Global Scientific JOURNALS
GSJ: Volume 11, Issue 8, August 2023, Online: ISSN 2320-9186
www.globalscientificjournal.com

Performance of synthetic dual-purpose (DZ-white) chicken breed in Assosa District Benishangul-Gumuz Region, Western Ethiopia

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Abstract

This study was conducted in two selected kebeles of Assosa woreda Benishangulgumuz Regional State, Western Ethiopia. The aim was to evaluate the production and reproduction performance and adaptation potential of DZ-white chicken breed under semi-intensive poultry production system. Fifteen rural households were selected purposely. Intensive and practical based training was given for all participant farmers, with regards to poultry house construction, feeding, and management. A total of 750 unsexed one-day old chicks were used for the study. Each participant farmer received 50 unsexed chicks. The average survivability - from a day old up to twenty weeks of age was 86%. The average weights at 20 weeks of age, under farmers' management condition were 1323 g and 1016 g for male and female, respectively. The average egg production performance of the breed in the study area was 134 eggs per year. The average egg weight at initial laying stage (5% production stage) was 41.9 g. The hen housed egg production under farmers' management at 30, 40 and 50 weeks age were found to be 40.89,(36.317 and 32.62%, respectively. The DZ-white chickens showed good production performance in terms of growth, sexual maturity and egg production. Farmers become interested with the chickens for their both egg and meat production under scavenging condition with little supplementation. Therefore, the chicken breed has to be registered as one of alternative dual-purpose chicken breeds for the semi- scavenging production system.

***Keywords*:** *Adaption, egg production, mortality,* DZ-White chickens testing

Introduction

Poultry production has an important economic, social and cultural benefits and plays a significant role in family nutrition in the developing countries (Guèye, 2000, Hinsemu,*et al., 2018,*). In Ethiopia chickens are the most wide spread and almost every rural family owns chickens, which provide a valuable source of family protein and income (Tadelle *et al., 2003*). According to CSA (2021) chicken population in the country estimated to be 57 million of which 78.85 percent are indigenous chicken ecotypes. Chicken population in Benishangulgumuz is estimated to be 1.15 million; from this 0.46 million, 0.39 million, 0.26 million and 0.038 million are found in Assosa, Metekel, Kamash zones and Maokomo special district, respectively.

There is an increasing of demand for animal products (Haftu, 2016). With low potential of indigenous chickens, it is difficult to satisfy the demand of egg and chicken meat of Ethiopian populations (Geleta *et al*., 2013). Therefore, to tackle the ever-existing problem, poultry technology packages needs to be evaluation and disseminated that following the basis of certain socio-economic and physical environments.

The most important inputs to satisfy the demand of the poultry products is by introduction of improved breed, improve feed quality, vaccine and medicaments (Tamir *et al*., 2015).

National Poultry Research Program has developed a new of synthetic dual-purpose breed known as DZ-white (DZW) at DebreZeit Agricultural Research Center /DZARC/. This effort was targeting for the semi-intensive family poultry production system that to contribute for the improvement of living conditions of Ethiopian women and youth farmers. DZ-white chicken breed (DZW) has been synthesized from Lohman silver, Koekoek and Rhode Island White (RIW) lines with blood level of 12.5, 37.5 and 50%, respectively. Production performance of this breed should be evaluated on different parts of the country to know the genetic potential and adaptability of the breed in different agro ecology. Therefore, the objective of this study was.

- To evaluate the growth, egg production and viability of DZ-white under farmers' management condition in Assosa
- To build the skill of participant farmers thereby to increase farmer to farmer technology dissemination
- To aware the contribution of poultry technologies for household income and food security

Materials and Methods

Description of the study area

This study was conducted in two selected rural Peasant Associations (PA) of Assosa Woredas namely (Amba12 and Gambela). Asossa town is located 670 km west of Addis Ababa. It is located between 8°30"and 40°27" N latitude and 34°21" and 39°1" E. longitude. According to National Meteorological Service the average annual rainfall is 1316 mm with uni-modal type of rainfall that occurs between April and October. The altitude of the district ranges from 1500 to 1550 m.a.s.l. Its mean annual temperature ranges between 16.75°C and 27.9°C (Shimelis, 2011).

Participant farmer selection

Eight farmers from (Amba 12 PA and 7 farmers from Gambela PA with total 15 farmers were selected purposely on the basis of willingness construct poultry house, cover all the associated package costs and record the required data according to the format provided. The selection process was done in collaboration with Assosa Woreda of livestock and fishery office and the PA's administrative staff.

Training

Intensive and practical based training was given to all participants /farmers, development agents on poultry house construction and housing management, poultry health, poultry feeding, constriction of Solomon hay box and data recording.

Construction of poultry houses and equipment

Poultry houses were constructed by trained farmers based on their training and by recommendations given by professionals using locality available material. Chicken houses were equipped with clean feeders and drinkers. Before tchicks' arrival, houses were cleaned, and disinfected.

Experimental Birds and Their Management

A total of 750 unsexed one-day-old chicks of DZ white feather breed were transported from Debre Zeit Agricultural Research Center to Assosa Agricultural research center. Cchicks were distributed to the selected farmers immediately after arrival at Assosa. Each participant farmers received 50 one-day-old chicks. Brooding was done using hey box (Solomon hay box) and charcoal.
Formulated ration was provided for the first two months of brooding period. Thereafter, chickens allowed scavenging in a restricted backyard running area and water was provided adlibitum. In addition, chickens were regularly supplemented with ration formulated based on locally available feed ingredients. Chickens were vaccinated against Mareks', NCD and Gumboro diseases at the appropriate age as recommended by veterinarians.

Data Collection: - body weight development (at different week of age, at the starting from day old), age at first egg (AFE), egg weight at 5% production, egg weight at 50% production, egg weight at pick of production, mortality rate, costs of feed, vaccines, medicaments and veterinary services, income from sale of cock , nonproductive/spent hens and eggs, collected for a period of 72 weeks of age Eggs were collected from each of the households daily on group basis. Partial budget analysis was also done to calculate economic data from different variable costs and income generated from different sources.

Mortality: Data on chicken mortality were recorded from one-day old up to 45 weeks of age at four weeks interval

Bodyweight: Male and female group body weights were taken at 4, 16, and 20 weeks of age using a weighing balance.

Data management and analysis: - Data collected were entered into Microsoft Excel sheets and coded for analysis. Data analysis was done by using SPSS (Version 20) software. Descriptive and ANOVA techniques were used for data analysis.

- **% survivability** = $\frac{\text{Total number of chicken survive}}{\textit{Total number of chicken at the start of the experimnet}}$ X 100
- **% Hen-day egg production** = $\frac{\text{Number of eggs collected per day}}{\text{Number of hens present that day}}$ X 100

HHEP housed egg production = $\frac{\text{Total number of eggs laid on a day}}{\textit{total number of hens housed at the begining of laying period}}$ X 100

Results and discussions

Survival rates of birds: - Table1 shows the survivability of DZ-white chicken breeds in the study area. The DZ-white poultry breed chicken survivability rate from day old until the first four weeks was 92% under farmers' management in the study area. The average survivability of the chickens (from day old until the twenty weeks of age) was86% with a mortality rate of 14%. The mortality rate of Dz-white chickens in the current study was high (14%) this might be related with poor management of the participant farmer in the study area .The survival rate and mortality varied among participant farmers and this could be due to the differences in chickens management by farmers.

Table 1. Survivability of DZ-White chicken breed up to 20 weeks of age

Participant	Day old chicken Distributed	Number of chickens survive n 1st 4 week	Survivability %	Number of chickens survive 20 weeks	Survivability %
1	50	46	92	44	88

2	50	47	94	43	86
3	50	45	90	42	84
4	50	44	88	42	84
5	50	49	98	46	92
6	50	47	94	43	86
7	50	45	90	43	86
8	50	47	94	44	88
9	50	44	88	42	84
10	50	42	84	40	80
11	50	47	94	44	88
12	50	46	92	43	86
13	50	47	94	45	90
14	50	46	92	42	84
15	50	48	96	42	84
Average (%)		**46**	**92**	**43**	**86**

Body weight development

The average body weight of female and male chickens at different weeks of age are presented in Table 2. The mean live body weight steadily increased until 20th weeks. The average weight at 20 weeks of age under farmers' management condition was 1323 g and 1016 g for males and females, respectively. The body weight of DZ-white at 20 weeks were comparable with the Potchefstroom koekoek which was 1399-1700.71g at 20 weeks of age (Wondmeneh et al., 2012), On another hand the current result of BWT is lower than Anwar seid (2019), who reported that 2.23 kg and 1.91kg for males and females, respectively for *potchefstroom* koekoek chicken breed at 20 weeks of age under agro pastoral management at Asayta district of Afar regional state

Table 2 Body weight development of Dz-white at 20 and 72 weeks of age

Participant	Weight 20 weeks of age (gram)		Weight 72 weeks of age (gram)	
	Males	Females	Males	Females
1	1207.4	1003.6	2289.5	1464.6
2	1401.9	1201	2388.6	1490.4
3	1301.7	1106.3	2662.3	1472.8
4	1418.2	976.5	2547.8	1454.6
5	1315.67	1017.9	2713.5	1439
6	1085.78	1061.2	2639.7	1482.2
7	1396.9	919.9	2568.7	1427.6
8	1456.3	973.4	2603.5	1472.4
9	1278.9	1044.1	2533.7	1395.6
10	1243.7	1037.8	2494.7	1460.6
11	1340.1	966.8	2484.5	1441
12	1401.7	1012.3	2012	1419.6

13	1308.06	927.8	2012	1419.6
14	1406.5	999.99	2550.5	1389.8
15	1284.7	1005.7	2692.2	1465.9
Average (%)	**1323.2**	**1016.9**	**2479.5**	**1446.4**

Age at first egg lay: - The average age at first egg lay are presented in Table 3. The present study revealed that average age at the onset of egg production was 180 days. This result has difference with Gezahegn et *al. (*2016), who reported that an average age at the onset of egg production of koekoek chicken breed was 27.4 weeks of age.

Egg Weight at different production stages: - Egg weights of Dz-white at different production stages are presented in Table 3. The average egg weight at initial laying stage (5% production stage) was 41.9 g. The result is almost similar to the weight achieved at Areka areas (40.2gm) as reported by Aman *et al*., (2016), but lower than Dessalew (2012) who reported 48.84± 6.77. As indicated in Table 3, egg weights increased as the production stage increases from 5% to 50%.

Table 3. Age at first egg lay and egg weight at different production stages

Participant	Number of pullets reached AFL	Average age at first egg lay (day)	Wt. of egg at first egg lay (g)	Egg weights at 50% production ()	Egg weights at peak production(g)
1	21	172	35.3	41	47
2	22	179	37.6	42.2	49
3	23	190	40.2	40.6	51
4	19	154	34.7	43.2	46
5	25	184	41	42.3	45.6
6	24	192	33.8	44	46
7	20	189	39.1	40.9	49
8	27	188	35.2	39.6	44
9	24	183	34.3	38.5	46
10	14	175	39.7	42.6	48.7
11	17	162	34.9	44	50.1
12	23	179	36.2	40.3	44.9
13	26	192	39.4	41	51.2
14	17	201	38.3	43	45.5
15	23	163	40.8	45	44.9
Average (%)	**21.7**	**180.2**	**37.4**	**41.9**	**47.3**

Egg production: - Hen-day egg production and Hen - housed egg production at 30, 40 and 50 weeks of age are indicated in Table 4. The Hen-day egg production under farmers management at 30, 40 and 50 weeks were 41.83 ,41.94 and 41.1%, respectively. While the Hen housed egg production under farmers at 30, 40 and 50 weeks were 40.89, 36.317 and 32.62%, respectively. The average egg production performance of the breed in the study area was 134 eggs per year. This result is higher than egg production performance of the local chickens which ranges from 40 to 63 eggs per year (Lemlem and Tesfay, 2010).

Table 4. Hen-day egg production and Hen - housed egg production at different weeks of age

Participant	Hen-day egg production at 30 weeks	HHEP housed egg production at 30 weeks	Hen-day egg production at 40 weeks	HHEP housed egg production at 40 weeks	Hen-day egg production at 50 weeks	HHEP housed egg production at 50 weeks
1	33.33	33.33	41.18	33.33	37.50	28.57
2	36.36	36.36	38.89	31.82	27.78	22.73
3	47.83	47.83	35.00	30.43	36.84	30.43
4	31.58	31.58	38.89	36.84	33.33	26.32
5	43.48	40.00	42.86	36.00	42.11	32.00
6	40.91	37.50	45.45	41.67	41.18	29.17
7	55.00	55.00	41.18	35.00	41.18	35.00
8	48.00	44.44	52.63	37.04	42.11	29.63
9	33.33	33.33	36.84	29.17	43.75	29.17
10	42.86	42.86	45.45	35.71	45.45	35.71
11	47.06	47.06	43.75	41.18	56.25	52.94
12	42.86	39.13	38.10	34.78	42.11	34.78
13	46.15	46.15	50.00	46.15	36.84	26.92
14	35.29	35.29	47.06	47.06	52.94	52.94
15	43.48	43.48	31.82	30.43	42.11	34.78
Average	41.83	40.89	41.94	36.31	41.43	32.62

HDEPW30 = Hen-day egg production at week 30, HDEPW40= Hen-day egg production at week 40, HDEPW50= Hen-day egg production at week 50, HHEPW30 =Hen - housed egg production at week 30, HHEPW40 =Hen - housed egg production at week 40, HHEPW50 =Hen - housed egg production at week 50

Partial budget analysis:- In computing the partial budget analysis the feed, medication, chicken house maintenance and chicken costs were considered as variable costs whereas the sale of live chickens, sale of cocks, eggs and the existing chickens till to the time of this data collected were used as an income sources. Based on the listed variable costs and the income earned the average income generated per individual farmer was **10546.93** Ethiopian Birr. The change in net income **(**Δ**NI**) was calculated as the difference between the change in total return **(**Δ**TR**) and the change in total variable costs **(TVC)** Δ**NI=** Δ**TR** - Δ**TVC** Δ**NI**=196243-38039 Ethiopian Birr Δ**NI**=158204 Ethiopian Birr Average profit/participant=158204÷15 Average profit/participant =10546.93 Ethiopian Birr.

Table 5: Lists and amounts of Variable costs for Dz-white chickens evalaution in Assosa

		List of variable costs					
Participants	Unit	House maintenance	Chick purchase	Transportation cost	Feed cost	Medication cost	Total
1	ET Birr	320	750	480	1270	90	2910
2	ET Birr	160	750	480	1500	62	2952
3	ET Birr	210	750	480	950	40	2430
4	ET Birr	170	750	480	1020	36	2456
5	ET Birr	90	750	480	780	80	2180
6	ET Birr	200	750	480	960	143	2533
7	ET Birr	160	750	480	860	94	2344
8	ET Birr	120	750	480	1204	30	2584
9	ET Birr	180	750	480	879	26	2315
10	ET Birr	175	750	480	680	89	2174

11	ET Birr	158	750	480	940	72	2400
12	ET Birr	350	750	480	793	70	2443
13	ET Birr	210	750	480	743	150	2333
14	ET Birr	240	750	480	1432	70	2972
15	ET Birr	400	750	480	1321	62	3013
Average		**209.5**	**750**	**480**	**1022.1**	**74.2**	**2535.93**

Table 6: Lists and amounts of income earned from Dz-white chicken evaluation in Assosa

		Lists of incomes					
Participants	**Unit**	**Sale of hens**	**Sale of eggs**	**sale of cock**	**Home slaughtered price of chickens**	**Home consumed price of eggs**	**Total**
1	ET Birr	4750	1190	7000	1400	280	14340
2	ET Birr	4500	1428	6300	700	154	12928
3	ET Birr	3750	1680	5600	1050	406	12080
4	ET Birr	5000	1456	5250	1400	350	13106
5	ET Birr	5000	623	7350	700	651	13673
6	ET Birr	4750	1428	7000	350	98	13528
7	ET Birr	3750	1078	6650	1050	210	12528
8	ET Birr	5000	1127	5250	1750	301	13127
9	ET Birr	4500	756	5950	0	392	11206
10	ET Birr	3250	1029	7350	1050	210	12679
11	ET Birr	3750	1953	7350	700	644	13753
12	ET Birr	5000	2240	5250	350	126	12840
13	ET Birr	5250	1330	5600	1050	392	13230
14	ET Birr	3750	1470	7350	1050	567	13620
15	ET Birr	4750	1155	6650	1050	287	13605
Average		**4450**	**1329.5**	**6393.3**	**910**	**337.8**	**13082.9**

Conclusion and recommendations

Dz-white chickens showed good production performance in terms of growth, sexual maturity, egg production as compared to the local chicken population in the area. The study also showed that the breed is well adapted in in the lowland areas of Benishangul gumuz region.The color of the chickens which is white is less preferred by farmers that will not help to escape from predators than the locals. Farmers become interested with the chickens that is due to the breed could effectively manage for both egg and meat production under scavenging condition with little supplementation as compared to other improved breeds. Therefore, the breeds have to be registered as one of alternative dual-purpose chicken breeds for the semi-

scavenging production system with a combination of sound environmental and nutrition management packages.

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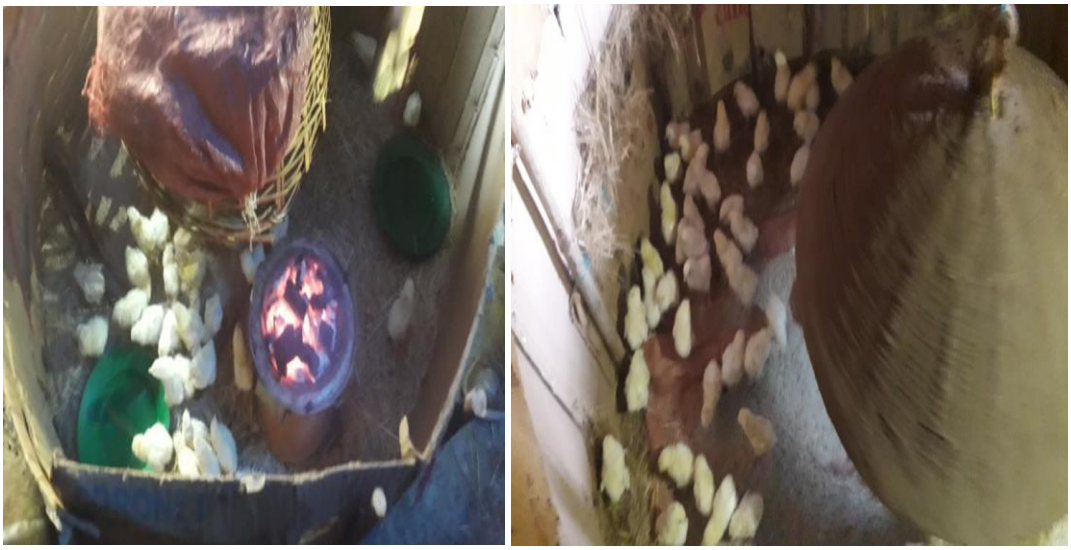

Picture 1. Dz-white during Brooding period under farmers management

Picture 2. Performance of Dz-white the chicken under farmers management

Picture 3. The performance of DZ-white breeds at 52 weeks of age (on station)