



Demonstration and Performance Evaluation of Broilers Using Locally Processed Feed in Bahir Dar Zuria District, Amhara Region, Ethiopia

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ABSTRACT

An introduction and demonstration of broilers was conducted in Bahir Dar Zuria district of Amhara region, Ethiopia, in the year 2013 and 2014. The major objective of the trial was to introduce broiler chicken breeds in the area and evaluate their performance using locally processed feed. The trial was done at Bahir Dar Zuria district, Andassa kebele. A total of 420 Hubbard JV broiler breed day old chicks were purchased from Debre Zeit Agricultural Research Center and used for the study. Four jobless women were participated in this trial and each participant received 105 broiler day old chicks. Brooding was done by using electrical brooder. Finished broilers were sold live after six weeks of growing period. The average weight of day old chicks was 41.4g. The average weight of birds at end of 1st, 2nd, 3rd, 4th, 5th and 6th weeks were 130g, 213.72g, 291.25g, 599.7, 849.9g and 1293.9.6g, respectively. The total numbers of birds died in the entire period were seven (1.8 birds/HH). The average cumulative mortality percentage was 1.7%. The average daily feed intake/bird and cumulative feed intake/bird during the entire period was 79.4g and 3335.9g, respectively. The cumulative average feed conversion ratio (FCR) was 2.3. The partial budget analysis result indicated that broiler production was profitable with a net benefit of 20.41 Ethiopian birr per live bird. The lower mortality rate and profitability of birds revealed that broilers could be reared at small holder level using locally processed feed. The result of the trial showed that boiler producers should give a due attention for the preparation of good quality feed if they could not purchase and use commercial feed. Otherwise; it will not be an easy task to bring broilers in to marketable weight within six weeks of growing period.

Key words: Broiler, Hubbard JV, Small Holder Chicken Producers

INTRODUCTION

The poultry industry constitutes a significant contribution to human livelihood and food security of poor households (Abdelqader et al., 2007). In Ethiopia chickens are the most widespread and almost every rural family owns chickens, which provide a valuable source of food and cash income (Tadelle, 2003). The total chicken population in the country was estimated to be 52.3 million; with native chicken representing 96.9% from it (CSA, 2013). The production system was based mainly on scavenging where birds were allowed to scavenge for major parts or all of their feed (Tadelle and Ogle, 1996). Similar to the national system, the major proportion (>95%) of chicken production in Amhara region was a traditional sector from which almost the whole chicken meat and egg production was produced (CSA, 2013). According to CSA (2013) the total chicken population of the region was estimated to be 14.6 million, accounting to 27.9% of the national chicken population.

In Ethiopia, like many African countries, attempts have been made at various times to improve village chicken production systems through introduction of exotic chicken breeds (Alemu and Tadelle, 1997). Distribution layers and duals purpose breeds has been one of the livestock extension packages accomplished by the regional bureau of agriculture since the last 20 years aiming at improving chicken production and productivity. Despite this huge distribution of exotic chicken breeds, the contribution of improved chicken in the current production system of the region was believed to be very low mainly due to high mortality rate of chicks.

A recent study on the adoption of exotic chicken breeds in the highlands of Ethiopia indicated that adoption has been limited by a set of factors such as; lack of strong extension follow up, lack of complimentary inputs, disease outbreak, lack of appropriate breed, unavailability of credit services, seasonal feed shortage and marketing problems (Tekelewold et al., 2006). In addition to the above constraints; lack of alternative and productive chicken breeds like broilers has been one of the major problems which limit the supply and availability of chicken meat in the region. Currently there were few commercial poultry farms which were evolved in production and marketing of broilers in and around Addis Ababa.

Some big hotels and super markets found in Bahir Dar city were also had no any opportunity to get broiler meat other than these commercial farms until 2012. Small holder chicken producers found in the region were not aware about the breed and its productivity. The introduction of broiler in the region was done in 2011 for the first time at Bahir Dar

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and Gondar cities. Currently there were few broiler producers in these cities and were providing broiler meat for big hotels and supermarkets. Most of these chicken producers used commercial broiler feed purchased from private feed companies found around Addis Ababa, the capital city of Ethiopia. However; it was very expensive and unavailable for small holder broiler producers.

Poultry producers are interested in increasing economic return in the process of broiler fattening. Economic feeding is an important issue that must be considered in the formulation of broiler rations. The nutritionists offer new improved solutions of diets to fulfill the producers needs (Popescu and Criste, 2003).

There was no any information if broilers breeds could survive and grow using locally processed feed. Therefore evaluation of this chicken breed in different areas using locally processed feed was mandatory to enhance the production throughout the region. Therefore; the objectives of this trial were to introduce broilers with locally processed feed and evaluate their performance and to evaluate their profitability.

MATERIAL AND METHODS

Study area and participants

This experiment was done at Bahir Dar zuria district in Amhara region, Ethiopia. A total of four participants were selected for the trial in collaboration with Bahir Dar city urban agriculture office, Bahir Dar city, Ethiopia. Practical training was given to all participants on management of birds (feeding, health care, housing, etc), chicken house construction and data collection. After the training, each participant prepared a small-scale chicken house designed for 100 chicks; the specification was 1m² for 10 birds. Then the house was equipped with necessary husbandry equipments like; feeders, drinkers, brooder and brooder guard. The feed was prepared by participants using locally available materials including; maize, noug cake, full fat soybean, limestone, wheat, wheat bran, salt and vitamin premixes.

Experimental Birds and Management

A total of 420 day old chicks of Hubbard JV breed were purchased from Debre Zeit Agricultural Research Center and transported to Bahir Dar. Deep litter housing system was used and the litter was disinfected with formalin before receiving the day old chicks. Brooding was done using infra-red lamp for at least 4 weeks of age. After 4 weeks we used natural light and heating system. Data collection formats were prepared and given to each participant to record all relevant data.

Disease prevention and control

Routine vaccination against Newcastle and Gumboro diseases were given as recommended by the manufacturers. On top of this strict bio-security measures were employed during the entire rearing period. Treatments for other diseases like coccidiosis were given as it was occurred. Feed was supplied three times a day as recommended by the management guide of the breed (Hubbard, 2010).

Data management and statistical analysis

The qualitative and quantitative data sets were analyzed using appropriate statistical analysis software (SPSS, 2002). More specifically descriptive statistics and General Linear Model (GLM) were used for this study. The following linear model was used during analysis of quantitative data: Model statement regarding the effect of age on mortality: $Y_{ij} = \mu + m_i + \varepsilon_{ij}$; $P < 0.05$. Where Y_{ij} was the chicken performance parameter estimate for bird j in age i , μ was the overall mean, m_i was the fixed effect of age in weeks ($i=6$; week 1, week 2, week 3, week 4, week 5, week 6) and ε_{ij} was the residual error.

Data collected

The following data were collected from the trial: weight of day old chicks (g), weekly and cumulative mortality percentages, daily and weekly feed intake, cumulative feed intake in kg, weekly and total body weight gain/bird (g), final weight of chicks (g), weekly and total Feed Conversion Ratio (FCR), market price per chicks (live and processed) in Ethiopian birr, variable cost, total revenue (Birr), total gross margin (Birr), perception of participants and end users.

RESULTS AND DISCUSSION

Growth performance

The average weight day old chicks (DOC) at arrival was 41.4g (ranged 41.1g – 41.7g). The average final weight of chicks was 1115.6g (Table 1).

The final weight of broilers obtained in this trial was lower than the genetic potential of the breed when managed intensively which was 2592g, (Table 2). However, the result obtained in this trial was very promising under small holder level, which fulfills the weight requirement of our end users (1kg-1.5kg carcass weight).

The average weight gain of birds at end of each week is presented in table 2. The minimum and maximum weights gain of birds at end of the trial was 1028.4g and 1115.3g, respectively. The highest weight gain was recorded at the end of the trial period, mainly at 5th week. The weight gain recorded at some participants in the final week was below the expected due to feed shortage.

Table 1. Average weight of broilers at end of each week (g)

Participant's code number	No of DOC received	Wt. of DOC	Av.Wt at 1 st week	Av.Wt at 2 nd week	Av.Wt at 3 rd week	Av.Wt. at 4 th week	Av.W. at 5 th week	Av.Wt. at 6 th week
1	105	41.1	98	260.8	455.5	710.0	899.4	1156.4
2	105	41.3	102	259.0	377.4	540.0	815.7	1140.2
3	105	41.3	126	232.6	348.0	500.0	831.7	1095.8
4	105	41.7	114	212.7	417.2	580.0	863.9	1070.1
Mean ±SD	105	41.4± 0.26	110± 27.88	241.3± 23.0	399.5± 46.9	582.5± 91.1	852.7± 37.7	1115.6± 28.3

Table 2. Average weight gain of broilers at end of each week (g) recorded in a broiler demonstration trial conducted at Bahir Dar zuria district, Ethiopia in 2013 and 2014.

Participant's code number	Av.wt. gain at end of 1 st week	Av.wt. gain at end of 2 nd week	Av.wt. gain at end of 3 rd week	Av.wt. gain at end of 4 th week	Av.wt. gain at end of 5 th week	Av.wt. gain at end of 6 th week	Total Wt. gain (g)
1	56.9	162.8	194.7	254.5	189.4	257	1115.3
2	60.7	157	118.4	162.6	275.7	324.5	1098.9
3	84.7	106.6	115.4	152	331.7	264.1	1054.5
4	72.3	98.7	204.5	162.8	283.9	206.2	1028.4
Mean	68.65	131.275	158.25	182.975	270.175	262.95	1074.275

Mortality

The result of the current study indicated that the total number of birds died from all participants in the entire period was seven. The minimum and maximum numbers of birds died were 0 and 4, respectively (Table 3). The highest mortality rate (1.5%) was recorded at the first week of the rearing period. The average cumulative mortality percentage of birds recorded in this trial was 1.7% (ranged 0%-1.5%). According to the results of Table 3, higher mortality percentage (1.5%) was significantly ($p < 0.05$) recorded at the first week of the growing period. Mortality level up to 5% was expected in big poultry farms and accepted as normal. This low mortality was might be the result of timely application of vaccines /medications/ and better management of birds by participants. This low mortality percentage (<5%) was a very promising result and it showed that broilers could be reared at smallholder in peri-urban areas using locally processed feed.

Table 3. Number of birds died at each week and cumulative mortality recorded in a broiler demonstration trial conducted at Bahir Dar zuria district, Ethiopia in 2013 and 2014.

Participant's code number	Number of birds died at 1 st week	Number of birds died at 2 nd week	Number of birds died at 3 rd week	Number of birds died at 4 th week	Number of birds died at 5 th week	Number of birds died at 6 th week	Total number of birds died at entire period
1	2	0	0	0	0	0	2
2	1	0	0	0	0	0	1
3	3	1	0	0	0	0	4
4	0	0	0	0	0	0	0
Mean±SD	1.5 ±1.3 (1.5%)	0.25 ±0.5 (0.24%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1.75±1.7 (1.71%)

^{a,b} Least square means with different superscript within a column are significantly different ($P < 0.05$)

Feed intake of Birds

The average daily feed intake of birds was presented in Table 4. Accordingly, the average daily feed intake of birds during the entire period was 89.2g. The average cumulative weekly feed intake was presented in Table 5. The total average cumulative feed intake of each bird was 3765.7g. The daily, weekly and total feed intake of birds recorded in

this trial was lower than the genetic potential of the breed. This might be due to many factors including; the feed quality, housing condition, water intake, temperature stress and general management of birds.

Table 4. Average daily feed intake of birds at each week (g) recorded in a broiler demonstration trial conducted at Bahir Dar zuria district, Ethiopia in 2013 and 2014.

Item	Daily feed intake at 1 st week	Daily feed intake at 2 nd week	Daily feed intake at 3 rd week	Daily feed intake at 4 th week	Daily feed intake at 5 th week	Daily feed intake at 6 th week	Daily feed intake at entire period
Mean	19	34	66	95.5	112.5	124.50	54.5

Table 5. Average weekly feed intake of birds (g) recorded in a broiler demonstration trial conducted at Bahir Dar zuria district, Ethiopia in 2013 and 2014.

Item	Cumm. feed intake at 1 st week	Cumm. feed intake at 2 nd week	Cumm. feed intake at 3 rd week	Cumm. feed intake at 4 th week	Cumm. feed intake at 5 th week	Cumm. feed intake at 6 th week	Cumulative feed intake at entire period
Mean	133	238	462	669	788	872	133

Feed Conversion Ratio (FCR)

The average feed conversion ratio (FCR) recorded each week was presented in Table 6. Accordingly, the total average FCR recorded in this trial was 2.25. It was higher than the genetic potential of the breed, which was 1.74. This relatively higher FCR (low efficiency) could be related to the feed quality, feed preparation, environmental stress, type of chicken management, feed wastage and water quality and consumption rate of birds.

According to the results, significantly ($P < 0.05$) higher feed conversion efficiency (low FCR) was recorded at the second week of growing period. The lower efficiency (higher FCR) was recorded at the 6th week of production period and this indicated that the quality of feed prepared by participants was deteriorating from time to time.

Table 6. Average weekly feed conversion ratio (FCR) recorded in a broiler demonstration trial conducted at Bahir Dar zuria district, Ethiopia in 2013 and 2014.

Participant's code number	Average FCR at 1 st week	Average FCR at 2 nd Week	Average FCR at 3 rd Week	Average FCR at 4 th week	Average FCR at 5 th week	Average FCR at 6 th week	Average FCR at entire period
1	2.72	1.39	2.37	2.63	2.73	8.96	2.17
2	2.27	1.50	3.9	4.11	2.11	6.87	2.29
3	1.22	1.92	4.0	4.40	1.82	8.38	2.30
4	2.28	2.11	2.26	4.11	2.06	8.17	2.23
Mean	2.12	1.73	3.13	3.81	2.18	8.10	2.25

Economics of broiler production using locally made feed

Partial budget analysis: Finished broilers were sold in live weight (per head) after 42 days of growing period. They were purchased by small holder broiler processors living at Bahir Dar city. Labor was provided by family as side line activity and the cost was not considered in the analysis. The economic analysis result showed that the average selling price of finished broilers was 50 Birr per head (Table 7).

Table 7. Partial budget analysis of broiler production using locally processed feed recorded in a broiler demonstration trial conducted at Bahir Dar zuria district, Ethiopia in 2013 and 2014.

Description	Ethiopian Birr/bird
Total average revenue (ETB)	5162.5 (Ranged 5050-5250)
Total average variable costs (ETB)	3019 (Ranged 2904 – 3235)
Day old chicken cost	600
Feed cost	1875.6
Labor cost	319.00
Electricity cost	73.75
Guard cost	68.75
Other costs (vaccine)	82.00
Gross Margin (Revenue - Variable Cost)	2143.5 (Ranged 804.5 – 1287)
Average profit/bird	20.41 Birr

Partial budget analysis result indicated that smallholder broiler production was profitable with a net benefit of 10.75 ETB/head and 19.33 ETB/kg, respectively. Semi processed broiler meat suppliers fetched 8.56 ETB/kg more than those who supplied live birds. In addition, the return could also increased by 4.30 ETB/head when the day old chicks and formulated feed supplied in the locality. The result of the current study indicated that the cost of feed for broiler

production covered more than 70% of variable cost. Opara (1996) also agreed that feed accounts 70-85% of the total production cost in modern poultry production system.

Sensitivity analysis

The result of the current study indicated that broiler production would result in a positive net benefit for all production situations up to 20% output price reduction and 10% input price increment (Table 8).

Table 8. Sensitivity analysis for broiler adaptation trial using local feed recorded in a broiler demonstration trial conducted at Bahir Dar zuria district, Ethiopia in 2013 and 2014.

Description	Price of birds and variable cost (Birr)
Average selling price of broiler	50.00
Average variable cost	29.59
Net benefit	20.41
Sensitivity analysis	
+ 5% variable cost	31.0695
- 5% selling Price of broiler	47.5
Net benefit	16.4305
+ 10% variable cost	32.549
- 10% selling Price of broiler	45.25
Net benefit	12.701
+ 15% variable cost	34.0285
- 15% selling Price of broiler	42.5
Net benefit	8.4715
+ 20% variable cost	35.508
- 20% selling Price of broiler	40
Net benefit	4.492

Producers' opinion

The survey result indicated that all participants of the trial were highly satisfied by the breed. According to the producers the breed has paramount merit than other chicken breeds they know. Some of the merits mentioned by trial participants included; very fast growth, high final weight, able to rear many cycles per year and rear as side activity (Table 9). All growers mentioned that they have future plan to maintain broiler production since it was highly profitable. Participants mentioned that presence of high demands for chicken meat and low supply improved poultry breed meat were good opportunities for broiler production in the study area. Participants were afraid to sustain the production in the future due to some constraints. The major challenge raised by all participants was lack of day old chicks in the region (Table 10).

Table 9. Special merits of broilers as mentioned by growers recorded in a broiler demonstration trial conducted at Bahir Dar zuria district, Ethiopia in 2013 and 2014.

Special characteristics of broilers mentioned by producers	Number of respondents	Response
		%
Fast growth	4	100
High product (high final body weight)	4	100
Ability to do many cycles per year	4	50
Could be done as side activity	4	25

Table 10. Challenges of broiler production as mentioned by participants recorded in a broiler demonstration trial conducted at Bahir Dar zuria district, Ethiopia in 2013 and 2014.

List of Constraints	Number of respondents	Response
		%
Lack of day old chicks	10	100
Lack of formulated feed	10	75
High feed cost	10	50
Lack of appropriate health services	10	25
Lack of knowledge (poor training access)	10	25
Lack of husbandry equipments	10	25

CONCLUSION

The result of the current study showed that there was high demand for broiler meat around Bahir Dar city and this could be considered as a good opportunity for maintaining broiler production in the area.

The Lower mortality rate (<2%) recorded in this study revealed that broilers could be produced using locally processed feed at smallholder level. The final weight and feed conversion efficiency was lower than the genetic potential of the breed. This was highly correlated with the quality of feed produced by participants and the daily amount given to birds.

The finished broilers were purchased by small holder processors found in Bahir Darc city. They bought them to fatten birds for one extra week before processing. This showed that prolonging the growing period from 6 to 7 weeks might be important to bring birds at slaughter weight if the quality of feed produced was not according to the standard. The higher mortality rate was recorded at the early stage of the growing period and this showed that attention should be given for the first two weeks of growing period. Provision of trainings on small scale broiler processing and packing was found to be relevant to make small holder producers more profitable.

Recommendation

Preparation of good quality feed should be given a due attention by broiler producers so as to fatten broilers in short period of time (6 weeks) and make it more profitable using locally processed feed. Otherwise it will be advisable for them to purchase and use commercially processed feed.



Figure 1. Pictures of young chicks and finished broilers taken in a broiler demonstration trial conducted at Bahir Dar zuria district, Ethiopia in 2013 and 2014.

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