Asian Journal of Poultry Science

ISSN 1819-3609

Academic Journals Inc.

www.academicjournals.com

OPEN ACCESS Asian Journal of Poultry Science

ISSN 1819-3609
DOI: 10.3923/ajpsaj.2017.49.56

Research Article
Growth Performance, Feasibility and Carcass Characteristics of Cobb 500 Commercial Broiler Under Small-scale Production in Western Ethiopia

[1]Dessie Abera, [1]Alemayehu Abebe, [1]Fekadu Begna, [1]Alayu Tarekegn and [2]Misba Alewi

[1]Assosa Agricultural Research Center, P.O. Box 265, Assosa, Ethiopia
[2]Debrezeit Agricultural Research Center, Debrezeit, Ethiopia

Abstract

Background and Objective: Cobb 500 is one of the world's most popular broiler breed. The present study was undertaken to evaluate the performance of this breed under small scale at Assosa town of Ethiopia and to promote the breed for wider use. **Materials and Methods:** To do so, nine urban farmers were selected and provided with appropriate training regarding broiler management. Farmers made poultry houses ready prior to arrival of chickens and each farmer received 100 day-old chicks with recommended type and level commercial feeds. Appropriate vaccinations were given and standard bio-security measures were employed in all farms throughout the study period. Daily feed intake, weekly body weight, mortality and its cause, variable costs and revenues were recorded at each farm. Carcass processing was done at the end of 7th and 8th weeks of study period. Forty randomly selected birds were used to evaluate the carcass characteristics from all farms and both male and female chickens were considered. Data analysis was done by using SPSS (Version 20) software. Descriptive and one way ANOVA techniques using General Linear Model procedures were used for data analysis. **Results:** Feed intake of Cobb 500 commercial broiler for this study under Assosa condition was comparable to target feed intake of the breed, but feed conversion ratio was slightly higher than the target performance of the breed. The mean body weights at the end of 7th and 8th weeks were 3.1 and 3.8 kg, respectively. Carcass characteristics were affected by age and sex of chickens. The overall mortality rate recorded in this study was 7.8%. Among the dead chickens, 54.9% of them died in the first week indicating the importance of the first week in broiler chicks to implement proper management practices under small scale production. **Conclusion:** It is concluded that Cobb 500 commercial broiler showed good growth performance and the partial budget analysis indicated that growing broilers at Assosa is profitable given that appropriate management was followed as per the breed's management guideline.

Key words: Benishangul Gumuz, broiler production, carcass yield, feed conversion ratio, partial budget analysis

Received: September 28, 2016 Accepted: November 10, 2016 Published: December 15, 2016

Citation: Dessie Abera, Alemayehu Abebe, Fekadu Begna, Alayu Tarekegnand Misba Alewi, 2017. Growth performance, feasibility and carcass characteristics of Cobb 500 commercial broiler under small-scale production in western Ethiopia. Asian J. Poult. Sci., 11: 49-56.

Corresponding Author: Alemayehu Abebe, Assosa Agricultural Research Center, P.O. Box 265, Assosa, Ethiopia Tel: +251 57775 2315

Copyright: © 2017 Dessie Abera *et al.* This is an open access article distributed under the terms of the creative commons attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Livestock sector has been contributing considerable portion to the economy of Ethiopia and still promising to rally round the economic development of the country[1]. Poultry is the largest livestock species accounting for more than 30% of all animal protein consumption in Ethiopia[2]. The prominence of poultry production today is primarily due to the short generation interval and relatively quick turn over on investment and high quality protein from their products. Traditional chicken rearing is practiced virtually every family in Ethiopia indicating that it's an affordable source of animal protein. Reports of Central Statistics Agency (CSA)[3] estimated that chicken of the country is estimated to be 51.4 million of which about 97% are of indigenous breeds. Rural poultry production in Ethiopia accounts 99% of the national total poultry products[4].

Traditionally, indigenous Ethiopian chicken breeds are considered to be disease resistant and adaptive to wider environments. However, their contribution to human nutrition, gross domestic products and export earnings are disproportionally low[5]. According to Demeke[5], the low productivity of local chickens in terms of egg and meat is attributed to long reproductive cycle, attaining of small body size in long maturity period, poor health care and low feeding and housing management practices in rural chicken farming. Chicks in this system are produced mostly by natural incubation with a broody hen. The broody hens have also a responsibility of feeding, protecting and raising the hatched chicks[5].

Chicken meat is a good source of animal protein but its availability in human diet is very low in tropical countries like Ethiopia. Since majority of chicken meat comes from traditional rural households, it cannot withstand the strong demand resulted from fast growing economy, rapid growing population and urban centers. Thus, production of poultry meat for the rapidly growing human population is an important system for supplying high-quality protein and it provides an interesting source of finance[6]. The two major factors for a successful and economic broiler production are fast growth rate and efficient feed conversion. These can be achieved through efficient management practices that ensure effective disease prevention and control, coupled with the availability of high quality feed, fed *ad libitum* and the flock maintained under continuous illumination[7].

Production of commercial broiler breeds like Cobb 500 in Ethiopia has been intense in some larger cities, mostly in Addis Ababa and its surrounding. However, there is steadily increasing demand for poultry products in other cities like Assosa due to increasing human population and growing economy. Assosa is one of the major tourists 'destinations in the country in association with its proximity to Ethiopian Grand Electricity Dam. Thus, introduction and demonstration of Cobb 500 commercial broiler breed to the area is believed to bridge the huge gap of demand and supply of chicken meat. However, it is important to evaluate the production performance of the breed and associated profitability in small-scale in Assosa area prior to recommending for wider production. Thus, the objectives of this study were:

- To evaluate the performance of Cobb 500 commercial broiler breed at small scale in hot-humid environments like Assosa
- To study the economics of broiler chickens under small scale production
- To promote commercial broiler breeds to emerging regions in Ethiopia like Benishangul Gumuz and elsewhere with similar agro-ecology

MATERIALS AND METHODS

Study area, selection of participants and husbandry practices: The evaluation of the breed was undertaken on research station and farmer's field condition at Assosa town from end of June to August, 2016. Assosa town is located 670 km West of Addis Ababa. Assosa Agricultural Research Center is located 10°30′ N latitude and 034°20′ E longitude, at an altitude of 1565 m a.s.l. The pattern of rain was uni-modal with mean annual rainfall of 1275 mm. The minimum temperature varies between 14 and 20°C and the maximum temperature ranges from 25-39°C.

Nine urban farmers were selected for the study after intensive discussion was made with agricultural experts of urban agriculture of Assosa town. Then, the selected farmers and respective development agents were given an intensive training regarding management and health care of broilers. Two weeks earlier to arrival of day-old chicks, houses were cleaned and disinfected using formaldehyde solution. Adjustable brooding ring was constructed with locally available materials like carton and the floor covered with 7-10 cm depth wooden shaving litter. Chicken houses were equipped with cleaned and disinfected feeders and drinkers. The days-old chicks were procured from private company placed in Mojo town and each participant received 100 day-old chicks. One hundred fifty day-old chicks were kept at research station as a control. Artificial light was provided using 100 w bulb lambs continuously for the first 48 h and then darken for an hour at night until the end of the study. Commercially produced feeds were used and the feeding was according to Cobb 500 broiler performance and

nutrition supplement[8]. Chickens fed starter, grower and finisher ration at age of 1-11, 12-21 and 22-56 days, respectively and water was provided *ad libitum*. Feed formulation is presented in Table 1.

Chicks were vaccinated against Newcastle disease at 1st and 3rd weeks of age and against gumboro disease at second and fourth weeks of age. Treatments were given against Coccidiosis in some farms as it occurred. Standard bio-security measures were employed in all farms throughout the study period.

Data collection: Data which include daily feed intake (g per head), weekly body weight (g per head), mortality and its cause, variable costs (Birr) and revenues were recorded at each farmer level. The daily feed intake of the birds was calculated as the difference of feed offered and refused. Feed Conversion Ratio (FCR) was computed to measure the efficiency with which broilers convert feed in to desired output i.e meat. The FCR was calculated for each week on the basis of feed intake and weight gain until the age of 56 days. Partial budgeting technique was used to assess the potential profitability of commercial broilers in the study area.

Carcass processing was done at the end of 7th and 8th weeks. At each week, 2 randomly selected birds from each farm totaling of 20 birds were slaughtered for carcass evaluation. In both weeks half of the slaughtered broilers were female to consider the effect of sex on carcass characteristics. Prior to slaughtering birds were starved for 3 h and live weight (g) was measured individually. Then, the slaughtered birds scalded in hot water at temperature of 53°C for 2 min and de-feathered by hand picking. Head and shanks were removed close to the scull at the occipital joint and at the hock joints, respectively. Evisceration was done by posterior ventral cut and then a complete removal and weighing of the visceral organs. Abdominal fat including fat surrounding the gizzard and liver was carefully removed and weighed. The dressed carcass, breast, thighs and drumsticks were weighed with bones. The wings were removed by a cut through the shoulder joint at the proximal end of humerus. The thigh and drumstick portions were obtained by cutting through the joint between the femur and ilium bone of the pelvic girdle. The drumstick was separated from the thigh by a cut through the joint formed by the femur, fibula and tibia. The dressing percentage was calculated as weight of the carcass (without neck, head, feathers, feet and visceral organs) divided by live bodyweight multiplied by 100.

Table 1: Feed formulation of commercial feeds used in feeding the birds

	Quantity		
Constitutes	Starter	Grower	Finisher
Crude protein (%)	20.5	19	18
Energy (kcal kg^{-1})	3000	3150	3250
Crude fat (%)	6.5	9	8
Crude fiber (%)	5.5	5.5	5.5
Calcium (%)	0.9	0.75	0.65
Moisture (%)	10	10	10

Data management and analysis: Data collected were entered into Microsoft Excel 2010 sheets and coded for analysis. Data was analyzed by using SPSS (Version 20) software. Descriptive and one way ANOVA techniques using General Linear Model procedure[9] were used for data analysis. General linear model was employed to understand the effects of age, sex and their interaction on carcass yields. The model is indicated as:

$$Y_{ijk} = \mu + A_i + S_j + AS_{ij} + \varepsilon_{ijk} \quad (1)$$

where, Y_{ijk} is dependent variable, μ is overall mean, A_i is the fixed effect of age i, i is 49th day and 56th day, S_j is the fixed effect of sex j, j is male and female, AS_{ij} is the interaction of age i and sex j and ε_{ijk} is a random error.

RESULTS AND DISCUSSION

Feed intake and conversion: The mean feed intake and conversion ratio of this study and the targets for Cobb 500 commercial broiler is presented in Table 2. The target values are adapted from Cobb 500 broiler performance and supplement[8]. Feed intake of Cobb 500 commercial broiler for this study under Assosa condition was similar to target feed intake of the breed. But, it was higher than the average values reported by Hascik *et al.*[10] for the same breed. The FCR in this study was slightly higher than the target performance of the breed. This could be related to difference

Table 2: Actual feed intake, actual and target FCR of Cobb 500 commercial broiler breed

	Age (days)							
Parameters	1-7	8-14	15-21	22-28	29-35	36-42	43-49	50-56
Actual feed intake (g day^{-1})	24.0±0.42	54.0±0.57	93±0.63	135±0.52	174±0.83	205±1.20	228±1.43	242±0.94
Target FCR	0.856	0.907	1.173	1.367	1.542	1.697	1.741	1.975
Actual FCR	1.149±0.17	1.409±0.08	1.609±0.12	1.774±0.09	1.859±0.10	1.95±0.16	2.036±0.15	2.146±0.13

Values are given as Mean±SE, FCR: Feed conversion ratio

in nutritional specifications designed to help achieve these targets, light control, temperature, ventilation, water quality and/or prevalence of diseases. The study indicated that Cobb 500 more efficient in feed conversion in the first 2 weeks and the feed conversion efficiency declined as age of the birds increased.

Growth performance: Live body weight and average daily weight gain of Cobb 500 commercial broiler under Assosa condition are presented Table 3 and 4, respectively. The mean live body weight steadily increased until 8th week, whereas the average daily weight gain steadily increased up to 7th week and started to decline at 8th week. Both mean live body weight and daily weight gain in this study was found to be higher than some previous studies for the same breed[10,11]. The differences might be attributed to management and environmental variations. The better growth performance indicates that hot humid environments like Assosa were conducive to produce broilers given that appropriate feeding and other management practices are followed.

Comparisons of mean live body weight and daily weight gain of Cobb 500 commercial breed in this study with breed performance targets showed that the mean live weights were slightly lower than the target values of the breed. This could be associated with discrepancies of management practices. But, the average daily weight gain was slightly lower than the target up to 5th week and higher for the last 3 weeks of the experiment. The main reason for the higher daily weight gain from 6-8th weeks of age could be related with higher feed intake of the birds in this experiment in this period of time.

Carcass and body organs characteristics: Live weight, carcass and body organs weight for male and female chickens at different age are presented in Table 5. Chickens at the age of 56 days had significantly higher ($p<0.01$) live weight than that of chickens at the age 49 days. Sex did not affect live weight in this study. However, both age and sex of chickens significantly influenced ($p<0.05$) carcass weight. Male broiler chickens had bigger carcass weight than female chickens. In the same manner, broilers slaughtered on the 56th day had bigger carcass weight than those of slaughtered on 49th day. Breast, thigh and drumstick are the components yielding most of the meat and the portions that are mostly consumed[12]. Breast was significantly increased ($p<0.001$) as age of chickens increased, but it was not significantly affected ($p>0.05$) by sex. Broiler chickens of 56 days old had significantly bigger ($p<0.05$) breast and thigh than that of 49 days-old and male chickens had significantly bigger ($p<0.05$) thigh and drumstick than females. But, age did not significantly affect ($p>0.05$) weight of drumstick. This result is consistent with findings of Young *et al.*[13], who reported that female carcass had smaller thigh and drumstick than males. Previous studies also indicated that these major carcass parts are influenced by several factors such as line, sex, age, health, nutrition, body weight, carcass estimation and period of terminated nutrition before slaughtering[14-16]. In the present study, male chickens had significantly larger ($p<0.05$) organs which include wing, kidney and an empty crop. Significantly bigger ($p<0.05$) pancreas weight was recorded at 56 days than at 49 days. Dressing percentage, liver, heart, spleen and abdominal fat weight affected neither by age nor sex of broiler chickens.

In the present study, similar trends were observed in slaughter yields in terms of percentage of live weight regardless of sex and age. Breast, thigh and drumstick yielded 25.5, 10.3 and 8.4% of live weight, respectively on average.

Mortality: Mortality rate of broiler chickens and the cause of deaths in this study are presented in Fig 1. Mortality in broiler flocks represents lost income to growers and hence should be minimized as much as possible. The overall mortality rate recorded in this study was 7.8%. Among the dead chickens, 54.9% of them died in the first week. It was also indicated that the first week life of broiler chicks is important because modern broiler chicks grow faster than ever in their early days, resulting in a short lifetime and it's a transitional period from very conditioned life at the hatchery to more independent life at the broiler farm[17].

Mortality was mainly caused by poor management practices of chickens by some farmers (64.6%) followed by sudden death (19.5%) and disease (11%). Majority of the chickens were died by mechanical damage and suffocation in the first week of study period. This was caused by poor housing system with uncontrolled environment and less follow up. This infers that broiler farmers should implement good and proper management practices, as these will ensure the optimum performance of broilers by reducing mortality that might occur due to poor management practices. The sudden death occurred in later age of broilers with good body condition and the cause might be acute heart failure.

Cost-benefit analysis: Partial budget analysis technique[18,19] was used to evaluate the benefit of producing broilers in Assosa town (Table 6). Feed accounted majority (56%) of total variable costs followed by cost of day-old chicks (19%) and transportation costs (19%). The higher feed cost recorded in this study can be minimized by substituting the commercial feeds by formulating broiler feeds by locally available feed

Table 3: Live body weight (g) of Cobb 500 broiler at Assosa town up to 56 days of age

	Age (days)								
Participants	1	7	14	21	28	35	42	49	56
Research station	44.0±0.56	152.1±2.67	423.5±13.06	892.6±17.82	1328.3±29.50	1984.5±57.03	2725.0±82.68	3385.0±87.74	3760.0±89.58
Farmer 1	42.2±0.59	179.3±2.72	443.9±12.62	823.0±21.71	1323.1±34.23	2098.7±66.34	2895.0±81.27	3855.0±89.58	-
Farmer 2	41.7±0.56	160.9±2.70	432.6±8.99	817.2±15.81	1163.6±26.88	1746.7±50.95	2540.0±61.73	3040.0±54.48	-
Farmer 3	40.5±0.56	132.8±2.98	385.1±6.88	736.8±18.19	1175.6±24.99	1832.8±30.57	2265.0±47.17	2990.0±67.24	-
Farmer 4	40.6±0.56	155.9±4.63	410.9±12.71	781.7±17.65	1295.5±27.90	1898.3±54.63	2450.0±62.20	3090.0±49.15	-
Farmer 5	38.6±0.56	-	362.6±11.31	595.9±14.06	1154.0±28.95	1696.9±42.70	2345.0±54.52	3165.0±70.81	-
Farmer 6	42.9±0.59	132.5±3.49	347.0±8.17	640.9±13.45	1077.8±24.91	1693.2±56.79	2168.4±46.55	2952.6±77.37	-
Farmer 7	44.2±0.56	150.0±2.75	368.6±7.31	726.2±11.12	1161.9±23.54	1692.7±40.20	2325.0±50.20	2905.0±68.62	-
Farmer 8	43.7±0.56	147.9±3.57	375.6±6.76	762.1±20.69	1268.4±30.25	1855.3±42.61	2455.0±58.70	3020.0±68.67	-
Farmer 9	40.4±0.56	95.5±3.09	294.8±9.32	632.2±19.65	1095.3±22.25	1535.1±34.94	2300.0±51.30	2915.0±50.41	-
Overall mean	41.8±0.17	145.3±1.96	385.8±4.44	745.9±8.32	1206.3±10.62	1807.3±18.99	2448.2±24.06	3132.7±29.13	3760.0±211.45
Target	42.0	185.0	465.0	943.0	1524.0	2191.0	2857.0	3506.0	4111.0

Values are given as Mean±SE

Table 4: Average daily weight gain (g) of Cobb 500 commercial broiler under small scale production in Assosa

	Age (days)							
Participants	1-7	8-14	15-21	22-28	29-35	36-42	43-49	45-56
Research station	15.5±0.39	38.8±1.93	67.0±3.62	62.2±4.61	93.8±8.56	105.8±13.44	94.3±19.12	77.1±31.74
Farmer 1	19.6±0.38	37.8±1.72	54.2±4.30	71.4±5.42	110.8±11.77	113.8±15.71	137.1±16.56	-
Farmer 2	16.3±0.68	36.4±2.00	53.0±2.87	73.4±5.28	86.1±10.19	78.8±11.93	91.4±12.24	-
Farmer 3	17.1±0.37	38.8±1.43	55.0±2.96	49.5±4.72	83.3±7.77	113.3±10.77	71.4±11.73	-
Farmer 4	13.0±0.43	36.0±0.96	50.3±2.48	62.7±4.32	93.9±5.22	61.8±10.16	103.6±11.90	-
Farmer 5	7.7±0.47	28.5±1.53	48.2±2.84	66.2±3.91	62.8±5.81	109.3±9.05	87.9±9.51	-
Farmer 6	12.9±0.49	30.6±1.26	42.0±1.62	62.4±4.66	87.9±8.31	71.4±10.97	110.7±12.61	-
Farmer 7	-	51.8±3.77	35.0±3.19	79.8±4.44	77.5±8.30	88.2±11.22	117.1±14.79	-
Farmer 8	15.2±0.52	32.6±1.02	55.2±2.87	72.3±3.72	83.8±7.19	85.7±9.65	80.7±13.32	-
Farmer 9	15.7±0.38	31.2±1.01	51.1±1.99	62.2±3.56	75.8±6.91	90.3±9.94	82.9±11.71	-
Overall mean	14.8±0.28	34.6±0.54	51.9±1.07	65.8±1.51	85.8±2.69	91.7±3.78	97.8±4.41	77.1±31.74
Target	17.6	38.0	59.0	79.1	88.6	87.0	78.7	66.7

Values are given as Mean±SE

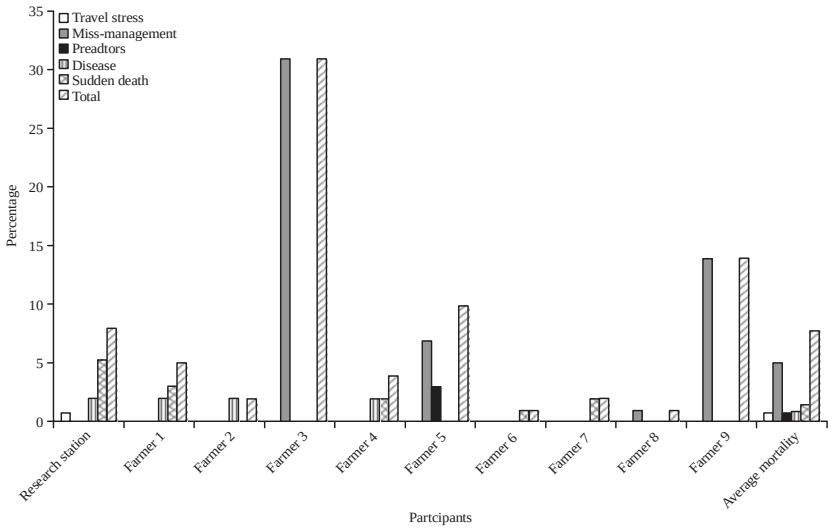

Fig. 1: Mortality rate and causes of mortality across the participants in the study

Table 5: Live weight, carcass and visceral organs weight (g) as influenced by age and sex of broiler chickens

	Age								
	Day 49			Day 56					
	Sex			Sex					
Parameters (g per bird)	Female	Male	SE	Female	Male	SE	P_A	P_S	P_{AxS}
Live weight	3110.0	3380.0	141.82	3560.0	3960.0	200.56	**	ns	ns
Carcass weight	1889.9	2042.1	104.38	2056.1	2503.7	147.62	*	*	ns
Dressing percentage	60.9	60.4	2.71	57.2	65.2	3.83	Ns	ns	ns
Neck	72.3	72.5	3.64	76.3	102.0	5.14	**	***	**
Breast	772.7	828.2	44.54	918.6	1072.8	62.99	***	ns	ns
Thigh	325.2	330.1	24.58	334.5	457.2	34.76	*	*	ns
Drumstick	263.4	285.6	18.36	268.7	343.8	25.97	Ns	*	ns
Back	225.7	243.3	14.24	239.4	264.5	20.14	Ns	ns	Ns
Wing	208.6	223.1	10.5	218.6	263.5	14.83	Ns	*	ns
Liver	62.5	64.9	5.36	58.8	65.9	7.59	Ns	ns	ns
Heart	14.8	18.6	3.30	16.89	18.5	4.66	Ns	ns	ns
Kidney	10.8	10.1	1.41	14.3	18.1	1.99	Ns	**	ns
Spleen	2.9	2.5	0.33	2.7	4.0	0.46	Ns	ns	*
Pancreas	3.6	4.0	0.57	5.4	6.6	0.81	**	ns	ns
Gizzard	36.5	38.4	1.84	33.4	40.7	2.60	Ns	ns	ns
Empty crop	13.9	15.2	1.32	9.4	16.1	1.86	Ns	*	ns
Abdominal fat	55.1	65.6	7.69	55.7	69.7	10.88	Ns	ns	ns

P_A: Effect of age, P_S: Effect of sex, P_{AxS}: Interaction effect of age and sex, ns: Non-significant, *p<0.05, **p<0.01, ***p<0.001, SE: Standard error

Table 6: Economic evaluations of broiler chickens under small-scale production at Assosa (number of day-old chicks purchased = 1050)

Variable cost per income	Amount (Birr)	Amount (USD)
Total price of day-old chicks	20000	909
Feed cost	58267	2649
Vaccination and medication costs	1416	64
Transportation of feed and day-old chicks	20000	909
Electricity cost	1000	46
Litter and other costs of poultry house preparation	4388	200
Total variable cost	105071	4776
Total cost per chick	100	5
Average market price per chick	149	7
Total income generated (survived chicks×Chick price)	144232	6556
Net profit per chick	41	2

ingredients. Family labor was used during the experiment and it was excluded from the analysis. The net profit of 41 Birr (2 USD) per chick indicates that raising broiler chicken Cobb 500 can be an attractive business in the study area. Similar study conducted on the same breed at Jimma town of Ethiopia indicated that the net profit per chick was 51 Birr, which is higher than that of the present study[19]. The lower net profit in the present study could be due to growing variable costs, especially cost of feed and day-old chicks. Besides, Assosa town is nearly 700 km far away from Debrezeit, where both feed and day-old chicks purchased, so that it incurred higher transportations cost. However, the net profit of this study was higher than Hubbard JV broiler breed at Axum town of Ethiopia[20] and Hubbard Classical broiler breed at Bahir Dar town of Ethiopia[11] at small scale level of production which were 27 Birr per chick and 11 Birr per chick, respectively. This could imply that Cobb 500 commercial broiler could be well adapted and profitable breed than other broiler breeds used in some parts of Ethiopia. However, conclusion cannot be reached in this regard based on these limited number of studies.

CONCLUSION AND FUTURE RECOMMENDATIONS

Cobb 500 commercial broiler showed good performance in Assosa in terms of feed intake, feed conversion and live weight gain under small scale production. Age and sex affected carcass weight of broiler chickens that male chickens slaughtered on 56th day had yielded better carcass. However, further economic analyses should be done on maintaining these chickens up to 56 as feed conversion ratio increased when chickens got older in this study. The higher mortality in the first week of age infers that broiler growers need strict follow up at this stage and it's also important to implement good and proper management practices to reduce the overall mortality rate. Finally, the study indicated that broiler production at Assosa is worthwhile given that appropriate management was followed as per the breed's management guideline.

SIGNIFICANCE STATEMENTS

This study compares the growth performance of Cobb 500 commercial broiler breed under small scale management with breed's performance targets. Besides, the study helps to determine the profitability of producing broilers in distant areas from multiplication centers and it explores the effect of age and sex of broiler birds on carcass characteristics. Thus, this study helps producers to know about production performance as well as benefits of producing Cobb 500 commercial broilers in this area.

ACKNOWLEDGMENTS

Authors thank Kasech Desalegn and Dereje Tafesse for their technical assistance and agricultural experts of Assosa town for their follow up during the implementation of this experiment. This research was funded (Grant number: EIAR 2-10-4) by Ethiopian Institute of Agricultural Research. The authors are grateful to anonymous reviewers for their critical and constructive comments that significantly improved the quality of this paper.

REFERENCES

1. Sonaiya, E.B. and S.E.J. Swan, 2004. Small-Scale Poultry Production: Technical Guide. Food and Agriculture Organization, Rome, Italy, ISBN-13: 9789251050828, Pages: 119.
2. Getu, A. and M. Birhan, 2014. Chicken production systems, performance and associated constraints in North Gondar Zone, Ethiopia. J. Fish. Livest. Prod., Vol. 2. 10.4172/2332-2608.1000115.
3. CSA., 2014. Agricultural sample survey 2013/14. Central Statistical Authority (CSA), Volume 3: Statistical Bulletin, Farm Management Practices, Addis Ababa.
4. Tadelle, D., Y. Alemu and K.J. Peters, 2000. Indigenous chicken in Ethiopia: Genetic potential and attempts at improvement. World Poult. Sci. J., 56: 45-54.
5. Demeke, S., 2003. Growth performance and survival of Local and White Leghorn chickens under scavenging and intensive systems of management in Ethiopia. Livest. Res. Rural Dev., Vol. 15.
6. Haseik, P., I. Elimam, J. Garlik, M. Kacaniova, J. Cuboo, M. Bobko and H. Abdulla, 2012. Impact of bee pollen as feed supplements on the body weight of broiler Ross 308. Afr. J. Biotechnol., 11: 15596-15599.
7. Amakiri, A. and A. Monsi, 1992. Effects of nocturnal variations in lighting regimes on broiler performance in a humid tropical environment. Delta Agric., 1: 37-42.
8. Anonymous, 2015. Cobb500 broiler performance and nutrition supplement guide. https://cobb-guides.s3.amazonaws.com/a71b8bc0-bbd4-11e6-bd5d-55bb08833e29.
9. Billard, L., M.Y. Shim and G.M. Pesti, 2014. Experimental design and analysis with emphasis on communicating what has been done: (II) Calculating interaction contrasts with SAS. Int. J. Poult. Sci., 13: 88-96.

10. Hascik, P., M. Kacaniova, M. Mihok, J. Pochop and E. Benczova, 2010. Performance of various broiler chicken hybrids fed with commercially produced feed mixtures. Int. J. Poult. Sci., 9: 1076-1082.
11. Moges, F., M. Nega, H.M. Asefa, A. Yetayew and G. Zeleke, 2014. On-farm evaluation of broilers for their adaptability and productivity at small holder level in Bahir Dar city, Ethiopia. Online J. Anim. Feed Res., 4: 137-143.
12. Rahayu, H.S.I., I. Zulkifli, M.K. Vidyadaran, A.R. Alimon and S.A. Babjee, 2008. Carcass variables and chemical composition of commercial broiler chickens and the red jungle fowl. Asian-Aust. J. Anim. Sci., 21: 1376-1382.
13. Young, L.L., J.K. Northcutt, R.J. Buhr, C.E. Lyon and G.O. Ware, 2001. Effects of age, sex and duration of postmortem aging on percentage yield of parts from broiler chicken carcasses. Poult. Sci., 80: 376-379.
14. Siegel, P.B., 1984. Factors influencing excessive fat deposition in meat poltry. Proceedings of the 17th World's Poultry Congress, August 8-12, 1984, Helsinki, Finland, pp: 51-52.
15. Brake, J., G.B. Havenstein, S.E. Scheideler, P.R. Ferket and D.V. Rives, 1993. Relationship of sex, age and body weight to broiler carcass yield and offal production. Poult. Sci., 72: 1137-1145.
16. Nikolova, N. and Z. Pavlovski, 2009. Major carcass parts of broiler chicken from different genotype, sex, age and nutrition system. Biotechnol. Anim. Husbandry, 25: 1045-1054.
17. Yassin, H., A.G.J. Velthuis, M. Boerjan and J. van Riel, 2009. Field study on broilers' first-week mortality. Poult. Sci., 88: 798-804.
18. Elghouth, F.O., O.E. Yassin, T.E. Angara and I.A. Wahab, 2013. Some management and Economic Aspects of broiler production in Khartoum State. J. Sci. Technol., 14: 80-85.
19. Getinet, A., D. Solomon and D. Tadelle, 2013. Feasibility of household broiler production with the use of hay box brooder in Ethiopia. Int. J. Livest. Prod., 4: 70-77.
20. Bruh, W., A. Alemayehu, F. Meareg, E. Dawud, H. Tadyos and W. Bahlbi, 2015. Evaluation and demonstration of hubbard JV broiler breed at axum and axum zuria, Tigray Region, Northen Ethiopia. J. Biol. Med. Sci., 3: 8-12.