Influence of a Dietary Management Practice on Performances and Cost-Effectiveness of an Intensive Breeding Broilers

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Abstract

To investigate impact of diet management on production and on economic outcomes in broilers was the aim of this study. Thus, 1062 chicks were studied over 91 days. Diet was formulated daily and the management was based on free access (*ad libitum*) to water and food. Consumption index, mortality, food costs and profitability were estimated, while daily gain average was estimated only for 50 chicks. The study pointed out an increasing food consumption, inversely proportional to the temperature decrease ($p<0.01$).The consumption index decreased from 45,31 at the 9th week to 1,14 at the 13th week. The overall mortality was about 21, 78%. The average weight at week 14 was 1590, 02g. The average daily gain increased from 0,98g to 49,86g. The correlation between food intake and food costs was +0,917 ($p<0, 01$). The cost of one kg of live weight was 1546, 14 f.cfa, while its selling price was about 1625 f.cfa. The main profit per kg was therefore +91, 73 f.cfa. Finally, when compared with other tropic countries, it was registered a higher mortality, lower daily gain average, lower final live weight and lower consumption index. Thus, diet variability showed medium livestock and economic performances that could be performed.

Keywords: Avian economy - Performance - Profitability - Production – Chicken Broiler

1. Introduction

According to FAO estimations (September 2013), the poultry meat production increased in 2012 (+2,4%) and will be up in 2013 (+1,8%). The main producers in 2012 were the United States, China, Brazil and the EU with 19,8; 18,5; 13,1 and 12,2 million tons respectively (UBABEF, 2013).

For Niger, between 2000 and 2007, the average annual production of poultry meat was 28,405 tons and that of eggs was estimated at 10,466 tons (Idi and Ganda 2009). In developing countries, poultry plays a socio-economic function in households. Thus, the analysis of poultry production in two Burkina Faso villages showed that chicken products are primarily intended for sacrifices, gifts, items of trade for traditional medicine or sold (Kondombo *et al.* 2003). The same statements have been made in Malawi (Gondwe and Wollny 2007). So, there is undoubtedly contribution of poultry farming in food security, but that faces many constraints. The main problems are diseases, predators and theft (Gondwe and Wollny 2007), feeding, water and birds housing (Dessie and Ogle 2001), or also a lack of genetic performance, inexperience of farmers (Badubi *et al.* 2004) or insufficient entrepreneurship or management skills (Mtileni *et al.* 2012).

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Niger, and especially Maradi, doesn't escape to these rules, so that the present study has been conducted with the main objective to evaluate the production parameters and the profitability of one breeding system presenting a discutable diet formulation.

1.   Materials And Methods

2.1. The farm presentation

The farm owned Guidan Gona with a poultry house is enlarged of 200 m^2, and located at 1 km from the city of Maradi. The entire resort is sufficiently shaded. Buildings with solid materials are generally in good repair.

2.2. Methodology

The test is carried out on 1062 chick two (2) weeks aged belonging to the strain Cobb 500 broiler, products of Guidan-Gona farm. The starting average weight of chicks was 29,28 +/- 5,85 g (the third week). These birds were bred on ground peanut hulls litter, and were housed in the same conditions of humidity, ventilation and temperature (average 30,12 °C). During the assay period (91 days), chickens received *ad libitum* water and food. The food was formulated each day and was composed with cereals (corn, sorghum and millet), wheat bran, flour, peanut meal, fish meal, blood meal, bone powder, cooking salt, lysine, methionin and 'premix' (complex of vitamins and minerals). The weight change was controlled weekly on a group of 50 chicks. Each morning, an individual clinical control was made in order to isolate chicks presenting signs of depression or diarrhea. The hen house temperature was recorded two times a day, in the morning and in the evening.

Data were processed in SPSS 15.0 statistical software for Windows. A multivariate linear model is used to analyze the effect of breeding period (week) on different parameters as mortality, body weight, ambient temperature, ingested food quantity and food cost. The statistical significance was analyzed with the Duncan test, and correlations were sought between the different variables.

3.   Results

The weekly amounts of food ingested by all chickens underwent significant fluctuations throughout the rearing period (Table1).

The lowest values, from 24 kg to 30,74 kg, were registered in the beginning of the experiment (from 3rd to 7th week), and did not differ significantly with that of the 9th and 10th week. The maximum of food intakes (from 46,42 kg to 48,25 kg) was obtained within the 11th, 12th and 13th week, with no significant difference with the 8th week food intake. The highest daily mortality (0,584%) was recorded in the 3rd week although the difference is not significant with mortalities occurred during the 4th, 6th and the 9th weeks (0,436%; 0,505% and 0,407%, respectively).

About room temperature, the highest values (from 32,23 °C to 32,81 °C) were recorded at the beginning of the experiment (p <0.05), and it decreased thereafter until the end (from 27,97 °C to 28 °C). On the other side, the average of food cost increased with age, with a maximum of expenditures of 17113,41 f.cfa (p <0.05) made in the latest week. Finally, it was noted that the live weight of birds increased with age, reaching 1590,02 g in the 14th week.

Table 1: Mean daily evolution of food intake, mortality, temperature and food cost in the weeks

Weeks	Food intake (kg)	Mortality (%)	Room T° (°C)	Food cost (f.cfa)	Live weight (g)
3	29.28 +/-5.85 a	0.584 +/-0.227 d	32.23 +/-1.39 c	9271.55 +/-1863.12 a	82.28 +/-29.28 a
4	24.00 +/-0.00 a	0.436 +/-0.381bcd	32.22 +/-1.83 c	7606.08 +/-0.0000 a	89.18 +/-33.81 a
5	29.14 +/-2.26 a	0.303 +/-0.100 abc	32.81 +/-0.60 c	9290.66 +/-7457.1 a	144.98 +/-91.09 ab
6	28.00 +/-2.08 a	0.505 +/-0.383 cd	30.12 +/-1.85 b	8971.13 +/-561.09 a	215.30 +/-138.89 b
7	30.74 +/-2.56 a	0.076 +/-0.040 a	28.85 +/-1.96 ab	9700.12 +/-690.90 ab	344.82 +/-184.59 c
8	43.21 +/-3.62 b	0.214 +/-0.210 ab	29.83 +/-1.04 b	12023.03+/-1738.22 bc	552.60 +/-233.82 d
9	31.14 +/-8.51 a	0.407 +/-0.224 bcd	28.08 +/-1.25 a	7778.82 +/-2817.42 a	756 +/-221.46 e
10	31.42 +/-4.27 a	0.240 +/-0.169 ab	27.75 +/-1.11a	8799.22 +/-4157.66 a	783.06 +/-191.04 ef
11	47.85 +/-3.93 b	0.081 +/-0.050 a	28.58 +/-1.23 ab	14495.99+/-1609.68 c	852.36 +/-206.89 f
12	46.42 +/-8.03 b	0.130 +/-0.122 a	27.97 +/-1.35 a	14069.72+/-2333.10 c	1017.30 +/-213.50 g
13	48.25 +/-12.83b	0.115 +/-0.087 a	28 +/-0.47 a	17113.41 +/-379.61 d	1240.98 +/-285.36 h
14					1590.02 +/-289.85 i

Different letters in the same column signify significant differences (p<0.05) between the arithmetic means
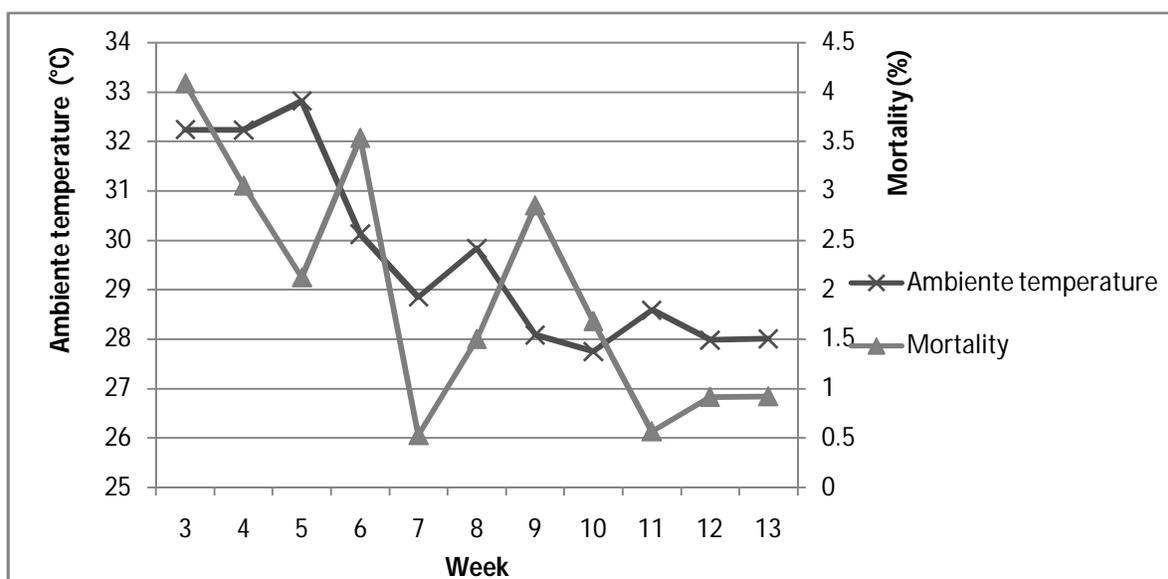
Figure 1: Weekly changes of ambient temperature and mortality

Significant negative correlations (p <0.01) were recorded between food consumption and ambient temperature, then between food consumption and mortality, respectively coefficient of correlation "r" was -0,355 and -0,432. Elsewhere,

a significant positive correlation (p <0.05) was recorded between food consumption and food cost, and also between ambient temperature and mortality, respectively "r" was +0,917 and 0,334.
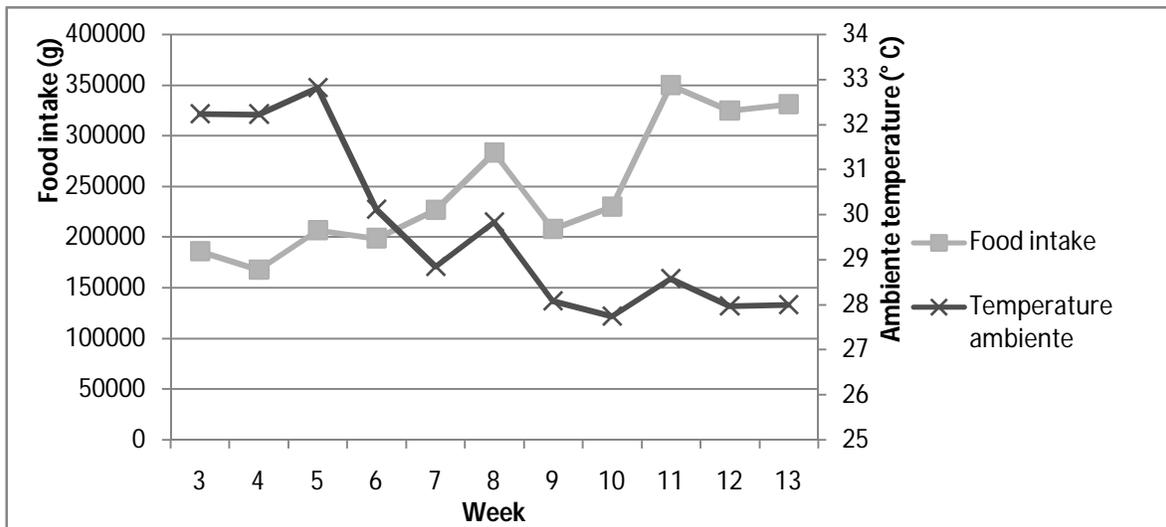

Figure 2: Changes of the weekly food intake and the ambient temperature

According to Figure 1, the mortality curve had the same trend with the hen house temperature curve that showed a high value of 32,81 °C at the beginning, but fallen down with a value of 27,97 °C by the end. Large fluctuations were sometimes observed as well as on the ambient temperature curve than on the mortality curve throughout growing period. Thus, the total mortality that was 3,53% at the 6th week, fell down to 0,53% in the following week before increasing to up to 2,85% at the 9th week, and then a finally dropping curve was observed in the 11th week attempting the value of 0,56% at the end. Regarding to the food intake curve, it tended to increase from the beginning to the end of the experiment, while the ambient temperature showed an opposite evolution (Figure 2).
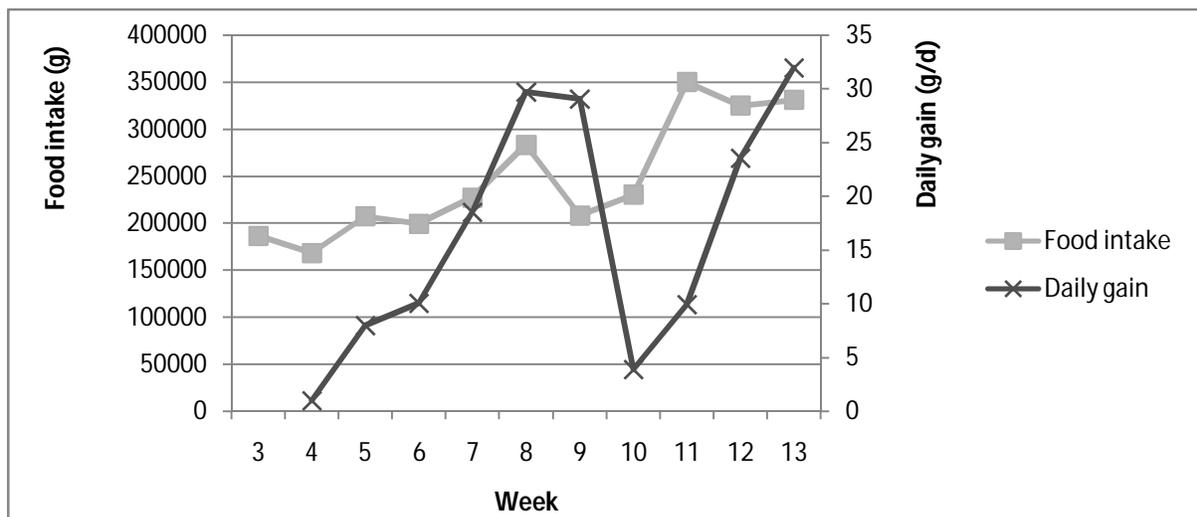

Figure 3: weekly evolution of daily gain and food intake

About weight change and food intake (Figure 3), it was observed that the average daily gain and food consumption increased with age throughout the experiment. The total food consummation curve suffered a slight depression between the 8th and the 9th week (from 283300 g to 208000 g), before increasing at the 11th week (350000 g). For the weight gain curve, it also dropped from 29,09 g to 3,86 g between the 9th and the 10th week, before rising to 49,86 g in the 14th week. On the other side (Figure 4), a decrease was observed for the consumption index (CI) between the 4th

and the 8th, before increasing at the 9th week (CI = 45.31), and then dropping to reach its lowest value in the 13th week (CI = 1,14).
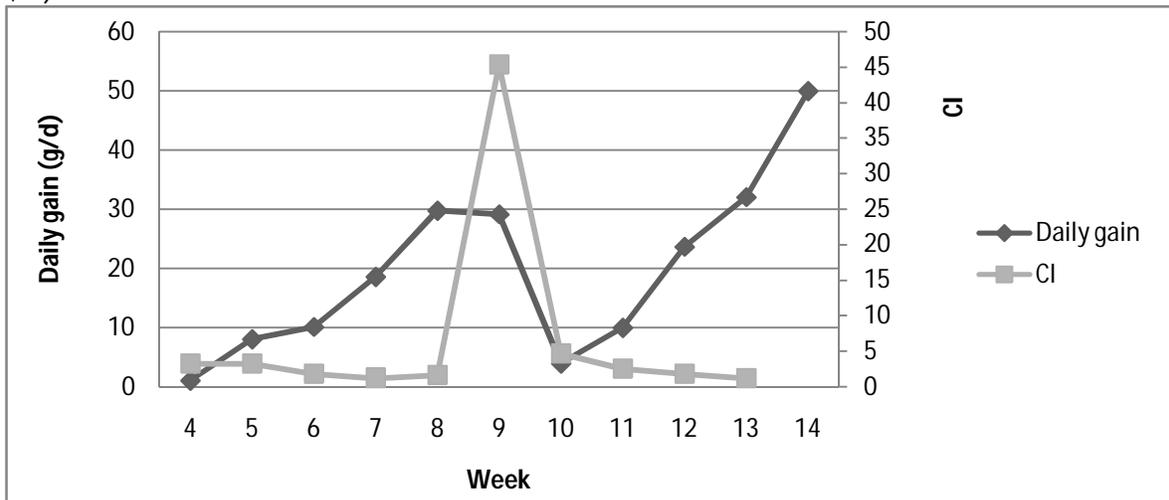

Figure 4: weekly evolution of consummation index (CI) and weight gain

For the economical performances, the labels were classified as production costs, production revenues and profit or production margins. Thus, with regard to production expenses, they were composed of 1999765,75 f.cfa for operating expenses and 114427,3 f.cfa for structural loads for a total of 2114193, 05 f.cfa. This total cost was majority represented by feed cost (850951,79 f.cfa or 40,24%) and chicks cost (849600 f.cfa or 40,18%) and followed by chicks died cost (115 813 f.cfa or 5,47%) and wages (109000 f.cfa or 5,15%).

The income statement issue from the chicken and manure sale was 2239625 f.cfa in which 92.21% corresponded to the sale of chickens. Since profits are the difference between revenues and expenses, the recorded profit was 125431,95 f.cfa. On chicken production, the average body weight of the produced chickens was 1,59 kg, and for each, the cost of production was 2458,36 f.cfa.

4. Discussion

The recorded mortality rate was 20,92% during the 91 days, very higher than the mentioned rate in the Notice of Agronomy that is about 3,4% in 42 days (MCRF 1993). On the other hand, some reported mortality rates are higher than in the present study, 25% for chickens slaughtered at 12.4 weeks age in Zimbabwe (Kelly *et al.* 1994), or 56% within 10 weeks in studies conducted in Malian households (Wilson *et al.* 1987). The high mortalities recorded, in the present study, between the 3rd and the 5th week, comparatively to the 11th, the 12th and the 13th, were probably due to the high henhouse temperatures observed during this period, that contributed in reducing food ingestion and related consequences. Indeed, the temperature should be below 26 °C for chickens older than 21 days (COBB 2008). In fact, with higher temperatures above 32 °C to 36 °C, food ingestion in adults is reduced by 4,2 g per day as reported by Sanofi (1996) cited by Dooko (2006).

The analysis of the food intake curve suggested bad practices in breeding management. Because of a curve looking to sawtooth, showing great variability induced by a lack in the food disponibility for animal's physiological functions. During the 9th week, the growing birds had experienced a drastic reduction in their food rations that has negatively affected food intake, and subsequently a significant reduction in average daily gain at the end of the same week, and perhaps influenced the increase in mortality during this period of time as shown in figure 1. Regarding to the animals weighting, Lwelamira (2012) reported in a study conducted in Tanzania, a body weight of 348 g, 685 g, 974 g and 1188 g respectively at the 8th, 12th, 16th and 20th week of age in Kuchi breed chickens, these results are lower than in the present study.

In general, registered performances are lower in comparison with the reported ones in literature. A study conducted in Botswana poultry producers found that chickens are sold at 48,3 days of age, with a live weight of 1,79 kg, a conversion index of 2,72 and a mortality rate of 9,15% (Badubi *et al.* 2004). Also, in a work done by INRA (1978) cited by Dooko (2006), it is shown that the average body weight of broiler breed at 20°C was 1630 g at 6 weeks of age, that is very higher than the 215,30 g recorded in our study. The final weight mean at 91 days, around 1590,02 g, is significantly lower than those obtained by Ndiaye (1995) and Alloui *et al.* (2001) cited by Dooko (2006). Their values were respectively 1900 g, 2010 g with the same strain.

Houndonougbo *et al.* (2009) meanwhile, got 1662 g at 42 days with ROSS 308 strain fed with controlled rations in Beninese farms. On the other hand, Dei and Bumbie (2011) obtained in Ghana a daily weight gain moving from 58 to 64 g, depending on the food presentation. Values of weight gain between 540 g and 702 g were found in poultry depending on the Ross 308 and Hubbard strains (Bengi *et al.* 2012). Carvalho *et al.* (2014) found 56, 68 g to 63,14 g of weight gain for chickens raised under different installations. While the present study the average daily weight gain was about 19, 57 g, with a lack in diet control and food presentation.

This poor weight gained during long period was mainly due to the poor food conversion. Indeed, the consumption index varied between 1, 14 and 45,31 that is significantly above the upper limit of 2,6 recommended in poultry farms by Hubbard (2007). The degradation of the consumption index is probably due in large part to poor dietary practice in this farm. Indeed, the 9th week that experienced the highest consumption index (45, 31), the food has been drastically modified by replacing the corn which represents 52-79% by the same quantity of sorghum with no phase of adaptation.

For the economic evaluation, Duteurtre *et al.* (2005) estimated the price of chicken meat kilogram in Senegal at 1450 f.cfa, including the transportation cost, whereas in the present case, the kilogram price 1625 f.cfa. The cost production of one chicken was 2458,36 f.cfa, which is higher than the reported 2275,75 f.cfa recorded in Senegal by Dooko (2006), while Njikam (2003) reported, with the same strain, a cost of 2540 f.cfa in Cameroonian farms. In addition, benefits of 91,73 f.cfa per kg of chicken; 145,85 f.cfa per chicken and 125431,95 f.fcfa per production cycle were recorded at the end of this study. Thus, broiler speculation seams economically unprofitable.

5. Conclusion

At the end of the study of breeding performances, we hold a very high mortality rate than the average for other comparable countries, and a deteriorated average of daily gain, average live weight and average consumption index. All these recorded performances testify to stock rising where birds often do not manage to eat their fill. But, despite these shortcomings, the economic results recorded at the end of the study (the cost of one kg, a selling price of a kg and earnings per kg) are very encouraging. Nevertheless in the present case a low profitability is observed.

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