

(RESEARCH ARTICLE)



## On-farm multi-location testing of synthetic dual-purpose chicken breed (DZ-white) at Lowland area of Kaffa Zone of Ethiopia

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### Abstract

A study evaluated synthetic dual purpose DZ-white's adaptability and production performance in lowland agro-ecology. A total of 900 day-old chicks were distributed to fifteen (15) participant farmers (sixty chicks per farmer). Vaccines for Newcastle and Gumboro were administered as per veterinarian recommendations. Initially, chicks were supplemented with commercial feed and gradually shifted to locally available feed resources. Data on body weight, age at first egg, egg production, egg weight and farmers' perception were recorded. On average, the adult male and female chicken body weight recorded at 20 weeks of age were 331.2 grams and 273.3 grams per chicken, respectively. Moreover, in the present study, the adult male and female chicken body weight recorded at 20 weeks of age were 1541.3 grams and 476.9 grams per chicken, respectively. The result also showed that an average egg weight at initial laying stage 5%, 50% and peak production stage were 44.09 grams, 48.33 grams and 55.45 grams, respectively. In the current study, chickens produced 296 eggs annually. Based on the adaptability, production performance and social acceptance, participant farmers preferred synthetic dual purpose DZ- white chicken breed to commonly used local and exotic breeds. As a result of their moderate growth and production performance, scavenging ability and social acceptance, demonstration and scaling up of the breed in the rural smallholder production system are highly recommended.

**Keywords:** On-farm; Production performance; DZ white; Scavenging; Adaptability

### 1. Introduction

The current chicken population in Ethiopia is estimated to be about 57 million; 78.85, 12.02 and 9.11 % were reported to be indigenous, exotic and crossbreeds, respectively (CSA, 2020/2021). Based on production objectives, biosecurity level, and the numbers of chickens kept, the poultry sector in Ethiopia can be categorized into large-scale commercial, medium-scale commercial, small-scale commercial and village production systems (Wondmeneh et al., 2017). The dominant proportion of national poultry meat and eggs are produced under the scavenging village production systems using low-producing indigenous breeds. However, the share of exotic breeds in this sector nowadays has increased. According to FAO (2019), in 2016, the contribution of exotic breeds reached more than 27 percent of the total number of eggs produced nationally. However, they constitute only 9 percent of the total national flocks. Economic empowerment, food security and socio-cultural importance are the significant contributions of village poultry to the livelihoods of poor households (Asgedom, 2007).

Poultry is the smallest livestock investment a village household can make as the first investment step on the ladder out of poverty (FAO, 2004). Poultry is being kept by village farmers who live in all agro-ecologies of Ethiopia. Among all livestock species, poultry appears to be the most suitable and practical intervention to improve rural livelihoods in the developing countries, including Ethiopia (Simainga, 2011). Hence, production and productivity could be improved through the type of chicken breed used, management and husbandry practices (NPRCS, 2016). In this regard, attempts

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have been made to introduce different exotic layer breeds to smallholder farming systems of Ethiopia because of the low performance of indigenous chicken to improve poultry productivity since 1950s (NPRCS, 2016). However, this attempt cannot succeed as expected due to the low adaptation of exotic breeds to the harsh production environment. On the other hand, indigenous chicken's production performance is poor and needs improvement. On the contrary, another chicken category, dual purpose is characterized by moderate adaptability and production performance. Thus, dual purpose chickens are well adopted under smallholder farmer conditions. DZ-white is a dual purpose synthetic breed produced for a village production system. Hence, the general objective of this study was to test its adaptability and production performances under the smallholder production system in lowland agro-ecology.

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## **2. Material and methods**

### **2.1 Study Area**

The study was conducted in Shomba Sheka kebele, located in the Kaffa zone, Southwest Ethiopia Regional state and characterized by wet moist lowlands. The experimental site was located from 450 km from Addis Ababa, capital city of Ethiopia and 14 km from Bonga, the capital of the Kaffa Zone. The altitude of the area is 1200 meters above sea level and the average annual rainfall ranges from 1050 to 1892 mm. Its average temperature also varies from 15 to 29°C (Tesfaye and Nebiyu, 2021).

### **2.2 Farmer selection and training**

Fifteen participant farmers of different age groups, perceptions and sex were purposively selected based on the willingness to rear chickens, ability to manage the breed well and up come all the related challenges. These selected farmers were given training on poultry production systems, breed selection, housing and husbandry practices, feeding and nutrition, health and biosecurity and other routine activities.

### **2.3 House construction**

Each farmer selected to keep chickens had constructed about 5m\*4m chicken house. The chicken house was made from locally available but durable materials through the participation of participants. The house had the quality to protect the chicken from rain and sunlight, wind force, predators and the theft and was safe from flooding.

### **2.4 Distribution and management of birds**

Sixty unsexed day-old chicks sourced from Debrezeit agricultural research center were provided for each participant farmer. Chicks were given sugar solution through drinking water at arrival to minimize transportation and handling stresses. Vaccines for NCD and Gumboro were administered. In the beginning, chickens were provided commercial feed as supplement. Then gradually feeding system relay on scavenging with regular supplementation of locally prepared feed. Maize, sorghum and rice were the primary grains used by farmers.

### **2.5 Data Collection and Analysis**

The data recording sheet that allows filling all the required data was prepared and provided to farmers, and recording was done by the farmers themselves and researchers. Data on body weight, mortality, age at first egg, number of eggs, egg weight and farmer's perception were collected. The data was analyzed using simple descriptive statistics.

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## **3. Results and discussion**

### **3.1 Adaptability, reproductive and growth performance of chickens**

The synthetic DZ-white chicken in the present study revealed good adaptation and growth performance as a dual purpose chicken. Hence, 84.33% the birds could survive until maturity age. In agreement with this result, the adaptability and growth performance of Potchefstroom Koekoek dual purpose chickens under scavenging production system was comparatively good (Dessalew et al., 2015). In this study, the average age of chickens, where nearly 5% of the population lay, was about 141.8 days. Dessalew (2012) reported that the mean age of dual purpose Koekoek chicken at first laying was 153.5 days under the village production system in the Ada'a and Lume districts of East Shewa. This early egg production feature of the breed implies a better production potential for the chicken in its lifetime.

The average body weight of male and female chicken recorded at 20 weeks of age were 331.2 g and 273.3 g per chicken, respectively. Moreover, the average body weight of males and females chicken recorded at 72 weeks of age were 1541.3 g and 476.9 g per chicken, respectively.

**Table 1** Production performance of dual purpose synthetic DZ –white chickens under farmer management practice

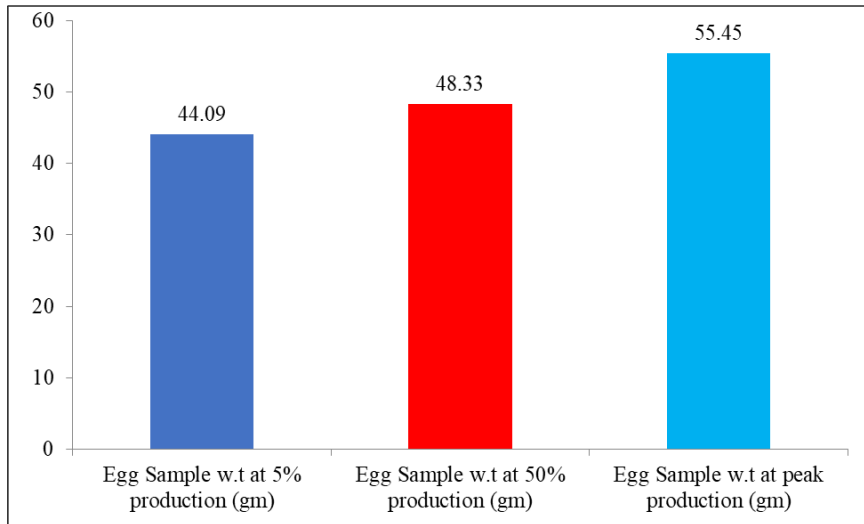
Sex	Mean body weight at 20 weeks of age/chicken/gm	Mean body weight at 72 weeks of age/chicken/gm	Average age at first lay in days	Average egg production in numbers/chicken/year	Average egg weight in gm
Male chicken	331.2	1541.3			
Female chicken	273.3	476.9	141.8	276.64	52.71

### 3.2 Egg production performance

In the present study, the annual average egg production performance of synthetic DZ-white under farmers' management conditions per chicken was 296.64 eggs. The current result of this study is in line with  $292.4 \pm 17.9$  eggs for Desalew Tadesse *et al.* (2013) and Tomas Melkamu *et al.* (2017), respectively on the same breed. In the current study, an average egg weight at initial laying stage 5%, 50% and peak production stage observed were 44.09g, 48.33g and 55.45g, respectively. Under farmer's management conditions in Ethiopia 52.5, 52.1 and 43 g of average egg weight were reported for RIR, white leg horn and Fayoumi breeds, respectively (Lemlem and Tesfaye, 2010). As indicated in figure 1, the increase in egg weight was observed as the production stage increases from 5% to peak stage. The average egg weight through all production stages was 52.71 g.

**Table 2** Egg production performance

Traits	Local	Synthetic DZ-white	Another exotic breed
<b>Adaptability (hardness)</b>			
Disease resistance	1	2	4
Scavenging ability	1	2	4
Alertness to predators	1	2	4
<b>Production performance</b>			
Growth rate	4	1	1
Age at egg	4	1	1
Egg production	4	3	1
Egg weight	3	2	1
Mature body weight	4	2	1
<b>Market preference/social acceptance</b>			
Live bird	1	2	3
Egg	1	2	3
<b>Total</b>	24	19	23
<b>Rank</b>	3	1	2



**Figure 1** Average egg sample weight at 5%, 50% and peak production (gm)

### 3.3 Farmers’ perception of synthetic DZ-white breeds

At the end of the experiment, participant farmers’ perceptions of the chicken breed were evaluated. Farmers were asked to score a point from 1 (better) to 4 (poor) for traits of adaptability, production performance, and marketing preference of synthetic DZ-white breed compared with local and other exotic chicken breeds from their previous experiences.

In the study area, the perception of farmers for poultry production was low compared to crop production. The main reason is that the government’s focus on extension is crop production and farmers are more oriented toward cropping. As indicated by Wondmeneh (2015), in Ethiopia institutional factor (public extension system) is the main responsible for failures in disseminated technologies. At the beginning of the experiment, farmers showed a tendency of resistance to investing more in poultry production. However, their attitude changed gradually, and initiatives were seen.

**Table 3** Cost-benefit analysis

Parameters	Cost- benefit analysis
Average amount of feed used/farmer (kg)	6.9
Change in Total Revenue (ETB)	269,105
Change in Total variable cost (ETB)	88,550
Change in net income ( ETB) $\Delta NI = \Delta TR - \Delta TVC$	180,555
Average profit/farmer (ETB)	12,037

Where;  $\Delta NI$ = Change in net income;  $\Delta TR$ = Change in total revenue;  $\Delta TVC$  = Change in total variable cost; ETB = Ethiopian birr; kg = kilogram; = change

The partial budget analysis the feed and medication were considered as variable costs whereas the sale of live chicken, eggs and the existing chicken till the time of this data collected were used as an income source. The change in net income ( $\Delta NI$ ) was calculated as the difference between the change in total return ( $\Delta TR$ ) and the change in total variable costs (TVC). Based on the listed variable costs and the income earned the average income generated per individual farmers were 12,037 ETB.

## 4. Conclusion

The synthetic dual purpose DZ- white chicken breed are suitable for scavenging production system and adapted lowland agro ecology. They have characteristics of good egg production, and growth performance traits equally. Their ability to stand in harsh environments and social acceptance made them preferable to producers. Therefore, based on this result, demonstration and scaling up of the breed are highly recommended.

## Compliance with ethical standards

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### *Disclosure of conflict of interest*

None of the authors have any conflict of interest.

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