ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 09, Issue, 05, pp. 27679-27684, May 2019

RESEARCH ARTICLE OPEN ACCESS

FAMILY INCOME AND OCCUPATION, PROMOTED BY THE SEMI-INTENSIVE POULTRY FARMING SYSTEM

***Carlos Tadeu Bandeira de Lavor, Thalita Evangelista Bandeira, Lia Corrêa Coelho, [1]Patricia Araújo Rodrigues, Maria Izabel Florindo Guedes and Marcone Sampaio Oliveira**

Postgraduate Program in Biotechnology of the Northeast Network of Biotechnology, State University of Ceará, Silas Munguba Avenue, 1700, Itaperi Campus, CEP: 60740-903, Fortaleza-Ce, Brazil

ARTICLE INFO

Article History:
Received 15th February, 2019
Received in revised form
29th March, 2019
Accepted 03rd April, 2019
Published online 30th May, 2019

Key Words:
Sustainability; Animal welfare;
Social justice; Environment.

ABSTRACT

The objective was to produce meat rustic chicken, to develop poultry farm with technical and economic viability in a semi-confined system, promoting work, production and income. The farm was planned with four areas (A, B, C and D). Family members were instructed on how to develop the activity. 100 chickens were raised each month.Data collection was done weekly, by weighing the batch. All batches showed good growth performance, which promoted satisfactory income from the sale of slaughtered poultry, with a net revenue forecast of R$ 899.18 each month. The Mean live weight, 2427,33 ± 91,84 g, mean slaughter weight, 1844,02 g ± 56,79, the mean weight of the slaughtered flock 176,02 Kg ± 3,36, Food conversion 2,67 ± 0,10, Mortality 4,50% ± 2,07, Viability 95,50% ± 2.07 and 70,00% ± 4,69 Food efficiency on Carcass. The model of rustic fowl raising here proposed proved to be sanitary and economically viable.

Citation: Carlos Tadeu Bandeira de Lavor, Thalita Evangelista Bandeira, Lia Corrêa Coelho, 1Patricia Araújo Rodrigues, Maria Izabel Florindo Guedes and Marcone Sampaio Oliveira, 2019. "Family income and occupation, promoted by the semi-intensive poultry farming system", *International Journal of Development Research*, 09, (05), 27679-27684.

INTRODUCTION

In order to dynamize the economic life and promote social justice, it is necessary to implement policies that value the diversity of the region and rural populations, as well as their practices of use and appropriation of natural resources. Those policies challenge the brutal inequality existent in Brazil since its origins, and reflect the country's vision that "a rich country is that without social misery". Family farmers, quilombolas, artisanal fishermen, extrativists and ribeirinhos, including urban people, are partners in the construction of a more just and democratic society. Programs on social inclusion and citizenship invest on promoting agroecology, but also on production diversification and the transforming power of family owned business, besides promoting more gender equality and production sustainability for the families. Poultry farming is highly important in small farm for the northeastern region of Brazil, both in the issue of food security for the family and in the economic aspect (GalvãoJúnior *et al*., 2009, Siqueira, 2014).

Corresponding author: **Carlos Tadeu Bandeira de Lavor**
Postgraduate Program in Biotechnology of the Northeast Network of Biotechnology, State University of Ceará, Silas Munguba Avenue, 1700, Itaperi Campus, CEP: 60740-903, Fortaleza-Ce, Brazil

The increasing search of consumers for differentiated products that also have higher quality has been influencing changes in the systems used for chicken production. Society is interested in production systems that increase the animals' wellfare. Consumers are prompt to pay more for certified products with guarantee of "Animal Wellfare" (Nazareno *et al*., 2011; Queiroz *et al*., 2014; Moyle *et al*, 2014 and Carvalho *et al*., 2017), which makes it necessary to implement changes that can improve this wellfare, offering new products for those consumers. In rustic poultry production, outdoor access is a key feature and can provide birds with generous space, open air, and the opportunity to express a diversity of behaviors. It also may allow poultry the ability to self-harvest the nutrients available (Ifoam, 2014) and Pinto (2011) states that poultry farming is one of the industry's sections that is the most demanded in terms of changes, for which it needs to readapt to keep itself in the market. The semi-intensive poultry farmingis considered an alternative to the industrial system (Sousa *et al*., 2009). This system, colloquially known as "heritage poultry" or "rustic", allows the chickens to have free access to the grazing areas, resulting in particular differences on their alternative meat chicken quality when compared to the meat chickens of the industrial model (Fanatico *et al*., 2007; Mikulski *et al*., 2011). According to Silva and Nakano (1998),

such differences occur mainly due to the animals' ingestion of cattle run, vegetables, insects, worms and wigglets, all abundant in the pasture area. With that in mind, traditional consumers prefer the flavor and differentiated texture of the meat of semi-intensive raised poultry, considering it more "natural" as compared to the meat of poultry raised in confinement systems. These characteristics would result in dishes and culinary preparations with better aspect and flavor, representing a great production alternative directed to a selective consumer market (Santos *et al*., 2012). The farmers are now selling their products directly to the public. Large-scale agricultural production is poisoning the soil with water collections and contaminating communities. Buying directly from family farminghelps reducing this harmful trend. By purchasing local farmer products, it contributes to maintaining a balanced environment, a healthy community and a strong and sustainable regional economy. Animal wellfare and health must be considered in the production system (Santos, 2009). Production and quality are linked to the animal's wellfare, therefore farming systems must try to control the internal environment of poultry housing and pasture area, which is fundamental to the success of this activity, making it also necessary to be knowlegeable about the environmental needs of the animals and the region's climatic conditions (Santos *et al*., 2014). The climatic conditions should be specially considered in Brazil's northeastern region, where temperatures along the year are predominantly high (Lavor *et al*., 2008), for the purpose of attending the animals' and consumers' needs.
The farming of rustic poultries is a good option for people who want to insert themselves in thepoultry market, because besides being a market that is still not largely explored, it may proportionate a new source of income for the farmer, turning the small farmer economically viable (Lavor, 2007). Alternative production technologies acquire more relevance as exigencies of environmental conservation are incorporated in the production process. Environmental conservation, besides having a social benefit, tends to become a competitively component of products in the market, as they have higher aggregated value (Figueiredo; Soares, 2012; Morais, *et al*., 2015).

The use of alternative aviculture, in contrast with industrial aviculture, with improved lineages that adapt well to warm climates, showing satisfactory zootechnical performance (Dias, *et al*., 2016), has as main advantages the necessity of small land areas for poultry housing implantation,also being distinctive among lucrative activities, with possibility of application in those small lands. It is even possible to be applied on weak and invaluable degraded lands, which might have their potential restored through the incorporation of the animal manure to the soil. Another advantage is the use of family labor, since it is an easily manageable farming system. The greatest advantage, however, is the demand for the final product, since it is differentiated, and free of the chemicals from the animal feed and the ones generated by the confinement stress. The main factor that allows an excellent economical profit in this alternative system model is the fact that it meets the requirements established by the European Union, one of its leading consumer markets. Conjointly, it follows the principles of animal welfare. Nowadays, this subject is one of the most debated, as it concedes the animal the possibility of expressing its natural behavior, free of thirst or hunger, which is one of the five liberties that are comprised by the standards of animal welfare (Azevedo *et al*., 2016).

Given the above exposed, raising poultry using simplified techniques, safe both from the sanitary and economical points of view, is an alternative to proportionate social justice and income to people, deserving more attention from governmental research funding agencies (Bridi *et al*., 2016). The objective was to present the technical and economic viability of rustic poultry production, providing occupation, production of quality foods and income for farmers.

MATERIALS AND METHODS

This study was conducted according to the IN 36/2012 of the National Program of Avicultural Health of the Ministry of Agriculture, Livestock and Supply - Brasília - Brazil 1998 in the Technological Education Center Institute in the city of Barreiras, Ceará, 4°17'01.9"S 38°38'19.8"W. where initially a nucleus composed of four pasture area (A, B, C e D) with areas of 200 m² each was projected, surrounded with sticks and subdivided as shown (Figure1). At the center of the nucleus, a roofed space subdivided into four serves each of the pasture areas. For the pilot project, a pre-existent poultry house was restored, measuring 2,0 meters of lenght and 4,0 meters of width, totalizing 8,0 m² of covered area, to be used as a chick house. All flocks between 0-21 old-day were kept in this space (Figure2 c). Costs, in Brazilian currency (Real), applied over the implantation of the experimental nucleus elaborated according to the design (Figure 01) and the renovation of the chick house, as well as expenses with veterinarian technical services during the study and human resources engaged in the physical structure's construction and adaptation (plummer, bricklayer, electrician) totalized R$ 30.507,95. The pasture areas were constructed in a land surrounded by trees, which provided shading in range areas during the day. For forage support of thepasture areas,were grown*Clitoriaternatea* L, a leguminous plant, and *Pannisetumpurpureum*, a species of grass (Figure 2 a and d). Water was offered through an automatic dispenser installed in the pasture area and another installed in the roofed area. Concentrated feed, formulated only with ingredients of plant origin,was offered daily in the morning, through two automatic food dispensers, with capacity to hold 15kg of feed, both placed in the roofed area. The birds' access to the pasture areawas permitted in early mornings through the opening of the entrance and exittrop door, as shown in (Figure2 e). The family members involved in the experimental project were previously instructed on how to develop the activity. Practical training occurred during the process of raising the animals. They received instructions until the 7th batch. Each month, 100 chicks were placed in the area, bought from commercial suppliers with lineages adapted to the semi-intensive system. The poultry were raised according to technical raising standards, with feed provision control, with a brooder in the chicks lodgment and prophylactic measures with vaccination, adapting to the rustic installation conditions. Feed consumption was limited in all raising phases. At an initial stage, which occurred from the 1st to the 21st days of age, the animals consumed 800g/animal of concentrated feed; in the growth stage, which began on the 22nd day and ended on the 60th, consumption was of 1600g of concentrated feed per animal. In the final phase, from the 61st day of age to the 91st (slaughtering age), the consumption of balanced feed was of 4000g per animal. During the growth phase and final phase, besides the feed, the birdswere allowed to freely consume the pasture and a total of 5 Kg/day/batch of chopped grass and leguminosae was offered as well.

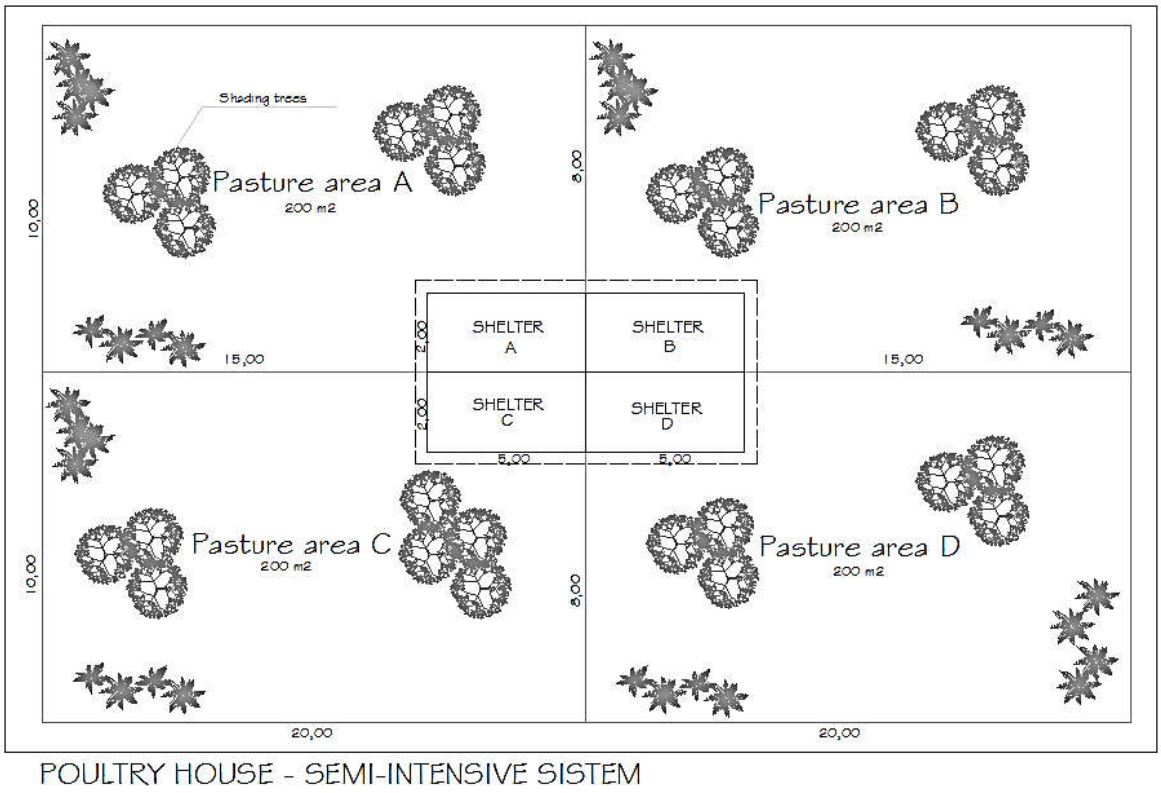
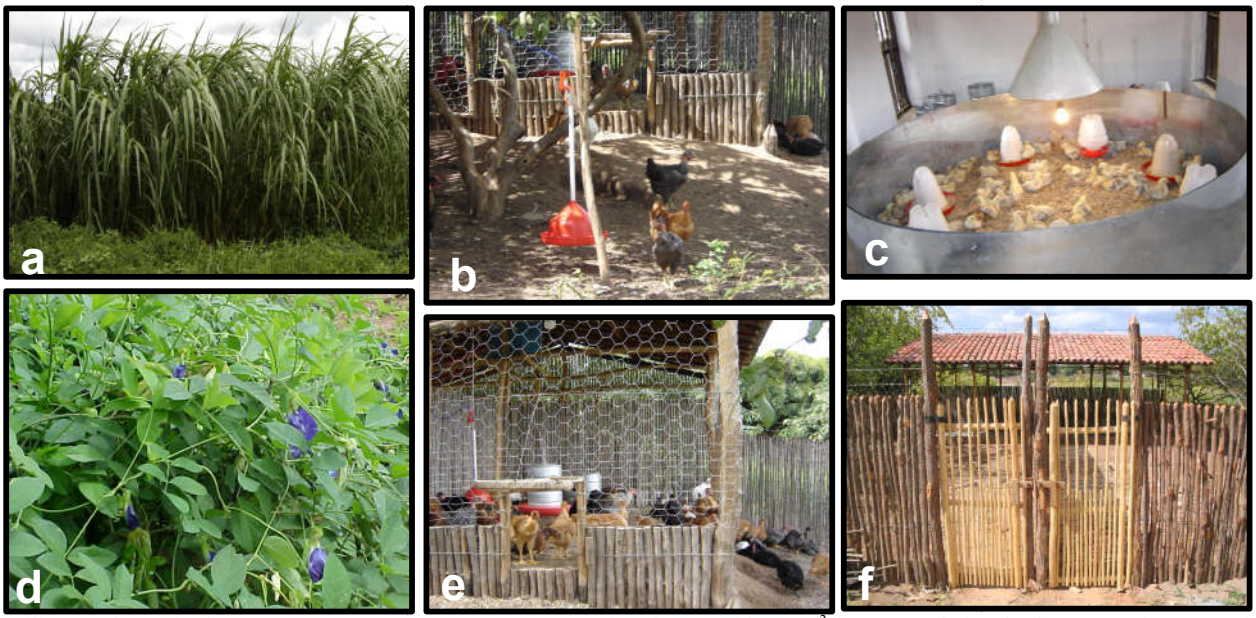


Figure 1. Schematic diagram of the physical structure for the construction of poultry house



The images illustrate the production process: (a) *Pannisetumpurpureum*, a species of grass, with 100 m^2 for support during the dry season. (b) presentation of the birds in a shaded area of the pasture area and a drinking fountain. (c) presentation of the chicks in protection circle, where the flocks remained for 21 days old. (d) *Clitoriaternatea* L, a leguminous plant with 100 m^2 for green support during the dry season. (e) View of the "trapdoor" passage that is open in the morning in the first management that makes an exchange between the pasture pasture area and covered area where the birds are housed at night and where the feeders are located with balanced feed and a pendulum drinker automatic. (f) front view of access gates to pasture area (C and D).

Figure 2. Forrage support area, the pasture area, protection circle and the entrance of the pasture area

The chickswere initiallyplaced in a chick house, until 20 days of age, and were then transferred to the poultry house, following the lodgement chronogram.

Chick House: One-day old chicks were placed in a protection circle with a bell jar for artificial heating; inside of the of the circle 4 chick-type drinkers and 4 chick-type feeders were layed for water and balanced feed provision, respectively, until the completion of 21 days. Starting from the 21st day, each batchwas transferred to the poultry house nucleus. After transferring all the batches of chicks, the circle and equipments were removed, the chick house was broomed and washed, as well as the equipments, and pulverized with formaldehyde dissolved in water at a 5% concentration. The chick housewas then subjected to 7 days of rest and sanitary emptying, by the end of which a new pulverization was made, in order to receive the next batch of animals, which was always placed 30 days after the placement of the previous batch.

Poultry House: The batch completed 22 days of age in the poultry house and transferring occurred in the 21st day of

housing, being the animals distributed in sequence from poultry houses A to D, starting from the 1st batch to the 4th, respectively. Animals were slaughtered at 91 days-old (13 weeks). The first batchwas kept in thepoultry house. A from the 4th to the 13th weeks; the second batch entered the poultry house B at the 7th week and was removed in the 17th week; the third batch stayed in poultry houseC from the 12th to the 21st week, whereas the fourth batch was placed inpoultry house D from the 16th to the 25th weeks. The cycle was reinitiated with batch 5 being placed atthepoultry house A at the 20th experimental week, which had been empty and in sanitary resting for 6 weeks.

The same cycle and duration of the experiments applied topoultry houses B, C and D. After transferring, the 21-days-old chicks were allowed access to the pasture area, with an approximate area of 200 m^2, being recollected to the poultry house at the beginning of evenings. Pasture grazing were indirectly offered twice a day to the chicks, being cultivated, harvested and sliced outside the pasture area (Figure 2 a and d).

RESULTS

Mean living weights distributed from the 1st to the 13th weeks, with crescent evolution and the final mean weight

Table 1. Means weights of birds (g) 1-91 day old

Week	Flocks					
	1	2	3	4	5	6
0	38,9	36,7	37,6	41,8	40,8	41,5
1	56,4	53,5	54,8	60,8	59,4	60,4
2	118,6	114,5	115,7	117,0	120,7	122,6
3	208,3	196,6	201,4	204,5	209,6	222,3
4	414,3	391,3	400,4	435,1	434,5	441,9
5	710,2	673,8	690,3	747,8	749,0	802,7
6	862,5	823,5	847,8	937,5	915,1	929,8
7	1.165,8	1.100,0	1.126,0	1.252,7	1.222,7	1.243,5
8	1.547,5	1.460,0	1.495,8	1.662,0	1.623,0	1.649,0
9	1.823,0	1.720,0	1.760,0	1.890,0	1.910,0	1.940,0
10	1.907,0	1.800,0	1.844,0	2.050,0	2.000,0	2.035,0
11	2.210,0	2.100,0	2.140,0	2.380,0	2.320,0	2.365,0
12	2.350,0	2.220,0	2.270,0	2.520,0	2.400,0	2.400,0
13	2.384,0 ±34,86^{d}	2.460,0 ±40,27^{bc}	2.270,0 ±49,57^{e}	2.530,0 ±43,20^{a}	2.430,0 ±21,21^{c}	2.490,0 ±22,30^{ab}

Different letters represent statistical difference $p < 0.05$ by the *t* test.

Table 2. Means of the zootechnical indexes of six flocks

Zootechnical indexes	Mean	±sd	CV%
Mean live weight	2.427,33 g	91,84	3,78
Mean slaughter weight	1.844,02 g	56,79	3,07
Mean weight of the slaughtered flock	176,02 Kg	3,36	1,91
Food conversion	2,67	0,10	3,91
Mortality	4,50%	2,07	46,08
Viability	95,50%	2,07	2,17
Food Efficiency on Carcass	70,00%	4,69	6,71

Table 3. Production costs of 100 rustic chickens

MONTHLY VARIABLE COST				
ITEM	*Unit*	*QUANT*	*R$ UNIT*	*R$ TOTAL*
CHICK ONE DAY OLD	Unit	100	2,20	220,00
CHICKEN BED	Kg	10	0,90	9,00
VACCINES	Unit	1	30,00	30,00
FEED 6.400g/ POULTRY	Kg	860	2,00	1.720,00
FORAGE 3.500g/ POULTRY	Kg	1000	0,04	40,00
ELETRIC ENERGY	Watts	100	0,10	10,00
SLAUGHTER	Unit	100	0,50	50,00
PACKING	Unit	100	0,05	5,00
TOTAL				2.084,00
MONTHLY FIXED COSTS				
TECHNICAL ASSISTANCE	Verba	0,1	954,00	95,40
CLEANING AND DISINFECTION	Verba	1	30,00	30,00
SUBTOTAL				125,40
OTHERS (3% onitemsabove)				3,76
TOTAL				129,16
MONTHLY REVENUE FORECAST				
CHICKEN MEAT	Kg	176,02	17,00	2.992,34
CHICKEN BED	Kg	300	0,40	120,00
TOTAL				3.112,34
PROJECTION OF ANNUAL REVENUE				
CHICKEN MEAT	Kg	2112,24	17,00	35.908,08
CHICKEN BED	Kg	3600	0,40	1.440,00
TOTAL ANNUAL REVENUE				37.348,08
PROJECTION OF ANNUAL RESULTS				
TOTAL ANNUAL REVENUE (1)				37.348,08
TOTAL VARIABLE COSTS (2)	Months	12	2.084,00	25.008,00
CONTRIBUTION MARGIN (1-2)				12.340,08
TOTAL FIXED COSTS	Months	12	129,16	1.549,94
TOTAL NET INCOME				10.790,14
MONTHLY NET REVENUE FORECAST				899,18
MONTHLY NET REVENUE FORECAST / POULTRY				8,99

among the flocks presented statistical difference for $p < 0.05$ as shown in Table 1, and indicating that the means weights were within the standard growth curves of the activity.The mean slaughtered weight, as well as the mean weight of the slaughtered batch, feed conversion, mortality rate, viability and feed efficiency presented in Table 2, were within the standard of the lines used in this work even with the consumption limit in 6400g of concentrated feed per poultry and complementing the nutrition with grass. The use of alternative feeding methods, which have the potential to impact the use of the pasture area. Chickens can get protein and other nutrients from the grass. In this work all the data of the costs of production with monthly variable costs, monthly fixed costs were collected; the monthly revenue forecast was based on the amount of kilograms of carcass and bed of shed produced by the 6 flocks and this led to the projection of annual revenue and projection of satisfactory annual results as presented in Table 3.

DISCUSSION

A free-choice feeding method is a way to incorporate nutrients from pasture areas into diets where birds choose complementary foods to reach nutrient levels (Fanatico *et al*., 2016). Corroborating with the work of Silva *et al*. (2003) who found final weights between 2754g, 2699g, 2589 and 2089g, but with feed consumption (7877-5824g), being different from the higher of the feed consumption of this work and also with the higher feed conversion (3.56-3.28). Madeira *et al*. (2010) found feed efficiency of 70.03% in a semi-confined system similar to that of this experiment. Gomes *et al*. (2007), which included birds with crop, found a good performance of mean weight (2100g) with low mortality (2%), showing that this activity increased family income, besides contributing to the quality of family food with direct consumption of chicken meat, being that the mean weight was below those found in this experiment but with lower mortality. Avila *et al*. (2005), found a mean viability of 92.59%, lower than those found here, mean weight of 2619g with feed consumption of 8505g on mean while the mean weight found here was below the mean weight of these authors, since the feed intake per bird was 2005g below the consumption of the birds of Avila *et al*. (2005) as well as feed conversion had a lower index than the 3.25 of the mentioned authors and 3.00 of Schmidt and Figueiredo (2007) Carbone *et al*. (2004) found performance indices for the hickling chicken with an mean weight of 1700g-2200g with a low mortality rate (2-7%) after 85-90 days of breeding, lower indexes than those in this study, being feed conversion 1.56-2.04, lower than in this experiment. Silva *et al*. (2003) comparing four strains for mean body weight and feed conversion reached weight of 1662.5g, 1895.5g, 2411,75g and 2490g with feed conversion 2,94, 2,91, 2,92 and 3,10 respectively, and Guelber Sales *et al*., (2009), analyzing the performance of broiler chickens in coffee plantations were found to have an mean weight of 2730 g and feed conversion ratio of 3.4, being the highest of the results presented here. Sousa *et al*. (2009) obtained mean results of weight in four batches of 2339.4g and systematizing production costs in comparison with the revenues presented a rate of return of R$ 2.30 for each R$ 1.00 invested despite this systematization be elaborated only with food and medication costs, whereas in this work the costs are more complex and presented satisfactory results presented in Table 03.Regarding financial income, this work had a net value per bird, higher than the R$ 5.27 of the work of Guelber Sales *et al*., (2009). Valentim *et al*. (2017) affirm that this type of breeding is very profitable when using appropriate management techniques that are within the reach of the small producer, Abbas (2014) states that in addition to governments assuming their role of encouraging small-scale poultry production, there must be improved skills of small producers through education and training in poultry management, techniques that were followed in this work and confirmed in the results, since their implantation is of low cost and good return, when following the indicated procedures of handling, sanity, feeding, among others. These procedures are not difficult to follow and neither costly, and the producer can adjust his production and have a higher profitability.

Conclusions

The rustic poultry raising system proposed through the present study is economically and sanitarily viable. With financial support for the initial implementation, the resulting monthly wage corresponds to approximately a Brazilian minimum salary to the small farmer. This pilot project, if conducted in a professional and organized matter, with the respective adaptations to geographic, social and technological conditions, may be exposed to other regions.

Conflict of interests: The authors declare that there is no conflict of interests regarding the publication of this article.

Acknowledgements

The present work has been supported by Technological Education Center Institute. The authors would like to thank Dr. A.A.O. Fernandes, Director of Institute, for the assistance in providing of poultry house and the animals for the experiment.

REFERENCES

Abbas TE. 2014. Poultry welfare in developed and developing countries. Anim. Vet. Sci. 2: 1-4.

Ávila VS, Angonese C, Figueiredo EAP. 2005. Criação de frangos coloniais: uma alternativa para a pequena propriedade familiar. Nordeste Rural. Negócio do campo, p. 1-4.

Azevedo GS, Souza JPL, Cardoso JA, Araújo PHH, Santos Neta ER, Novas MPV. 2016. Produção de aves em sistema orgânico. PUBVET. 10: (4)327-333.

Bridi AM, Muniz CASD, Sampaio AAB. 2016. Produção agroecológica de frango – Londrina: UEL/PET-Zootecnia.

Carbone GT, Sato GS, Moori RG. 2004.Cadeia produtiva de frango caipira no interior do estado de São Paulo: uma alternativa de microempresa de agronegócio. Brasília: Rev. Sebrae. 3: 114-124.

Carvalho LC, Romano GG, Ivo MA, Rodrigues RF. 2017. Bem-estar na produção de galinhas poedeiras – revisão de literatura. Ver. Cient. Med. Vet.28: 1–14.

Dias AN, Maciel MP, Aiura ALO, Arouca CLC, Silva DB, Moura VHS. 2016. Linhagens de frangos caipiras criadas em sistema semi-intensivo em região de clima quente. Pesq. Agro. Bras. 51: (12) 2010-2017. http://doi: 10.1590/S0100-204X2016001200012.

Fanatico AC, Owens-Hanning CM, Brewer-Gunsaulis VA, Donoghue AM. 2016. Choice feeding of protein concentrate and grain to organic meat chickens. JournalAppl.Poult. Res. 25: 156–164.

Fanatico AC, Pillai PB, Emmert JL, Owens CM. 2007. Meat quality of slow-and fast-growing chicken genotypes fed

low-nutrient of standard diets and raised indoors or with outdoor access. Poult. Sci. 86, 2245-2255. http://doi: 10.1093/ps/86.10.2245.

Figueiredo EAP, Soares JPG. 2012. Sistemas orgânicos de produção animal: dimensões técnicas e econômicas. In: 49ª Reunião Anual da Sociedade Brasileira de Zootecnia A produção animal no mundo em transformaçãoBrasília – DF, 23 a 26 de Julho de 2012. Anais... Brasília – DF.

Galvão Júnior JGB, Bento EF, Souza AF. 2009. Diagnóstico da realidade dos criatórios de aves na comunidade base física – Ipanguaçu/RN. Holos. 4: 120-126.

Gomes AP, Silva AM, Guelber Sales MN, Silva VM. 2007. Integração de aves com lavouras na transição agroecológica da agricultura familiar: relato de experiência em Jaguaré, Espírito Santo. Resumos do V CBA - Manejo de Agro ecossistemas Sustentáveis. Rev. Bras. Agroecol. 2: (2) 867-871.

Guelber Sales MN, Silva AM, Gomes AP, Sena RR. 2009. EvaluandolaSustentabilidad de la Avicultura a Pequeña Escala: Estudio de Casos sobre Sistemas Agroecológicos en Espírito Santo, Brasil. Rev. Bras. Agroecol.4: (2) 2746-2750.

International Federation of Organic Agriculture Movements (Ifoam). 2014. The Ifoam Norms for Organic Production and Processing. Available in: <http://infohub.ifoam.bio/sites/default/files/ifoam norms version july 2014.pdf.> Accessed november 02, 2018.

Lavor CTB, Fernandes AAO, Sousa FM. 2008. Efeito de materiais isolantes térmicos em aviários no desempenho de frango de corte. Rev.Ciên. Agro. 39: 308-316.

Lavor CTB. 2007. Galinha caipira x granjeira: um empate técnico. Por uma renda mínima aos produtores. Brasília: Rev. Sebrae Agroneg. 6: 40-43.

Madeira. LA, Sartori JR, Araújo, PC, Pizzolante CC, Saldanha ESPB, Pezzato CA. 2010. Avaliação do desempenho e do rendimento de carcaça de quatro linhagens de frangos de corte em dois sistemas de criação. Rev. Bras. Zootec. 39: (10) 2214-2221.

Mikulski D, Celej J, Jankowski J, Majewska T, Mikulska M. 2011. Growth performance, carcass traits and meat quality of slower-growing and fast-growing chickens raised with and without outdoor access. Asian-Australasian J. Anim. Sci. 24: 1407-1416. http://doi: 10.5713/aja s. 2011.11038.

Morais J, Ferreira PB, Jacome IMTD, Mello M, Breda FC, Rorato PRN. 2015. Curva de crescimento de diferentes linhagens de frango de corte caipira. Ciên. Rural, Santa Maria.45: (10) 1872-1878.

Moyle JR, Arsi K, Woo-Ming A, Arambel H, Fanatico A, Blore PJ, Clark FD, Donoghue DJ, Donoghue AM. 2014. Growth performance of fast-growing broilers reared under different types of production systemswith outdoor access: Implications for organic and alternative production systems. J. Appl. Poult. Res. 23: 212–220. http://dx.doi.org/ 10.3382/japr.2013-00882.

Nazareno AC, Pandorfi H, Guiselini C, Vigoderis RB, Pedrosa EMR.2011. Bem-estar na produção de frango de corte em diferentes sistemas de criação. Eng. Agrí. Jaboticabal. 31: (1) 13-22.

Pinto ES. 2011. Visão da produção de ovos para os próximos dez anos: Quais são os desafios e o que fazer? In: Congresso de APA, Produção e Comercialização de ovos, 12, 2011, Ribeirão Preto. Anais... Ribeirão Preto: APA, 2011. Palestra.

Queiroz MLV, Barbosa Filho JAD, Albiero D, Brasil DF, Melo RP. 2014. Percepção dos consumidores sobre o bem-estar dos animais de produção em Fortaleza, Ceará. Rev. Ciên. Agro. 45: (2) 379-386.

Santos ELB, Junior GN, Leandro JB. 2012. Estudo de viabilização da produção alternativa de aves. Tékhne e Lógos, Botucatu, SP. 3: (1) 16-28.

Santos GB, Sousa IF, Brito CO, Santos VS, Barbosa RJ, Soares C. 2014. Estudo bioclimático das regiões litorânea, agreste e semiárida do estado de Sergipe para a avicultura de corte e postura. Ciên. Rural. Santa Maria. 44: (1) 123-128.

Santos MJB. 2009. Sistema de produção de frangos de corte caipira com piquetes enriquecidos e sua influência no bem-estar animal e desempenho zootécnico. Recife, 2009. 96 p. Dissertação(Mestrado em Engenharia Agrícola da Universidade Federal de Pernambuco - UFPE).

Schmidt GS, Figueiredo EAP. 2007. Dimensionamento de um sistema de produção agroecológica de frangos de corte. I. Sistema de integração. Resumos do II Congresso Brasileiro de Agroecologia. Rev. Bras. Agroecol. 2: 1, 1134-1136.

Silva MAN, Hellmeister Filho P, Rosário MF, Coelho AAD, Savino VJM, Garcia AAF, Silva IJO, Menten JFM. 2003. Influência do sistema de criação sobre o desempenho, a condição fisiológica e o comportamento de linhagens de frangos para corte. Rev. Bras. Zootec. 32: (1) 208-213.

Silva MJ, Menezes GP, Oliveira MSS, Paula FC, Santos EM. 2003. Avicultura alternativa como fonte de renda e melhoria da qualidade de vida nas propriedades de produção familiar. Available in: <http://www.pantanal2002.UCBD.br/eixos/eixo02.pdf.>Accessed november 02, 2018.

Silva RDM, Nakano M. 1998. Sistema Caipira de criação de galinhas. Piracicaba: O Editor. 110p.

Siqueira AF. 2014. Criação, Manejo e Comercialização de Galinhas Caipiras e Ovos. Anais...XVIII Seminário Nordestino de Pecuária – PECNORDESTE. Fortaleza, 2014.

Sousa LC, Souza FNS, Silva DS, Almeida VR. 2009. Avaliação do Desempenho Zootécnico da Avicultura. Resumos do VI CBA e II CLAA. Rev. Bras. Agroecol. 4: (2) 1600-1603.

Valentim JK, Bittencourt TM, Rodrigues RFM, Roberto CHV. 2017. Utilização de probióticos para aves tipo caipira. *Nutritime Rev. Eletrônica, Viçosa,* 14: (6) 8041-8050.

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