

Effects of cage and floor rearing systems on broiler chickens in Nangarhar, Afghanistan

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ABSTRACT

This research was accomplished Over 90 one-day broiler chickens in 42 days based on the record of their daily behaviors at Nangarhar University, in Agriculture Faculty research farm. When the chickens were brought from the city, they were having 40gr average weight and they were randomly distributed into two groups with (2×3) factorial design where each group was divided into 3 replications. Each replication of each group had 15 chickens. The first group, the cage group, which was divided into three replications: C1T1R1, C2T1R2 and C3T1R3 and the second group, floor group, which was divided into three replications: F1T2R1, F2T2R2 and F3T2R3, were placed in research farm. Both groups were vaccinated against new castel and infection Bural disease. Our factors were weight gaining, feed gaining and FCR. As a result this, research showed that in the first five weeks floor rearing group was not having significantly growth changing ($p>0.05$) comparing cage group, on sixth week a significant change ($p<0.05$) was between the two, both the groups were having significantly change ($p<0.05$) in the ratio of food changing during all weeks. Moreover, cage group was having significant change ($p<0.05$) in daily food gaining comparing on the floor group. As a whole, this research shows that cage rearing system and floor rearing system have significant changes and has great impacts on daily food gaining and FCR, but has no special impact on weight gaining.

1. Introduction

Rearing of meat chickens has significant role in the economy of a country and the countries, which take part in the rearing of meat chicken, has developed a lot in terms of broiler chicken and gained a lot of income this way. On the other hand, chicken meat is the great source of protein and energy which is easily digested and prevent malnutrition. Meat chickens have good capability of food digestion and are presented to the market as meat production in a short period of time. Nangarhar Province of Afghanistan has a fair climate for the rearing of chicken but because of the lack of the land, the unfamiliarity with the rearing of chickens in the form of cage floor and high cost, farmers can not present chickens to the market on time. So we tried to study broiler chicken rearing in both free and cage forms and its impacts. Rearing system of broiler chicken is a significant factor which has specific impact on health, relief and performance of chickens. Fouad. M. A *et al.* (2008) reported that broiler chicken are rearing with different production methods in the world. Difference in the rearing system is because of many factors like environment, specific amount of production and financial issues and is divided into two systems: floor and the cage. Both the chicken rearing systems are used in the broiler chicken rearing. Floor broiler chicken rearing is used the most and the rearing on the cage form has not been performed a lot yet. Construction companies started this action and at the end of 20th century this issue is taken care a lot.

Andre *et al.* (1974) and Tolan and Yalan. (1997) found that cage system, because of the need of broiler chicken and of having lots of specifications, is developing. From this point of

view, benefits of chicken rearing in the form of cage are: small amount of land and small number of workers, greatness of uniformity, greatness of production per unit area, less pollution and wet wastages as they are serious problems in floor system, lack of Introids and coccidioses disease, greatness of annual income, easily transferring to slaying place and etc.

Based on the research results of Shields and Greger (2003), the cage system with great income in less land has developed enormously in the world and especially in Russia, Middle East, Central Asia, different Asian Countries, Africa and European countries these years. But chicken rearing in free form has special area for chicken motion and chickens can move easily one and other side which is useful for their weight gaining and their relief.

The aim of this research is to study the impact of both rearing systems and to obtain the result at which the broiler chicken gets fair weight of bazar .

2. Research Questions

In which one of the broiler chicken rearing systems 'cage system or floor system' do meat chickens:

1. Get fair weight?
2. Take food in a good manner?
3. Their FCR is useful?
4. Need less place and change food into meat in a good manner?

3. Literature review

The results of the research done on Ross broiler chicken rearing systems (floor and cage) comparison by (2014)

Rafh.M.T.Khulel in Iraq Mosul University in 2014 are: cage system chickens have significant ($p \leq 0.01$) high physical, total and daily weight and also use significant high total daily food and protein in their whole age (0-7, 2-4 weeks). All the chickens of the cage showed significant growth, less percentage of dressing and high percentage of wings in the age of (0-7, 2-4 weeks) whereas other parts of their body did not have any significant difference. Cage chickens were having much economic importance compare to floor system.

Wasiu(2014) reported a research in North West Nigeria. In their research, meat chickens of the same age were rearing with 2x4 factorial design in the form of rearing two groups (floor and cage) and every group was divided into four replications where floor was named with (PA,PB,PC and PD) replications and cage was named with (A1-A10,C1-C10,E1-E10 and G1-G10) replications. Each group was fed with Grower grains at the first four weeks and after that they were fed with Finisher grains. They were recording daily given grains and weekly weight of the both groups. The only factors of the research were weight, food and rate of food change. The result of the research showed that both the groups have close relationship but in the first weeks, weight in the cage system is much than floor system and in the last weeks, weight is increasing fast in floor system and at the end weight in the both groups was approximately equal but use of food was much in floor rearing system.

Sainsbury (1988), Lamidi (2005) and Bessei (2006) obtained the results of their researches as: floor system is a continued and humidity over vaporizing system in which floor can easily be shifted for the relief of chickens; but cage rearing system always need less workers, enough careful rearing as the disease spreads less and benefits of land is taken into account, chickens are not moving a lot and their energy is not lost a lot and materials on the floor are collected easily. Materials of the floor are used as the meal of fish or as urea in both systems.

Songunal et al. (2018) reported a research on Anak broiler chicken in cage and floor rearing systems forms, he and his team distributed chickens into two groups (floor and cage) and divided each group into three replications where each replication had 25 chickens. The specific parameters were daily food, daily weight, eaten food and final weight. They obtained that daily food was obviously much in cage rearing. Chest weight and percentage of dressing were high in floor system though weight of leg and liver was much in cage system.

Menal et al. (2008). Reported that the rearing of meat chickens in cage and floor systems at Egypt Cairo University in 2008. The specific parameters were final weight, daily weight, ratio of changing food into meat and death. It was shown during the research (0-6 weeks) that much final and daily weight, good FCR and less death were recorded in floor chickens whereas food was used a lot in cage system but because of less activity chickens did not gain much weight and also from the point of view of economy, chickens rearing in floor system is more useful than in cage system; because death was less in floor system.

Turklymaz et al. (2002) Reported results that control in chicken rearing is better in floor system than cage system. Though Wang et al. (1997) and Thanga et al. (2001) found in their researches that cage system is more useful and more significant to every chicken than floor system.

Anderson et al. (1994) said that chicken rearing in floor system is better than in cage system because chickens get much weight as they do their physical and metabolic activity in a better way in floor system.

Tolon et al. (1997) obtained the results that chickens rearing in cage get less weight than rearing in floor system but with fair weight in cage system, less land is being gotten much benefit.

Skinner et al. (1992) obtained comparing broiler chicken rearing in cage and floor system, that the importance of FCR in chicken rearing is better in floor system than cage system because due to lack of physical and metabolic activity ratio of food change is less in cage system.

4. Material and method

Research place

This research was conducted under the title of (broiler chicken rearing comparison in cage and on ground) at Nangarhar University, in Agriculture Faculty Research Farm.

Experimental design

This research design was Completed Randomized Design – CRD method and 2x3 factorial design. 90 chickens were distributed into two groups and each group was divided into three replications. Each group was having 45 chickens, each group was having three replications and every replication contained 15 chickens and they were given traditional food and water equally for 42 days. Every chicken is weighted daily and besides last food new balanced food is added and is given to them and it was recorded daily for 42 days. As this research was for 42 days so it was started in 2018/10/17 and ended in 2018/11/28.

Action Plan

This research was conducted on one day old 90 chickens. The chickens were bought from a company in Jalal Abad city of Nangarhar province. Before bringing of chickens to the farm, farm was sanitized with quicklime and floor, light, ventilation and equally heating of the area for chickens were prepared. Next, we spread dry material (straw, leaves and wood powder) and we used newspaper on it for each replication of the two groups. Chickens were weighted randomly and divided into two groups where each group was divided into three sub groups and each subgroup was having 15 chickens. When chickens were brought to the farm, they were given glucose in water for the first three hours and then they were given small number grains (R4) or Starter for three weeks. After three weeks, they were given high number grains (R9) or Finisher for thirty days. Given food and last food were balanced every day and spent food amount was determined this way. To balance the food, a sensitive scale was used. Chickens, food and the last food were weighted with this sensitive scale. Water was given two or three times daily and food was given one time for the first four weeks and then two times with gram daily. Last food was weighted and recorded daily and new food was added to last food with gram. Some vaccinations against some virus diseases were also used in this research: on sixth day, ND+ID vaccine were applied to all chickens as eye drop where ND has BI Strain and IB has H-120 Strain. On twelfth day, IBD was applied to all chickens as eye drop. On eighteenth day, ND was

applied. This vaccine was for ND Lasota strain which was applied as eye drop.

5. Data Analysis

In this research, SPSS 20th version of 2018 which is related to IBM SPSS Statistics Company was utilized. Its General Confidence Interval is 95% and significant changes ($p < 0.05$) were taken into account. Data was analyzed for weight gaining, food changing into meet and FCR by SPSS and Ms. Excel and Graph pad were utilized for graphs drawing.

6. Result

Results and data of the research will be explained in terms of the comparison of related factors:

Daily Weigh Gain: daily weight is one of the important variable of this research and was recorded separately every week. Based on the statistical analysis, first live weight of the two group weekly comparison will be shown in chart then in graph:

Meat chickens live weight per week has been shown in the first chart, where in terms of statistical analysis no significant changes ($p > 0.5$) are felt between floor and cage chickens during 1-5 weeks; but on 6th week significant changes ($p < 0.5$) are felt between floor and cage rearing system groups. It means that on 6th week weight of floor chickens was increasing. On 3rd, 4th and 5th week, similarity in weight was because of coccidiosis disease and the correct management in floor chickens on 20th day.

Table 1: Weight gaining gram during different weeks between floor and cage rearing systems

Rearing system	Weight gain during different weeks (average standard deviation)					
	1st week	2nd week	3rd week	4th week	5th week	6th week
Floor system	94.5±3 ^a	312.46±2 ^a	797.38±6 ^a	1377.50±9 ^a	2007.24±6 ^a	2436.66±32 ^a
Cage system	98.32±1 ^a	314.40±10 ^a	816±23 ^a	1389.28±2 ^a	1983.28±61 ^a	2358.88±12 ^b

a and b are the averages having significant difference. Significant difference between averages is shown in ($p < 0.05$) surface. Six chickens gained weight average±standard deviation

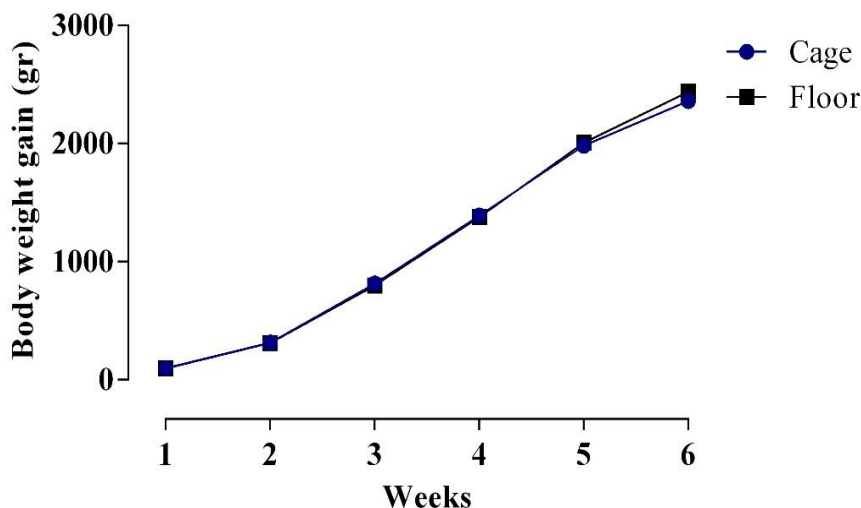


Figure 1: shows the difference of weight gaining between floor and cage rearing systems during six weeks

a-b shows significant difference between averages at the same week. Difference is supposed to be significant when ($p < 0.05$).

Averages in every week represents weight gaining average of six chickens. Error bar represents standard deviation of averages. Based on the results, there was no significant difference between floor and cage systems weight gaining in the first five weeks, but on sixth week there was a significant difference.

Food taking: food taking is the second factor of the both groups comparison. The results of this research shows that which rearing system used much food. This comparison is

based on the statistical analysis and is shown in chart and in graph:

Daily food taking of chickens during six weeks is shown in 2.1 chart, where significant changes ($p < 0.5$) are felt based on statistical analysis between floor and cage groups. There are also significant changes ($p < 0.5$) among floor and cage groups related replications; significant changes are felt among the floor replications but there is no specific significant changes among cage system replications.

Table 2: Feed intake during different rearing weeks between floor and cage rearing systems

Rearing system	Gained weight during different weeks (average standard deviation)					
	1st week	2nd week	3rd week	4th week	5th week	6th week
Floor system	159.96±2.13 ^a	581.92±1 ^a	1266.96±1 ^a	2214.24±2 ^a	3298.18±3 ^a	4414.14±4 ^a
Cage system	147.36±2.2 ^b	516.41±2 ^b	1147±2 ^b	2063.58±2 ^b	3077.64±1 ^b	4155.88±1 ^b

a and b are the averages having significant difference.
 Significant difference between averages is shown in (p<0.05) surface.
 Six chicken food taking average±standard deviation

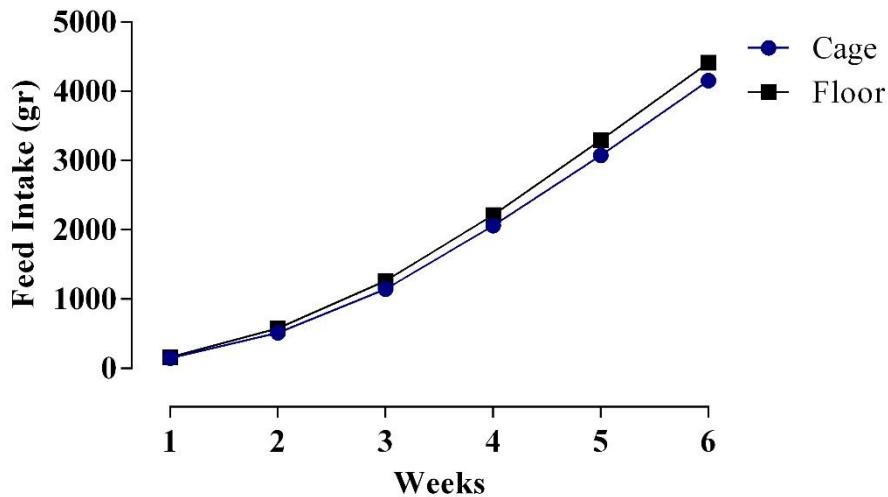


Figure 2: shows the difference of food taking between floor and cage rearing systems during six weeks.

a-b shows significant difference between averages at the same week. Difference is supposed to be significant when (p<0.05).

Averages in every week represents food taking average of six chickens. Error bar represents standard deviation of averages. Based on the results, there is significant difference in food taking of floor and cage rearing systems during all weeks.

Food changing ratio (FCR): Ratio of food changing into meat was another significant factor which is made clear in

terms of statistical analysis and then shown in chart and graph and is compared in both rearing systems:

FCR of meat chickens in floor and cage rearing system during 1-5 weeks is shown in 3.1 chart. Based on the statistical analysis there is significant difference (p<0.05) between floor and cage systems. There are also significant changes (p<0.05) among floor and cage groups replications.

Table 3: FCR during different weeks between floor and cage rearing system.

Rearing system	Gained weight during different weeks (average standard deviation)					
	1st week	2nd week	3rd week	4th week	5th week	6th week
Floor system	1.69±0 ^a	1.86±0 ^a	1.58±0 ^a	1.60±0 ^a	1.64±0 ^a	1.82±0 ^a
Cage system	1.50±0 ^b	1.64±0 ^b	1.40±0 ^b	1.48±0 ^b	1.58±0 ^b	1.76±0 ^b

a and b are the averages having significant difference.
 Significant difference between averages is shown in (p<0.05) surface.
 Six chicken food changing average±standard deviation

In the above chart, FCR of meat chickens and average standard deviation of every week (Mean SD) is shown in every column, where a in the first step and b in the second step

of the same column have significant difference (p<0.5) and the same letters have no significant difference (p<0.5).

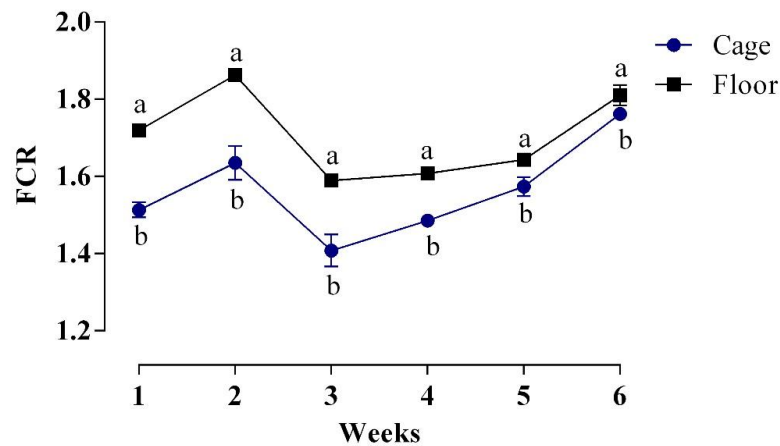


Figure 3: this graph shows the difference of food changing ratio during six weeks in floor and cage rearing systems.

a-b shows significant difference between averages at the same week. Difference is supposed to be significant when ($p < 0.05$).

Averages in every week represents food taking average of three chickens. Error bar represents standard deviation of averages. Based on the results, there is significant difference in food changing ratio of floor and cage rearing systems during all weeks.

7. Discussion

Many scientists reported that floor system is a continued and humidity over vaporizing system in which floor can easily be shifted for the relief of chickens; but cage rearing system always need less workers, it is enough careful rearing as the disease spreads less and benefits of land is taken into account, chickens are not moving a lot and their energy is not lost a lot and materials on the floor are collected easily. Materials of the floor are used as the meal of fish or as urea in both systems (Sainsbury, 1998; Lamidi, 2005; and Bessei, 2006) our data also showed the same trend, where floor materials were easily shifted floor system but the cage rearing was enough careful rearing where no disease was found. The main difference of this research is coccidiosis disease found on twentieth day floor chickens the cause of which was the grains affected with organic waste. And shifted to four chickens approximately in one day. To control this disease, we gave Pakline S syrup to chickens and it was disappeared after two days, but this disease was not found in cage chickens.

The research conducted on the rearing of meat chickens in cage and floor systems by Menal et al. (2008) at Egypt Cairo University, where the specific parameters were final weight, daily weight, ratio of changing food into meat and death. It was shown during the research (0-6 weeks) that much final and daily weight, good FCR and less death were recorded in floor chickens whereas food was used a lot in cage system but because of less activity, chickens did not gain much weight and also from the point of view of economy, chickens rearing in floor system was more useful than in cage system; because death was less in floor system. The same factors were taken into account in this research, but during getting the results of this research (0-6 weeks), much final weight, good FCR and good food taking were recorded in floor rearing, but enough weight and fair amount of food taking were recorded in cage

rearing. The amazing point in this research was having no death and was no significant difference in weight gaining till fifth week in both groups (floor and cage form rearing). But on sixth week, growth was low (2358.88) in cage rearing and high (2436.66) in floor rearing.

Anderson et al. (1994) reported that chicken rearing in floor system is better than in cage system because chickens get much weight as they do their physical and metabolic activity in a better way in floor system. The obtained results of this research show much final weight in floor chicken rearing, where the only reason is the good physiological and metabolic activities in floor chicken rearing.

Tolonet al. (1997) conducted the same research and obtained the results in 1997 that chickens rearing in cage get less weight for the whole life than rearing in floor system but with fair weight in cage system, less land is being gotten much benefit. The results of this research has difference with the above research results and that is: though less land was used in cage, weight of its chickens (1983.28) was not having any difference with floor chicken weight (2007.24).

Skinner et al. (1992) obtained comparing broiler chicken rearing in cage and floor system, the importance of FCR in chicken rearing is better in floor system than cage system because due to lack of physiological and metabolic activity ratio of food change is less in cage system. At the end of this research, FCR between the two rearing systems was having significant difference during the whole weeks, but till fifth week FCR was good and fair in cage rearing system and on sixth week though there was significant difference in, FCR in cage was better and significant than on ground. It means that food was used usefully in cage and in floor system, usage of food was a lot.

8. Conclusion

This research shows that both floor and cage rearing systems have benefits as well as risks: floor system is safe and economical system for meat chickens that different dry materials like *داری بور*, dry leaves, straw and others are utilized and it has high weight and fair food changing ratio at the last weeks of its age. This system has also some risks like getting sickness and easily spreading, needing large land, lots of food waste and others. The same is with cage system. Cage system has benefits as well as risks: its benefits are: getting

much benefit from small land, easily controlling, correct recording, lack of food waste and sickness is not found easily and can be controlled easily. Its risks are: it increases harmful gas and sometimes emotional condition happens in it.

This research shows that, there is no significant difference in growth of the chickens of cage and floor rearing systems during first five weeks but there is significant difference on sixth week.

In food taking, floor system chickens eats more than cage system chickens and floor system has lots of waste. There is significant difference in food taking.

In FCR, there is significant difference in FCR of floor and cage form. This research shows that in general broiler chicken rearing in floor and cage form has significant impacts on FCR and food taking, but it does not have significant impact on daily weight gaining, so if rearing system is taken care, cage form

rearing system will have good impact on broiler chicken weight, food consumption and FCR.

9. Recommendations

1. Looking at the benefits and risks of floor and cage form rearing systems if rearing system is taken care, cage form rearing system will have good impact on broiler chicken weight, food consumption and FCR.
2. The government should observe current quality and quantity.
3. For the production of good quality meat, the government should help farm owners as cage form rearing system needs much budget at first.

References

1. Andrews, L. D., Seay, R. L., Harris Jr, G. C., & Nelson, G. S. (1974). Flooring materials for caged broilers and their effect upon performance. *Poultry Science*, 53(3), 1141-1146.
2. Awoniyi, T. A. M. (2003). The effect of housing on layer-chicken's productivity in the 3-tier cage. *Int. J. Poult. Sci*, 2(6), 438-441.
3. Bilal, K., Mehmood, S., Akram, M., Imran, S., Sahota, A. W., Javed, K., ... & Ashfaq, H. (2014). Growth performance of broilers under two rearing systems in three different housing zones in an environmentally controlled house during winter. *J. Anim. Plant Sci*, 24(4), 1039-1044.
4. Fouad, M. A., Razek, A. A., & Badawy, S. M. (2008). Broilers welfare and economics under two management alternatives on commercial scale. *International Journal of Poultry Science*, 7(12), 1167-1173.
5. MI, A. (2013). The effects of different breeding methods on fattening performance and parameters related to slaughter, carcass and some meat quality in broiler chickens. *Kafkas Üniversitesi Veteriner Fakültesi Dergisi*, 19(2).
6. LAMIDI, W. A. (2014). Comparative Analysis of Broilers' Rearing in Different Housings Systems in Wet Humid Climate, South West Nigeria. *J. Biol. Agric. Healthcare*, 4(20), 34-40.
7. Fouad, M. A., Razek, A. A., & Badawy, S. M. (2008). Broilers welfare and economics under two management alternatives on commercial scale. *International Journal of Poultry Science*, 7(12), 1167-1173.
8. Merkle, J. W. (1984). Effect of restricted activity in cage-reared broilers upon performance, bone integrity, and muscle characteristics. *Poul. Sci*, 63(Suppl 1), 149-150.
9. Moravej, H., Alahyari-Shahrash, M., Baghani, M. R., & Shivazad, M. (2012). Withdrawal or reduction of the dietary vitamin premix on bone parameters of broiler chickens in two rearing systems. *South African Journal of Animal Science*, 42(2), 169-177.
10. Muhammad, S. A., Adeduwura, A. T., & Olayiwola, O. E. (2012). Growth performance of broiler chickens fed diets containing partially cooked sweet potato meal. *J Nat Sci Res*, 2, 50-59.
11. Rafh.M.T.Khuleel.(2014). Comparison of broile performanc under tworearing systems (floor vs cages). *jordan journal of applied science "Natural Sciences Series"*, Volume 13
12. Rodríguez, B., Valdivie, M., & Dieppa, O. (2005). Body damages associated with high stocking densities of broiler chickens in cages. *Cuban J. Agri. Sci*, 39, 61-66.
13. SANTOS, F. D. O., SANTOS JÚNIOR, A. A., Oviedo-Rondon, E. O., & Ferket, P. R. (2012). Influence of Housing System on Growth Performance and Intestinal Health of Salmonella-challenged Broiler Chickens. *Embrapa Suínos e Aves-Artigo em periódico indexado (ALICE)*.
14. Santoso, U. (2002). Effects of house type and early feed restriction on performance and fat deposition in unsexed broilers.
15. Shields, S., & Greger, M. (2013). Animal welfare and food safety aspects of confining broiler chickens to cages. *Animals*, 3(2), 386-400.
16. Skinner-Noble, D. O., Jones, R. B., & Teeter, R. G. (2003). Components of feed efficiency in broiler breeding stock: Is improved feed conversion associated with increased docility and lethargy in broilers?. *Poultry science*, 82(4), 532-537.
17. Sogunle, O. M., Egbeyale, L. T., Bajomo, T. T., Bamigboje, O. V., & Fanim, A. O. (2008). Comparison of the performance, carcass characteristics and haematological parameters of broiler chicks reared in cage and floor. *Pak. J. Biol. Sci*, 11, 480-483.
18. Swain, B. K., Sundaram, R. N. S., Barbuddhe, S. B., & Nirmale, A. V. (2002). Influence of cage and deep litter rearing systems on the performance of broilers. *Indian veterinary journal*, 79(5), 467-469.
19. Thamilvanan, T., Thiagarajan, M., Ramesh, V., Gnanaraj, P. T., & Sivakumar, T. (2001). Performance of broiler chicken under cage and floor systems of management fed differently processed feeds.
20. Tolon, B., & Yalcin, S. (1997). Bone characteristics and body weight of broilers in different husbandry systems. *British poultry science*, 38(2), 132-135.
21. Turkyilmaz, M. K., Nazligul, A., & Bardakcioglu, H. E. (2002). The effect of the floor and cage rearing systems on some production traits and livestock economics in broilers. *J Vet Sci*, 18, 99-105.
22. Wang, S. U., Zhang, X., Huang, B. L., Sheng, F., Li, K., & Ren, S. (1997). Comparison among different broiler-rearing technical crafts. *Transactions of the Chinese Society of Agricultural Engineering*, 13, 96-98.
23. Willis, W. L., Murray, C., & Talbott, C. (2002). *Campylobacter* isolation trends of cage versus floor broiler chickens: A one-year study. *Poultry science*, 81(5), 629-631.