Dana et al. (2010) in Ethiopia, Okeno *et al.* (2012) in Kenya,and Jansen *et al.* (2009) who considered it a secondary activity for 41% of households in the Solomon Islands.

Table 4: Association of qualitative variables of poultry farms in the Rabat-Salé-Kénitra region

Association	P value of Fisher's exact test	Cramer V
Size with province	0 < 5%	0.4556
Staff with breeder status	0 < 5%	0.3736
Level of education with Province	0 < 5%	0.3720
Level of education with status of the breeder	0 < 5%	0.6096
Number of diseases with province	0.0331 < 5%	0.3231
Number of traditional treatments used with number of diseases	0 < 5%	0.4975
Number of antibiotics used with number of diseases	0 < 5%	0.8093
Washing and disinfection with number of diseases	0 < 5%	0.5527
Number of food distributed in summer with province	0 < 5%	0.3716
Number of foods distributed with breeder status	0 < 5%	0.4238

The study showed that 94.9% of the breeders have no technical training in poultry farming, while only 5.1% of breeders have had technical training. This was the case for the work of Mahmoudi *et al.,* (2015) who concluded that 67% of the breeders surveyed conduct their farms without extensive training in the field and more than 52% of them perform only the daily tasks of breeding.

The high prevalence of hens (74%) in local poultry numbers corroborates the observations of Raach-Moujahed (2011); Desta *et al.*, (2012); Pym, (2010); Kingori *et al.*, (2010); Sanka et Mbaga, (2014); Letebrhan et al., (2015); Mahoro *et al.*, (2017) and Mtileni *et al.*, (2012).

The current feeding system of animals is based on wandering. Poultry is kept at large and the diet is mainly based on natural resources (28%). Our results corroborate those obtained in other countries (Kumaresan *et al.,* 2008; Ouedraogo 2015). Similar results were observed in the Burkina Faso (Kondombo, 2003) and confirmed by the study of Goromela *et al.,* (2006), Hailemariam *et al.,* (2010), Benabdeljelil (1983), Okeno *et al.,* (2012), Letebrhan *et al.*, (2015) and Mahammi (2014). These farming conditions explained the low productivity of the local hen.

Most farmers do not care about providing housing for their poultry, and those who did it provided only a very basic shelter. Our observations are also in agreement with those made by Kondombo (2003), Nmoula *et al.,* (2012) and Abdelqader et al. (2007) who indicated that in rural areas, 80% of poultry houses are built according to the traditional style with banco (73% of poultry houses) or straw (7% of poultry houses). They also pointed out that, in some cases, animals did not benefit from any shelter and spent the night perched on trees. This situation exposed them more to the predation and various adverse weather conditions, which is the main cause of the observed high mortality.

The most common diseases in Beldi chicken were coccidiosis (22%) and avian pseudo post (Newcastle) (21%), followed by *E. coli* (16%) and smallpox (11%). This reinforces the information given by Kumaresan *et al.*, (2008); Mtileni et al. (2012), and Ouedraogo (2015). In Kenya, a survey conducted in 2011 revealed that Newcastle disease and fowl typhoid diseases were ranked as the major causes of chicken deaths, whilst fleas, lice, mites and internal parasites (worms) were the most common parasites (Okeno, 2012). In South Africa, a survey carried out in 2012 showed that the major causes of chicken mortality were diseases (65 % of the households), particularly Newcastle disease (38.7 %) (Mtileni *et al.*, 2012).

Herbal medicine is usually practiced by Moroccan breeders; the majority of breeders (63 %) practiced traditional treatments, while only 37% of breeders used veterinary treatments. Indeed, Mtileni *et al.*, (2012) showed, breeders practice traditional medicines (46 %) and insecticides (12 %) to control ectoparasites, particularly fleas and mites. According to other studies, 28% of breeders do not make any treatment and 14% still use traditional treatments (Jansen, 2009).

The most frequently cited constraints are diseases, lack of follow-up and predators. These constraints have also been reported in many studies, generally in developing countries: Desta *et al.*, (2012) and Moges *et al.*, (2010) in Ethiopia, Olwande *et al.*, (2010) in Kenya, Sonaiya (2009), Kugonza *et al.*, (2008) in Uganda, Yakubu (2010) in Nigeria, Raach-Moujahed *et al.*, (2011) in Tunisia and Mtileni *et al.*, (2012) in South Africa.

CONCLUSIONS

Traditional livestock farming affects a large part of the rural population; it is available at the level of all farms. It participates in the supply of animal proteins and is a rapidly available financial resource. Its products are highly desired by urban consumers. They are considered as local products related to the particularities of the breeding site and drawing resources from the environment. It is generally owned by women and can be a support for the promotion of women in rural areas.

The presence of several phenotypes indicates a genetic multiplicity of high strains and offers a genetic diversity that guarantees the observed resistance of current strains, but at the same time, taking into account uncontrolled mating exposes flocks to the consequences of consanguinity, hence the need for thorough knowledge of the genetics of these strains and the control of mating.

This type of farming has the particularity of a very short production cycle and requires minimal investments. It is characterized by a minimal use of inputs. The buildings are rudimentary and the food supplements are very minimal. However, these investments and inputs are, in most cases, limiting the optimization of the production. Indeed, the resources of pastures are limited and depend on the location of the farm (often it is a fallow or thatch) and the supplements are dependent on the farmer's finances and the availabilities do not allow balancing rations. These supplements are distributed on the ground or in very dilapidated containers. Poultry shelters, when they exist, are rudimentary and designed with local materials and do not provide a healthy environment for animals. The absence of brooders, litter and nestlings in all households implies low productivity of the farms, due to losses of animals by predators and mortalities and losses of eggs. The chickens have the particularity of scattering the spawning in several places like the stable and the fields.

Economically, this farming is efficient, considering the investments and income generated, although the shortfall is enormous with, as an indication, the high rate of infectious diseases (38%). The reasons for this are hygiene conditions (63.1% of the breeders do not practice any washing of the hen house). In addition, mortality is high; the median rate is 10%.

In order to allow traditional farms to play their full role in the promotion of rural women, it would be necessary to undertake a number of actions, in particular:

• Design more suitable shelters with local materials to protect animals from inclement weather and predators.

• Provide livestock with the necessary equipment, organizing and improving the efficiency of farms such as perches, hangers, feeders, and drinking troughs.

• Popularize good housekeeping and disinfection practices.

• Reason the nutritional supplements so that they are sufficient and balanced.

• Set up a prophylaxis program and adapt the packaging of the drugs to the numbers of animals.

• Develop the organic label for these types of livestock: analyze the products of these farms and popularize their nutritional values to consumers.

• Organize sales and minimize intermediaries.

Unless the State puts in place an extensive, long-term and costly program, to induce changes especially in terms of farming methods, housing, food and sanitation (vaccination of backyard birds), the success of this type of breeding would eventually pass through the knowledge of the strain and the improvement of production techniques.

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