International Journal of Research in Agricultural Sciences
Volume 13, Issue 2, ISSN (Online): 2348 – 3997

Pre-Extension Demonstration and Evaluation of Improved Chicken Technology Productive Performance for Smallholder Poultry Producer Farmers at Siltie Zone, Central Ethiopia

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Date of publication (dd/mm/yyyy): 30/03/2026

Abstract **– Pre-Extension Demonstration of Bovans Brown chicken breed was conducted with the objective to evaluate productive performance of Bovans Brown Breed under framers condition and collect farmer's perception about improved chicken breed technology at Mirab Azernet and Worabe District Siltie Zone, Central Ethiopia. Sixteen participant farmers (male = 9 and female = 7) were selected purposively from both Districts (seven from Mirab Azernet and nine from Worabe District) with collaboration of Mirab Azernet and Worabe District livestock and fishery office experts, kebele agriculture office coordinator and kebele livestock experts based on willingness to construct poultry house, their willingness to keep the chickens up to the final stage, previous experience, to cover all associated package costs and to record all required data. Under each household 25 pullets 45 days old Bovans Brown chickens were distributed that purchased from Debre Zeit poultry production and multiplication farm. Before the distribution of pullets training was given on poultry house construction, feeding and watering and general management of chicken. The result revealed that, the mean body weight (1356.3 ± 0.02 grams) of the Bovans Brown chicken at onset of egg production, mean ages (26.20 ± 0.42 weeks) of chickens at first egg laying and the egg weight (58.55±1.27 grams) were no significant difference between two districts. Mean survivability of Bovans Brown chicken in the study area was 93.78±1.65% and overall mortality of Bovans Brown chicken breed at until egg production in the study area was recorded as 6.32 ±1.35% until the start of egg production. Farmers using Bovans Brown chicken breed technology gain 4729 eggs per year per household level in the study area. Based on the results, the author concluded that joint efforts are needed to step up smallholder farmers' income through promotion of improved technology and linking inputs and products of Bovans Brown chicken technology packages.**

Keywords **– Mirab Azernet, Worabe, District, Productive Performance, Bovans Brown, Pre-Extension Demonstra--tion.**

I. INTRODUCTION

In developing countries, animal production is being subjected to great pressure to satisfy the demand for animal protein required by continued increase in human population and also to have surplus for international trade. Among the animal production activities, poultry sector is the fastest growing [1]. In Ethiopia, chicken production is a mainstay of animal agriculture, where human food production is comparatively fast, initial capital investment is low, and uses are often made by using available household labor [2]. Chicken provides food and cash income and presents to strengthen social relationships and also play important socio-economic roles in developing countries [3]. According to [4] also reported that in Ethiopia, chicken added significant socio-economic impacts on food security, generating income, and religious and other purposes. In East Africa, over 80% of human populations live in rural areas and over 75% of these households keep indigenous chickens [5]. Considerable variation in genetic and morphology of indigenous chickens in Ethiopia is potential resource

for improvements [6]. Besides weight and physical appearance of live birds, the quality of their products affects marketability of chicken and acceptability of products to potential purchasers [7].

The poultry population of Ethiopia is almost entirely composed of indigenous chicken, and recent estimates showed that 78.85%, 12.02%, and 9.11% are indigenous, hybrids, and exotic poultry, respectively [8]. Poultry production in Ethiopia has a significant role in the country's economy, representing 98.5% and 99.2%, respectively, of chicken egg and meat production [2]. According to [9] revealed that, in Ethiopia the annual egg and chicken meat intake was around 2.85 kg of meat and 57 eggs per year. In Ethiopia, the contribution of indigenous chickens to farm household and rural economies is not proportional to their large numbers.

The chicken production system in Ethiopia can be characterized by not market oriented, low input, scavenging and traditional management system consisting of local breed [10]. The sector shows a clear distinction between traditional, low-input systems and improved production systems using relatively advanced technology [2]. A recent study on adoption of poultry breeds in the highlands of Ethiopia indicated that adoption of exotic breed chicken has been limited by a set of factors such as, lack of strong extension follow up and complimentary inputs, diseases, unavailability of credit services and market problems. Besides, the numbers of breeds and birds included in the package were few [11]. According to [12] witnessed the significance of enhancing institutional links to transform the ever-existing traditional piece meal approach of poultry technology transfer into promotion of carefully selected and packaged technologies. One of the main constraints of poultry production in Ethiopia is lack of productive and adaptive poultry strains. According to [13] many of these breeds or strain must possess some tolerance to heat stress and adaptation to tropical countries. The breeds introduced so far could not withstand the seasonal feed shortage and poor feed quality, prevalent diseases and poor management. However, evaluating tropically adapted breeds which are suitable for semi-scavenging system, high-producing with low-input, suited to local environment and searching farmer preferred breeds could be another option to be considered [14].

As an approach to improve the performance of poultry in Ethiopia, exotic high-performing breeds such as White and Brown Leghorns, Rhode Island Red, New Hampshire, Cornish, and Australorp Light Sussex have been introduced since 1952 including Bovans Brown, Potchefstroom Koekoek, and Sasso ([15; 16]. However, due to the low tolerance of exotic breeds to the local conditions, the program had not scored great success, and farmers have criticized that this distribution of exotic cocks, pullets, and fertile eggs has negatively affected the local poultry's brooding ability and adaptation to low-input feeding systems [17].

According to [18] stated that the genetic potential that attributed to the variation of productivity between local and improved breeds was enforcing the distribution of exotic breeds and replacing local breeds. Like the other parts of Ethiopia, the chicken production of the Siltie Zone is affected by the absence of adaptive and productive improved chicken breeds, knowledge gap and major constraints of the study area.

There is limited demonstration research carried out on productive performance evaluation of Bovans Brown Breed under farmer's condition in the study area. In addition, the perception of farmers was not documented. Thus, the demonstrating current status of Bovans Brown chicken breeds with alternative interventions like feed and improve poultry house construction might provide important and possible solutions and addressing production gap to encourage better production and productivity, future improvement program, and improving husbandry practice (feeding, housing, and health care and other management practices) in sustainable manner.

Therefore, the objective was designed to undertaken to evaluate productive performance of Bovans Brown Breed under farmer's condition and collect farmer's perception about improved chicken breed technology in Siltie Zone, Central Ethiopia.

II. Material and Methods

2.1. *Description of the Study Area*

The current studies were conducted in Siltie Zone, Central Ethiopia Regional State. There are 10 (ten) Districts and 5 (five) administrative towns having two different agro-climatic Zones, Highland or Dega (20.5%) and Mid-land or Weyna-Dega (79.5%). The average temperature ranges from 12-26°C, and the average annual rainfall ranges from 780-1, 818 mm, as reported by [20]. And Siltie Zone borders the Hadiya Zone to the South, the Gurage Zone to the North and Northwest, the Oromia Region to the East, and the Halaba Zone to the Southeast. Worabe is the capital town and is located 172 km South of Addis Ababa. Siltie Zone is one of the central zones of the region, with large plains, mountains, and plateaus. The coordinates of Siltie Zone are latitude of 8°1'0"N and a longitude of 38°19'60"E, and it is located at an elevation of 1,500-3,700 m.a.s.l., [19].

Two locations namely Mirab Azernet and Worabe Districts are one of the Districts of Siltie Zone. These locations had been selected purposively based on Agricultural Growth Program (AGP-II) mandate area, potentiality for chicken production, previous experience on poultry production and accessibility of road for the follow up. The main economic source of livelihood is a mixed farming system, with agriculture being the primary economic activity. The major crops grown in the Siltie Zone include barley, maize, sorghum, enset, and vegetables. The livestock reared in the study area include cattle, sheep, goats, chickens, and equines, as reported by [19].

2.1.1. *Mirab Azernet District*

Is located 258 km from Addis Ababa and 25 km from Hosanna (the regional capital). Mirab Azernet District bordered on the south by Anelemo woreda, on the west by Endegang woreda, on the north by Geto woreda and on the east by Misrak Azernet woreda. The woreda has a total land area of 179.32 Sq. Km. and the average altitude of the district estimated to be 2,838.5 meter above sea level (ranged 2400-3277 m.a.s.l) and the district sits at latitude of 7°45′27″N and longitude 37°54′27″E.The average annual rainfall was estimated to be 1500 millimeter (ranged 1400-1600 mm) and the average temperature was 17.5°C (ranged 16-19°C) [20].

2.1.2. *Worabe District*

Bordered on the south by Dallocha and wulbareg woreda, on the West by Wulbareg and Alicho Wuriro woreda, on the North by Siltie Districts and on the east by Dallocha and Siltie woreda and, District sits at latitude of 7°47′0″ N - 7°57′0″ N and longitude 38°8′0″ E- 38°16′0″ E, with the average altitude were estimated to be 1950 meter above sea level (m.a.s.l) (ranged 1500-2400 m.a.s.l). The average annual rainfall was estimated to be 1150 mm (900-1400 mm) and the average temperature was 23 °C (ranged 17-29 °C) [20].

Table 1. Descriptions of the Study Area.

Siltie Zone Sub-Division of Districts Agro Climatic Zone						
No.	**District**	**Agro-Ecology**	**Climate**	**Altitude (m.a.s.l)**	**Annual rainfall (mm.)**	**Average Temperature (°C)**
1	Mirab Azernet District	Wet highland	Cool & wet	2400-3200	>1400	17.5 °C

Siltie Zone Sub-Division of Districts Agro Climatic Zone						
No.	**District**	**Agro-Ecology**	**Climate**	**Altitude (m.a.s.l)**	**Annual rainfall (mm.)**	**Average Temperature (°C)**
2	Worabe District	Moist midland	Semi-humid	1500-2400	900-1400	23 °C

Note: m.a.s.l=meter above sea level, Millimeter mm), Degree centi-grade (°C).

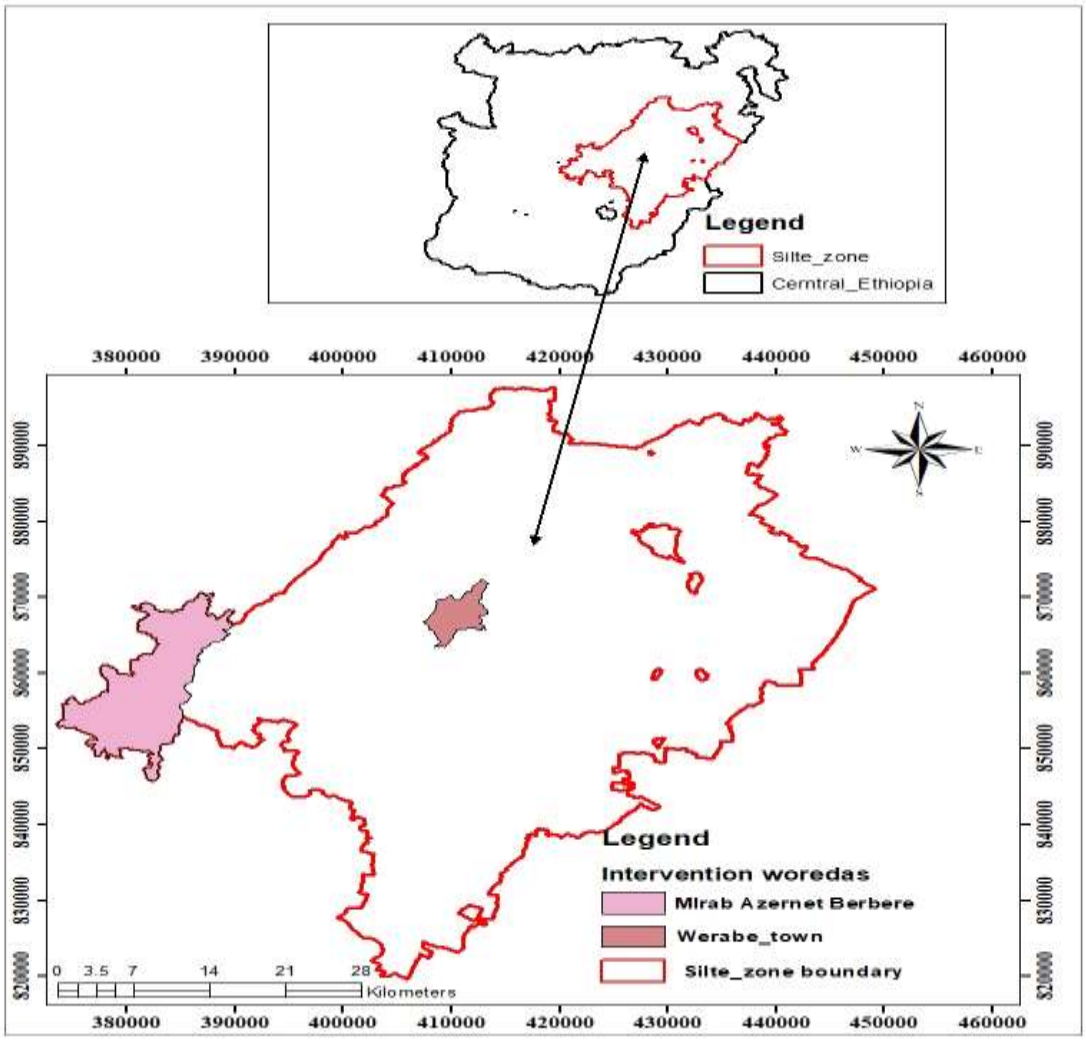

Fig. 1. Study area map.

2.2. *Sites and Participant Farmers Selection*

Mirab Azernet and Worabe Districts are Districts that has been supported by Agricultural Growth Program (AGP-II) project. Due to this the Districts were selected to demonstrate Bo vans Brown chicken breed. Two locations Mirab Azernet and Worabe Districts had been selected purposively based on potentiality and previous experience on poultry production. From Mirab Azernet District seven (7) households and Worabe District nine (9) households were selected based on the interest to construct poultry house, their willingness to keep the chickens up to the final stage, record required data and willingness to prepare supplementary feeds for chickens. Farmers research and extension groups (FREGs) in each District was formed consisting of 7 members (male = 3 and female = 4) from Mirab Azernet District and 9 members (male = 6 and female = 3) from Worabe District.

2.3. *Training of Farmers and Stakeholders*

Training schedule arranged and offered to the participant farmers, Kebele development agents (KDAs), District experts and other stakeholders from respective kebele (lowest administrative subunit) about chicken management (how to prepare feederer and waterer from locally available materials, feeding, feed preparation and health, poultry house & housing and data recording before the distribution of chickens.

Table 2. Training during Bovans Brown Chicken Production.

Participants	Name of Districts				Total
	Worabe		Mirab Azernet		
	Male	Female	Male	Female	
Participant farmers	6	3	3	4	16
Kebele development agent	2	1	1	-	4
District experts	2	-	1	-	3
Other farmers	15	10	18	7	50
Researcher	3	-	3	-	6
Total	28	14	26	11	79

2.4. *Poultry House Construction*

Farmers had been trained on poultry house construction and general management of chicken before the commencement of intervention. Then farmers constructed the poultry house as they have been trained. Feeders and watering materials were prepared by participant farmers from locally available materials before distribution of chickens.

Fig. 2. Photo of locally made permanent and movable chicken house at beneficiary farmers in Worabe and Mirab Azernet District.

2.5. *Chicken Distribution and Management*

Total of 393 (three hundred ninety three) 45 day old chickens were purchased from Debre Zeit in collaboration with livestock researchers from Worabe agricultural research centre. At Worabe District nine (9) households each household had given 25 chickens and Mirab Azernet District seven (7) households each household had given 24 chickens. In both districts each households had given commercial pullets feed based on number of chickens until start of egg production purchased from Melik Siltie Farmers' Cooperative Union, and supplementary feeds were prepared by farmers from locally available crops such as barley, maize, wheat, sorghum, etc. and after the onset of egg production each farmers formulated locally available layers feed.

Intensive follow up was done by researchers and development agents (Das), District Agriculture Office and technical support of Worabe Agricultural Research Center.

Fig. 3. Photo during distribution and management of chicken in Worabe and Mirab Azernet District.

2.6. *Field Day Organized at Farmers Level*

Field day organized and Media of communication was used for demand creation of technology for wider scaling up. During field day total of 149 participants (male = 128, female = 21) has been participated in the field day.

Table 3. Number of Participants during Field Day.

Participants	**Name of District**		**Total**
	Worabe		
	Male	**Female**	
Participant farmers	112	17	129
Kebele development agent	2	4	6
District experts	4	-	4
Researcher	6	-	6
Media (Debub Television and Asella Radio)	4	-	4
Total	128	21	149

Fig. 4. Photo at field day demonstration of Bovans Brown poultry breeds technology in Worabe District.

2.7. *Data Collection Methods*

Data of body weight at monthly basis, mortality & cause of mortality, age at first egg lay, body weight and egg weight at the start of egg lay, cost of feed and medicaments, income from sale of eggs and culled/unproductive birds has been taken by Worabe agricultural research centre agricultural technology transfer and communication (ATTC) researchers and development agents of selected District Kebeles.

2.8. *Data Analysis Methods*

Collected data were analyzed by using Statistical Package for Social Sciences (SPSS) version 27. Quantitative and qualitative data such as age at first egg laying, egg weight, body weight, survival rate and mortality rate analysed by using simple descriptive statistics including mean, standard error of mean and percentage. Means of quantitative data between districts were compared by employing one way analysis of variance (One-Way-ANOVA). Qualitative data such as farmer's perceptions were analysed by percentage. A benefit and cost ratio was used to analyse the cost of production and net income from Bovans Brown Chicken. Findings were summarized and presented in tabular form.

2.9. *Statistical Model*

Statistical model used for analyzing data regarding the effect of district differences on productive performance of Bovans Brown chicken production in this study.

$Yij = \mu + \alpha i + \varepsilon ij$

Where Yij is chicken productive performance estimate for chicken j in i district, μ is the overall mean, αi is the fixed effect of district (i=2) and Ɛij is the residual error. Level of significance $p<0.05$

2.10. *Gender Issues*

Based on pre-extension demonstration protocol gender participation from total participant farmers more than (44%) beneficiaries were female. The project realizes participation of women farmers and increases nutritional value and income of households.

III. Results and Discussion

3.1. *Productive Performance of Bovans Brown Chicken Breed*

3.1.1. *Mean age of first egg laying of Bovans Brown chicken*

The average age of Bovans Brown in the current study at the onset of egg production was (25.28 ± 0.28 and 27.37 ± 0.67) weeks at the onset of egg production in Worabe and Mirab Azernet Districts respectively with the overall mean of 26.20 ± 0.42 weeks at the onset of egg production in the study area. The mean age of Bovans Brown in the current study at the onset of egg production were no significant difference between two Districts ($P>0.05$). The mean age of first egg laying of Bovans Brown chicken shown on (Table 4).

Present study revealed that mean age of Bovans Brown chicken breed at the onset of egg production in the study area was 26.20 ± 0.42 weeks. The current result in line with the report of [21], who reported an average age at the onset of egg production of koekoek and Bovans Brown chicken breed was 27.4 weeks in South Wollo Zone, Ethiopia and higher than (22.10 and 22 weeks) reported by [22], in Menit Shasha Woreda, West Omo

Zone and [13], at Wondogenet Woreda, Sidama Zone, respectively for Bovans Brown chicken breed starting from pullet until onset of egg production in the study area. According to [23] reported that the average age of Bovans Brown chicken under semi-intensive, small scale and medium scale production system was 19.31 weeks, 17.2 weeks and 16.7 weeks respectively, in Northern Ethiopia. According to [27] reported that the average age of Bovans Brown chicken under small scale production system in Bahir Dar City Administration, Amhara Region, Ethiopia was 21.54 weeks. The current result in line with the report of [24], who reported "Bovan Brown" layer breed, reached the age of sexual maturity at 26 weeks in Peri-Urban Areas of Agro-Pastoralist, South Omo Zone, Ethiopia.

The longer sexual maturity obtained in this study may be due to longer cold climate of the study area during distribution of chicken and management (nutrition, lighting intensity etc.) difference by participants because this character is influenced by environmental factors such as temperature, nutrition, lighting intensity etc.

3.1.2. *Mean Body Weight of Bovans Brown Chicken*

The mean body weight of Bovans Brown in the current study at the onset of egg production was (1342.2 ± 0.027 and 1374.30 ± 0.03) grams of body weight in Worabe and Mirab Azernet Districts respectively with the overall mean of 1356.3 ± 0.02 grams of body weight in the study area. The mean body weight of Bovans Brown in the current study at the onset of egg production were no significant difference between two Districts (P>0.05). The mean body weight of Bovans Brown chicken shown on (Table 4).

The current finding was in line with the result (1.3612 kg) reported by [13]; and higher compared with the results of [21], 0.930 kg for supplemented and 0.783 kg for no supplemented Bovans Brown chicken breed. The current study was lower than [27], reported that overall body weight around urban and peri-urban areas were 1546 gram recorded from the same breed and lower with the report of [24] who reported "Bovan Brown" layer breed body weight was 1.5 kg in Peri-Urban Areas of Agro-Pastoralist, South Omo Zone, Ethiopia.

3.1.3. *Egg Weight Performance of Bovans Brown Chicken*

The mean egg weight of Bovans Brown in the current study at the onset of egg production was (57.53± 1.20 and 59.86±2.50) grams of egg weight in Worabe and Mirab Azernet Districts respectively with the overall mean of (58.55 ±1.27) grams of egg weight in the study area. The mean egg weight of Bovans Brown in the current study at the onset of egg production were no significant difference between two Districts (P>0.05).The mean egg weight of Bovans Brown chicken shown on (Table 4).

The current result was higher when compared with 55.688 gram and 53.3 gram of egg weight which was reported by [13] and [21] on the same breed and [23] reported that the average egg weight of Bovans Brown chicken under semi-intensive, small scale and medium scale production system in Bahir Dar City Administration was 56.84 gm. The current result higher with the report of [24] who reported Bovans Brown layer breeds the average egg weight 52.25 gram in Peri-Urban Areas of Agro-Pastoralist, South Omo Zone, Ethiopia. The current result was lower than 60 gram egg weight recorded which was reported by [25] and [2], average egg weight of Bovans Brown chicken under intensive production system.

The mean laying % of Bovans Brown in the current study at the onset of egg production was (65.78± 2.31% and 65.57 ± 2.02%) laying percent (%) in Worabe and Mirab Azernet Districts respectively with the overall mean of (65.69 ±1.52%) in the study area. The current result in line with the report of [24] who reported average

number of eggs/hen/years the Bovan Brown commercial breed was 237 eggs in Peri-Urban Areas of Agro-Pastoralist, South Omo Zone, Ethiopia.

The current study (236.5) higher average number of eggs/hen/years the Bovan Brown commercial breed was reported than the report of [26] the average number of eggs per hen per year of the Bovan Brown commercial breed was 189 eggs.

Table 4. Mean age, Body weight and Egg weight of Bovans Brown Chicken at first Egg laying.

Parameter	Districts		Mean
	Worabe	Mirab Azernet	
Mean age at first egg laying (wks.)	25.28 ± 0.28	27.37 ± 0.67	26.20 ± 0.42
Mean body weight(g)	1342.2 ± 0.02	1374.30 ± 0.03	1356.3 ± 0.02
Mean egg weight(g)	57.53 ± 1.20	59.86 ± 2.50	58.55 ± 1.27
Mean lay percentage (%)	65.78 ± 2.31%	65.57 ± 2.02%	65.69 ± 1.52%

Note: g = gram; wks. = weeks; % = percent; SE = standard error of mean.

3.2. *Mortality and Survivability of Bovans Brown Chicken Breed*

Mortality and survivability rate of Bovans Brown chicken in the current study areas were presented in (Table 5). The mean survival rate of Bovans Brown in the current study until the onset of egg production was (93.78 ± 1.65% and 93.55 ± 2.38%) of survival rate in Worabe and Mirab Azernet Districts with the overall mean of (93.68 ± 1.35%) of survival rate in the study area. The mean survival rate of Bovans Brown in the current study at the onset of egg production in two Districts were no significant difference (P>0.05). The current findings was in consistence with the study of [28] and [24] reported that survivability (94%) and (93.1%) rate for Bovans Brown chicken breed chicken around Dessie Town in Amhara National Regional State and in Peri Urban Areas of Agro-Pastoralist, South Omo Zone, Ethiopia respectively.On the other hand, the survivability of Bovans Brown chicken in the current study (93.68%) was higher than the result (66.4%) reported by [22], starting from pullet until onset of egg production in the study area; and lower than the values (98.26%) reported by [13] in the same breed.

The mean mortality rate of Bovans Brown in the current study until the onset of egg production was (6.22 ± 1.65% and 6.45 ± 2.38%) of mortality rate in Worabe and Mirab Azernet Districts with the overall mean of (6.32 ± 1.35%) of mortality rate in the study area. The mean mortality rate of Bovans Brown in the current study at the onset of egg production in two Districts were no significant difference (P>0.05). The findings of the current study (6.32 ± 1.35%) mortality rate was higher than the result (1.74%) mortality rate reported by [13], but lower than the values (33.6%) mortality rate reported by [22], for Bovans Brown chicken breed starting from pullet until onset of egg production in the study area. The current result (6.32 ± 1.35%) mortality rate was lower than [23] reported that overall (17%) mortality rate across different production system was recorded.

According to [27], reported that overall mortality around urban and peri-urban areas were 7.4% recorded this result higher than the current study from the same breed. The reasons for the death of birds were predators and diseases. This indicates that survivability of Bovans Brown chicken in the study area highly constrained by poor managements (shortage of feed, diseases, predators and low adaptability of young chicken to cold environment

and presence of different predators, because the chicken were disseminated for the farmers during late winter (April 20th) and this time was the starting period of spring. No chicken mortality was recorded for long dry period season. The current study in line to [14] reported that young chicken less adapted to cold season as compared to dry season.

Table 5. Survival rate and Mortality rate of Bovan Brown Chicken until onset of Egg Production.

Study Area	Chicken Distributed	Survival Rate (%)	Mortality Rate (%)
Worabe District	225	93.78 ± 1.65%	6.22 ± 1.65%
Mirab Azernet District	168	93.55 ± 2.38%)	6.45 ± 2.38%
Mean		93.68 ± 1.35%	6.32 ± 1.35%

Note: % = percent; SE = standard error of mean.

3.3. *Farmer's Perceptions of Bovans Brown Chicken Breed Technology*

Farmers evaluated the Bovans Brown chicken breed performance in line with egg production performance, adaptability to different environment, rapid sexual maturity, egg weight and yolk colour, and disease resistance. About 93.75% farmers highly perceived egg weight and yolk color of Bovans Brown chicken breed compared to they used before. About 81.25% of farmers appraised the egg production performance of Bovans Brown chicken as very good, while about 18.75% appraised it as good compared to the existing local breed.

Table 6. Farmers Perception about Bovans Brown Chicken Breed in the Study Area.

No	Criteria	Very Good (3)		Good (2)		Poor (1)	
		N	%	N	%	N	%
1	Egg production performance	13	81.25	3	18.75	0	0
2	Adaptability to different environment	12	75	4	25	0	0
3	Rapid sexual maturity	14	87.5	2	12.5	0	0
4	Egg weight/yolk colour	15	93.75	1	6.25	0	0
5	Disease resistance ability	14	87.5	2	12.5	0	0

3.4. *Constraints of Chicken Production in the Study Area*

Present study revealed that predator's, diseases, lack of improved breed, feed shortage and housing constraints respectively were major important economic challenges of chicken production in the study area (Table 7). The current result in agreement with [29], reported that predators were the most important problem reported to be affecting poultry productivity in all the study districts accounting for 74.3, 80 and 62.5% in Decha, Chena and Gimbo districts, respectively. The disease was the second constraint as reported by 25.7, 20 and 37.5 % of respondents in Decha, Chena and Gimbo districts, respectively. According to [30] Predators (snakes, rats, dogs, cats, and foxes) caused death, especially in young chicks, within the southern neighborhood of Ethiopia. Also [22] and [13] reported that feed shortage, disease, predators and lack of improved breed important economic challenges of chicken production in Menit Shasha Woreda, West Omo Zone, and at Wondogenet Woreda, Sidama Zone, respectively.

Table 7. Constraints of Chicken Production in the Study Area.

No	Constraints	Number of Respondents (16)	Percentage	Rank
1	Predators	7	44	1st
2	Disease	4	25	2nd
3	Lack of improved breed	3	19	3rd
4	Feed shortage	1	6	4th
5	Housing	1	6	4th

3.5. *Cost Benefit Analysis*

In calculating cost benefit analysis it includes all variable costs, net income and net profit. In the study poultry purchase cost, feed cost and medication cost were considered as variable costs and income from sell of hen and income from egg sell were incomes of the poultry farm. According to (Table 8) below the average cost of poultry purchase, feed cost, medication cost, house construction costs, depreciation cost of house/year (10%), labor cost per farm per year (ETB) each household spent 0.5 hour per day for cleaning of house, watering, feeding and egg collection at farm level and this hours converted to daily working hours of the country. Maintenance cost of chicken house (5%) of house construction. The farmers got 56,982.76 Ethiopian Birr (ETB) net incomes from the improved chicken technology per year in the study area. ▲Net income (NI) =▲Total Return-▲Total Variable Cost (TVC) that is NI=90,304.56 - 33,321.8 = 56,982.76 ETB

Table 8. Cost Benefit Analysis of Bovans Brown Chicken Breed in the Study Area.

List of variables Cost in ETB	List of benefits
Total number of layers evaluated per house hold = 20	Annual egg produced in year = 4,729.68
Cost of house construction = 6,250	Eggs sell = 80,404.56
Purchase price of chicken (ETB) = 4000	Sell of hen = 9,000
Total feed intake (Kg)/year 720	Estimated cost of chicken manure used as fertilizer = 900
Feed cost (ETB)/year = 19771.2	Total benefit (B) = 90,304.56
vaccine (ETB) = 90.6	Net income/Benefit = B-A
Depreciation cost of house/year (ETB) (10%) = 625	90,304.56- 33,321.8 = 56,982.76 ETB
Maintenance cost of chicken house (ETB) (5%) = 312.5	
Labor cost per farm per year (ETB) = 2,272.5	
Total cost (A) = 33,321.8	

IV. Conclusion and Recommendation

The type of chicken production system in the study area was traditional system of chicken production system using local chicken by farmers. The participants' feedback showed that there was lack of knowledge gap, lack of adaptable and productive improved chicken breed technology in the study area. Farmers evaluated the Bovans Brown chicken breed performance in line with egg production performance, adaptability to different environment, rapid sexual maturity, egg weight and dark brown color of an egg, and disease resistance by their

own indigenous criteria, they set. Based on farmers selection criteria Bovans Brown chicken breed got high got high acceptance and perception by farmers in Worabe and Mirab Azernet District of Siltie Zone, Central Ethiopia. Farmers using Bovans Brown chicken breed technology gain 4729 eggs per year per household level in the study area. The farmers got 56,982.76 Ethiopian Birr (ETB) net incomes from the improved chicken technology per year in the study area. Awareness was created and training was given for the importance of improved chicken breed and improved husbandry practices. Thus use of improved chicken breed technology with its full package a vital in enhancing the production and productivity of the poultry sector, impact on improving family nutrition and income of householder, generate employment opportunity and empower women in the study area.

Bovans Brown chicken breeds should take with its full package needed for Zonal and District level scaling up and further dissemination activities with similar agro-ecology and poultry production potential areas.

ACKNOWLEDGEMENTS

This study was conducted with funds from Agricultural Growth Program (AGP II) project for funding budget to done this activity. I would like to thank Agricultural Growth Program (AGP II) project coordinator, Worabe agricultural research center, the agricultural development agents and the participant farmers who participated in the study for their cooperation during data collection.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest and the paper has not been submitted for publication to another journal.

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