ECONOMIC ANALYSIS AND CARCASSES QUALITY NAKED NECK CHICKEN FED FOLIAGE SHRUBS

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ABSTRACT

A differential explicative study was conducted to analyze economic indicators and carcass quality (sacrifice to 84 days old) naked neck chickens fed with 5% shrub leaf meal (group 1, Gliricidia sepium, 2, Cajanus cajan, and 3, Morus alba) and control group (diet based on corn and soybeans). Analysis for 2000 animal (500 per group, 50% by sex, initial weight 50 g per animal) was performed. They were reared in floor (free access to water and food and night lighting). The direct cost accounted between 48.87-51.91% of the value of production and food had the highest relative value. M. alba had the highest net income per animal. The cost per dollar ranged from 0.51-0.56 and cost benefit ratio 1.79-1.96. The best financial indicators were obtained in control, followed by M. alba. Investment indicators of M. alba were close to control. No system presented losses. The best indicators of the carcasses, efficient use of energy and protein, lean cost carcasses, cold performance (84.18%) and less fat ratio were obtained with M. alba. We can use these indicators, market segmentation, for the adoption of a power system that benefits human health, by reducing the fat in meat naked neck chickens consuming M. alba.

INTRODUCTION

The replacement of grains per shrub foliage for feeding poultry, is a viable alternative that leverages the production of plant biomass in tropical countries (Guelber 2012, Ravindran 2013 and Pietsch 2014). The feeding system of farm animals is one of the factors that most affect their productive economic performance and carcass quality, where the use of bushes has a fundamental value in improving these indicators (Herrera 2014 and Cino et al., 2014). However, it is not known what effects would the replacement of corn and soybeans, for leaf meals shrub in the diet of chickens neck bare, regarding the economic, financial and investment feasibility and quality indicators carcasses for the selection of the feeding system and a tool for market segmentation meat.

So in this research, the following hypothesis is proposed: the economic, financial and investment indicators feeding system with 5% flour Morus alba could be close to the basal diet with corn and soybeans, naked neck chicken generate lean carcasses. The aim of the study was to analyze the economic, financial and investment indicators and carcasses quality of naked neck chicken that were fed shrub leaf meal.

MATERIALS AND METHODS

Study type

An explanatory study of differences between groups was performed with attribution of causes and experimental randomized block design, to analyze the effect on economic indicators and naked neck chicken carcasses, fed shrub leaf meal during the period from September to November 2014, in the experimental farm "La María" State Technical University of Quevedo (UTEQ), Quevedo, Los Ríos province, Republic of Ecuador, to 01° 06' south latitude and 79° 29' west longitude, 75 meters above sea level, with an average temperature of 24.70 °C, relative humidity of 87%, average annual rainfall of 2613 mm, annual heliophany of 886 hours and clay loam soil.

METHODS

With data from the experimental results of productive behavior (Table 1) and quality of channels 192 chickens (50% of each sex) heterozygous naked neck (T451N), fed with 5% shrub leaf meal (experimental groups: I system with Gliricidia sepium; II system with Cajanus cajan and III system Morus alba) and a system with diet based on corn and soybean (control group). Economic, financial and investment analysis estimated for 2000 a poultry farm animals (500 animals, group
Information of productive animal behavior and energy and protein diets in the four feeding systems.

<table>
<thead>
<tr>
<th>Production indicators</th>
<th>Feeding systems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Corn and soybean</td>
</tr>
<tr>
<td>Average daily weight gain (g)</td>
<td>35.70</td>
</tr>
<tr>
<td>Live body weight (g)</td>
<td>3048.52</td>
</tr>
<tr>
<td>Total consumption of food (g)</td>
<td>8644.18</td>
</tr>
<tr>
<td>Metabolizable energy intake (ME) (MJ)</td>
<td>7.28</td>
</tr>
<tr>
<td>Crude protein intake (CP) (g)</td>
<td>172.60</td>
</tr>
</tbody>
</table>

Start average weights of the animals were 50 g (one day old). They were vaccinated against Newcastle (Life, Guayaquil, Ecuador) on arrival at the facility. They were conducted under heating, the initial seven days. These heaters were connected four hours before arrival of the animals. They were housed in rustic facilities and raised in floor with a bed of 15 cm chip. They received once daily ration and had free access to water and food, with artificial night lighting. Each breeding lasted 84 days, plus 37 days of cleaning and restocking of supplies and animals, for the next breeding, with three production cycles per year.

The direct cost accounted between 48.87-51.91%, the value of production and within the elements of direct cost, the highest relative value it had the power, followed by investment by purchasing animals, wages and other respect the total cost, in all cases (table 2). The highest net income per animal it had the feed system M. alba and control outperformed the other groups at all (table 3) economic indicators. No system introduced economic losses. The cost to produce a dollar was about 50% of its value and benefit cost ratio was greater than one and next two, in all cases. It is necessary to emphasize the lowest daily cost of maintenance of the animals and cost per kilogram of live weight produced, compared to the selling price per kilogram ($ 3.30 USD).

The best financial indicators were obtained in the group that consumed the diet based on corn and soybeans, followed by animals that consumed M. alba and the worst were to G. sepium (table 4). In these indicators the importance of net income ratio for direct costs, where the superiority of the basal diet group showed stands. The most unfavorable investment indicators were with flour shrub though, with M. alba nearest the group consuming the basal diet (table 5) results found. It should be noted that the recovery time of investment was low.

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Cost sheets were performed by production system for calculating the evaluation indicators of economic and financial feasibility and investment, where the live weight was the only item. The chips were composed of: fixed costs (depreciation of equipment and installations), variable costs (costs included food, health, wages, maintenance and other variable costs), indirect production costs (electricity and water) and investment (purchase of animals). Depreciation by linear method ((cost of the asset - value residual)/ year of the asset) was the percentage distribution of direct costs to total costs and production value was effected and economic indicators were calculated: cost/animal, cost/animal/day, unit cost, cost/$ produced, production value, value benefit/cost, profit or economic loss, net income/animal, economic gain/animal.

Economic Analysis And Carcasses Quality Naked Neck Chicken Fed Foliage Shrubs

RESULTS AND DISCUSSION

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requirements of the birds with the resources available in tropical countries, to ensure the development of an autochthonous poultry (Monforte et al., 2002). Fumero et al. (2010) and Ravindran (2013) stated that the incorporation of foliage shrub in poultry rations can replace imported raw materials (mainly corn and soybeans) and lower or reduce the cost of poultry production. However, this research showed that the best economic indicators are presented in animals fed the basal diet with corn and soybeans, except net income per animal was higher with \textit{M. alba} (table 3).

Table 4 Key financial indicators (USD) feeding systems for naked neck chickens, using flour shrub.

<table>
<thead>
<tr>
<th>Financial indicators ($)</th>
<th>Corn and soybean basal diet</th>
<th>Gliricidia sepium, 5% cajan, 5% alba, 5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net margin</td>
<td>2971.11</td>
<td>2585.72</td>
</tr>
<tr>
<td>Net margin/animal</td>
<td>5.94</td>
<td>5.17</td>
</tr>
<tr>
<td>Net margin/kg final weight</td>
<td>1.95</td>
<td>1.81</td>
</tr>
<tr>
<td>Net income ratio/direct cost</td>
<td>1.98</td>
<td>1.81</td>
</tr>
</tbody>
</table>

Table 5 Main indicators of investment (USD) feeding systems for naked neck chickens, using flour shrub.

<table>
<thead>
<tr>
<th>Investment indicators</th>
<th>Corn and soybean basal diet</th>
<th>Gliricidia sepium, 5%</th>
<th>Cajanus cajan, 5%</th>
<th>Morus alba, 5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic sensitivity (kg of live weight)</td>
<td>47.52</td>
<td>52.79</td>
<td>50.67</td>
<td>50.12</td>
</tr>
<tr>
<td>Economic breakeven ($)</td>
<td>156.82</td>
<td>174.22</td>
<td>167.21</td>
<td>165.39</td>
</tr>
<tr>
<td>Investment recovery period (years)</td>
<td>0.91</td>
<td>1.08</td>
<td>0.98</td>
<td>0.92</td>
</tr>
<tr>
<td>Internal rate of return (IRR) (%)</td>
<td>35.26</td>
<td>32.52</td>
<td>34.11</td>
<td>35.13</td>
</tr>
</tbody>
</table>

Table 6 Indicators of naked neck chicken carcasses that were fed meals shrub.

<table>
<thead>
<tr>
<th>Carcasses indicators</th>
<th>Corn and soybean basal diet</th>
<th>Gliricidia sepium, 5%</th>
<th>Cajanus cajan, 5%</th>
<th>Morus alba, 5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance of the cold carcasses (%)</td>
<td>80.26</td>
<td>75.16</td>
<td>79.77</td>
<td>84.18</td>
</tr>
<tr>
<td>Lean carcass weight (g) *</td>
<td>2343.98³</td>
<td>2071.81²</td>
<td>2324.30³</td>
<td>2594.64⁴</td>
</tr>
<tr>
<td>Relative value of the viscera, respect to body weight (%)</td>
<td>30.01</td>
<td>36.09</td>
<td>34.20</td>
<td>31.05</td>
</tr>
<tr>
<td>Fat cover on the weight of the carcass (%)</td>
<td>4.20</td>
<td>3.60</td>
<td>3.85</td>
<td>3.50</td>
</tr>
<tr>
<td>Efficient use of the metabolizable energy of the final diet to produce lean carcasses (MJ/g)</td>
<td>0.0031</td>
<td>0.0035</td>
<td>0.0031</td>
<td>0.0028</td>
</tr>
<tr>
<td>Efficiency of the final protein diet, to produce lean carcasses (g/g)</td>
<td>0.0736</td>
<td>0.0851</td>
<td>0.0764</td>
<td>0.0667</td>
</tr>
<tr>
<td>Total cost/lean carcasses ($/kg)</td>
<td>2.19</td>
<td>2.54</td>
<td>2.32</td>
<td>2.17</td>
</tr>
</tbody>
</table>

* Different letters in superscripts of the means (standard error 0.08) indicate significant differences, \textit{P} <0.0467 (Duncan 1955)

In general, all systems are characterized by the low percentage of direct costs from the value of production, which should represent 60\%, according to Peña et al. (2004). The biggest category of direct costs were eating (55.03-59.08\%) and coincided with animals fed the basal diet and \textit{M. alba} (table 2). This was due to increased consumption of the diet for the animals that were fed the bush (table 1). High consumption could be due to increased palatability, lower fiber content and anti-nutritional elements of \textit{M. alba}, compared to \textit{G. sepium} and \textit{C. cajan} (Savón 2010). This result was favorable and lower than Monforte et al. (2002) and Trömpez et al. (2010) who stressed that the cost of feeding chickens accounted for between 65-70\% of the total cost of production. Herrera (2014) obtained percentages of lower power cost, between 29-51\%, but with the use of \textit{M. alba} 3\%.

It is essential to achieve a feed to cover the nutritional and similar, 9.10 and 9.20 months for these two cases. In the representation of investment indicators of the two most favorable systems (figure 1) showed that with similar values of fixed costs, breakeven final live weight and dollar was higher with \textit{M. alba}, which was due the highest value of the variable cost items (food, table 2), with reduced utility area.

Not with standing the foregoing, in the world foliage as a source of vegetable protein are used for its high nutritional value (Cazana et al., 2010; Izza et al., 2010 and Leyva et al., 2012). The highest net income was obtained in animals that consumed \textit{M. alba}, due to the higher value of average daily gain that caused the higher final body weight (table 1) and consequently the greatest production value. Similarly, the largest item of cost in \textit{M. alba} feeding reduced the overall economic benefit, economic gain per animal per live weight in addition, the benefit cost and increased the cost per weight produced per animal, per day and per kilogram live weight, relative to the basal diet. However, had the best performance
of all systems with shrubs (table 3).

Simol et al. (2012) reduced 26.09% of the cost of food, using flour M. alba (20; 30; 40 and 50%), compared to control in broilers. This reduction in feed cost could be due to the decrease in consumption, which affected the end live weight of their animals (2047; 1992; 1994; 1758 and 1265 g), as increased shrub in the ration. Marquez (2009), Osorno et al. (2007) and Casamachín et al. (2007) found a reduction from 14-23% of the cost of feed to evaluate their inclusion of shrubs in raising broilers. Although, it is necessary to study the restriction of consumption to lower feed costs, as they raised Marin et al. (2003) and Caceres et al. (2006), but without affecting the final live weight affecting net income.

This could allow its use, depending on reducing dependence on conventional foods, for poultry breeding, with minimal variation in costs. López et al. (2012) stated that the use of local raw materials could reduce the price of allowances that are subject to external market fluctuations. The net margins per animal and final live weight were higher in the group that consumed the diet base, followed by the group of animals fed with M. alba (table 4). This was due to the higher production value was obtained with M. alba, but had a higher variable cost, with the same value of fixed cost. This work coincided with the results of Castelló (2011), where open and rustic buildings, for rearing in cages and floor, also led to a low fixed cost.

Similarly, net income was higher with M. alba, an element that contributed to increase the speed of rotation of capital. However, the highest direct cost, affected their relationship. The results coincided with those of Espinosa and Wiggias (2003) who determined that meat production depends more direct cost to the total production volume. These indicators were advantageous in all cases, because they allowed to cover the costs of the product, high net margin. With the analysis of investment indicators (table 5) showed that it is necessary to produce more body weight and values, in the case of animals that consumed G. sepium, because they had the highest total cost, similarly priced sales fixed cost and the rest of the groups. Meanwhile, the lowest values of sensitivity and breakeven presented with the basal diet and M. alba.

Similar values were obtained in the IRR based diet and M. alba (table 5). It showed that you can use all the alternatives under consideration, because in all cases the IRR exceeded 10% in USD, acceptable value for the agricultural sector. It should be noted that meat production expenditures are daily, but revenues are possible and this can affect the flow of capital. The term return on investment (table 5) was low and favorable in all cases and the like to the base diet and M. alba. This was due to the latest initial investment, indirect cost and investment in the purchase of animals, the final live weight was greater in M. alba diet. This increased production value was offset by the system based diet because of its higher variable cost of feed.

Through the representation of investment indicators of power systems with basal diet (figure 1a) and M. alba (figure 1b) showed that these systems regenerate investment costs and start producing profits in less time than remaining. The diet with M. alba needed just 5.18% over USD or 2.59 kg final live weight over to reach breakeven, compared to the basal diet. At this time of the study, economic performance, financial and investment were similar or lower, among the animals that consumed M. alba or the basal diet. However, this was reversed, in favor of M. alba diet way to analyze indicators of the carcass (table 6).

The performance and weight of the cold and lean carcass was higher in M. alba, with greater relevance in reducing the fat cover of carcasses. The relative value of the viscera, relative to body weight was greater in systems with shrub leaf meals on the diet base, where the lowest it had M. alba. The relative weight of the viscera, relative to body weight was greater in the diet with G. sepium. Most efficient use of energy and the final protein diet, to produce lean carcasses and the lowest total cost of lean carcasses M. alba was obtained. In relation to the fat content and the production of lean carcasses, Martinez et al. (2010) demonstrated that the use of fibrous foods reduced fat and cholesterol values in chickens. Therefore, the incorporation of fibrous foods to the diet is done, productive, economic and benefit human health objectives for reducing cholesterol and increased intake of polyunsaturated fatty acids.

The increase in the relative weight of the viscera of chickens shrub leaf meals could be related to the fiber content in the diet, as suggested Sasso (2010), Itzà et al. (2010) and Pietsch (2014). Rodriguez et al. (2012) showed that diets with lower starch content and increased in structural polysaccharides, modified morphology of the internal organs. Jiménez et al. (2006) justified the increased relative weight, the possible increase in the hygroscopic capacity of fiber, shape and chemical nature. The lower digestibility of fibrous foods, changes in the rate of gastrointestinal transit and increased fermentation too, could be the cause of the increased relative weight of the viscera in chickens.

The better growth performance average daily liveweight gain, voluntary intake and final live weight diet had it with M. alba, among the four power systems were iso-energetic and iso-protein (table 1). However, most economic indicators, financial and investment system based diet and M. alba reported similar or lower than in the base diet results. Importantly, the value of using naked neck chickens, for these systems, because their energy expenditure is lower (Fathi 2008 and SASSO 2012) and therefore, can better convert food into body weight and allow greater economic gains. The order of economic merit of the results could change with the implementation of a system of market segmentation, differentiation from the selling price for performance in lean carcasses. So in payment systems meat quality for the benefit of human health, feeding the chickens with shrubs and M. alba, should be more advantageous economically. You could move into a second phase where the payment be promoted to the primary producer for the sale of animals with high body weight, but less carcass fat.

With the analysis of the inclusion of foliage shrubs we showed that M. alba had economic, financial and investment indicators near of maize and soybeans diet; and it exceeded all groups, in the performance of lean carcasses. It's possible use these indicators for market segmentation and adoption of a power system that benefits human health by reducing fat in naked neck chickens.


