

Demonstration of Dual-Purpose Chicken “Potchefstroom Koekoek” and Technology Packages in East Gojjam Zone

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To cite this article:

Mezgebu Getnet, Anduamlak Assaye, Bainsagn Worku, Yalew Mazengia, Misba Alewi. Demonstration of Dual-Purpose Chicken “Potchefstroom Koekoek” and Technology Packages in East Gojjam Zone. *Animal and Veterinary Sciences*. Vol. 11, No. 1, 2023, pp. 1-5. doi: 10.11648/j.avs.20231101.11

Received: December 1, 2022; **Accepted:** January 17, 2023; **Published:** January 31, 2023

Abstract: Dual-purpose poultry package demonstration was undertaken at East Gojjam Zone, Aneded and Gozamin districts, Gudalima and Wonga Nifasam kebeles (PAs) from Aneded and Wonka and Adisna Gulit kebeles (PAs) from Gozamin. The objective was demonstrating Koekoek chicken breed and technology packages under farmers’ management condition. The districts, kebeles, and participant farmers were selected purposively based on interest. Training was given on poultry house and housing, health care, feeds and feeding and data recording. Demonstration was conducted by providing 55 a day-old chicks to each farmer with 25 days chick starter feed. Chickens were vaccinated from day old against Marek’s, Gomboro and Newcastle diseases based on the schedule of national veterinary institute and national poultry research program. The average chick mortality to 8th week was 5.43%. Chicken were reached first egg laying in 126 days which ranges from 126 to 291 days age. The average weight of male chicken at 8, 20 and 52 weeks old was 0.61 kg, 1.39kg and 2.59kg, respectively. Whereas average body weight of female chicken at 8, 20 and 52 weeks old was found 0.53kg, 1.26kg and 2.01kg, respectively. The MRR of keeping Koekoek chicken was 511.41% in the study area. Based on the current study production of Koekoek chicken can play an important role in reduction of malnutrition and improve households’ income and livelihoods.

Keywords: Aneded, Demonstration, Dual-Purpose, Gozamin, Koekoek Breed

1. Introduction

Animal production in general and chicken in particular play important socioeconomic roles for many poor rural households in developing countries [4, 15]. In Sub Saharan Africa, 85% of the rural population keep chicken and support the provision of affordable animal protein and household cash income [3]. It creates an employment opportunity for youth, elders, women, and disables in the urban and peri-urban areas. According to [8] report, in Ethiopia the total chicken population is estimated to be 57 million. In terms of breed distribution 78.85%, 12.02% and 9.11% were indigenous, hybrid and exotic, respectively. Poultry production is the most important commodity for developing countries to increase the Gross Domestic Product (GDP), food self-sufficiency,

poverty reduction, livelihood improvement, and economic growth [9, 16]. However, the per capita consumption of egg in developing countries is 42 per year, which is very low as compared to 153 eggs per year in developed countries [10]. Despite, the contribution of poultry sector is not proportional to its huge number. Efforts were made to improve the sector by different actors; government, Non-Government Organizations (NGOs) and others, but the way was disorganized.

Based on various selected factors like breed, flock size, housing, feeding, health, technology, and bio-security, Ethiopia’s poultry sector can be divided into three primary production systems; large-scale commercial poultry

production systems, small-scale commercial poultry production systems, and village or backyard poultry production system. In Ethiopia, chicken is primarily rearing a backyard operation with a few low-productivity scavenging birds. The production of eggs and meat in this system is insufficient to supply the increased demand for eggs and poultry meat in the country. The price of eggs and meat has been steadily rising which indicates an increasing local demand.

On the other hands, food insecurity and stunted child growth are common and big problem in East Gojjam zone and Ethiopia at large and must be treated with utmost urgency. In East Gojjam about 59.2% of households (HHs) are food insecure [2], which need diversified income generating opportunities to resolve the problem.

The *Potchefstroom* Koekoek is a South African registered chicken breed developed in the 1950's at the Potchefstroom Agricultural College by the late Chris Marais. It is considered as a composite breed of White leghorn, Black Austrorp and Bared Plymouth Rock [12]. The koekoek chicken breed is important in medium input production system or semi-scavenging production system. It is also a popular breed for egg and meat production as well as their ability to hatch their own offspring [13]. The breed has similar characteristics with Ethiopian indigenous chicken ecotypes and easily manageable at farmers' level. *Potchefstroom* Koekoek is free ranging, dual purpose breed, widely adaptable, and lays brown shelled eggs (196 eggs/bird/year with an average weight of 55.7g). It also reaches early for sexual maturity (130 days) and an average weight of 3-4kg for males and 2.1kg for female.

Moreover, East Gojjam zone has a conducive environment for poultry production. The production system of the zone is predominantly reared local breed due to limited access to improved breeds, health facilities, improved poultry feeds, prevalence and occurrence of diseases and lack of awareness on improved management practices of poultry production [11].

Therefore, the objective of this demonstration was to enhance a small-scale poultry production and address suitable full-fledged poultry technology packages to improve rural livelihood and nutrition of the people in East Gojjam zone. Eventually, to build the skill and knowledge of participant farmers' thereby to accelerate the diffusion and adoption of technology.

2. Methodology

2.1. Location Description

The demonstration was conducted by Debre Markos Agricultural Research Center (DMARC) which is 292kms away to North western from Addis Ababa and 265kms from Bahir Dar. East Gojjam Zone constitutes 19 districts and 4 urban administrations. The zone covers total area of 1.46 million hectares. The elevation ranging from 800 to 4200 m.a.s. and RF is mainly unimodal type which ranges from 900 to 1800 mm. The annual temperature ranges from 7.5°C to

27°C.

2.2. Participant Household Selection

A total of 36 farmers were selected from 2 districts (Aneded and Gizamin) of East Gojjam zone, From each district, 2 kebeles (Gudalima and Wonga Nifasam) from Aneded and (Wonka and Adisna Gultit) from Gozamin. Farmers were selected purposively who have willingness to construct poultry house from local available materials, to cover all the associated packages cost, and record the required data based on developed format. Training was given for two household members who have active participations in poultry housing, health, feeds and feeding and data recording.

2.3. Chicken Distribution and Management

Following training, poultry house construction and farmers prepared to receive a day-old chicks; and provided 55 chicks including 5 reserves for each participant farmers. A day-old chicks were transported from National Poultry Research Program (NPRP) of Debre Zeite Agricultural Research Center after vaccinate against Marek's disease. Like a day-old chicken, the starter feed was provided for participant farmers during the brooding period. Vaccinations against New castle and Gumboro were vaccinated based on the guidelines of National Veterinary Institute (NVI) and NPRP to 72 weeks and then the task was handed over to the districts livestock offices.

In the first 8 weeks of age chicken were managed in confined deep litter house. Most of the farmers used electric power as heat source, but some are used charcoal in the brooding periods.

Most of the participants strictly followed the biosecurity conditions by preparing foot bath, clothing during management time, keep isolation from others house, prepared recreation area, excluding entrance of visitors, and etc.

2.4. Data Collection

Data recording sheet was developed and placed in each participant households and checked at least once a week by research staff. Feed offered to chicken during brooding, grower and laying phase. The participant farmers were used various types and amount of feed ingredients which formulated from own produce. Body weight (at the age of 8 and 20 weeks), age at first egg, and end production (72 weeks of age), type of vaccines and way and/or route of administration, disease symptom and type of treatment (modern, ethno-vet or traditional medication), mortality and its cause, socioeconomic data, production costs, income from sale (cocks, non-productive hens and eggs), egg and number of chicken used for home consumption/gift were collected. For comparison with local chicken production the price of adult local chicken and egg was collocate from local market where the new breeds (Koekoek) was sold. Participant household's perception on the demonstration technology and packages were collected through semi structured interviews, focus group discussion and field observation.

The body weight was taken from 10% of total male and female birds of the groups.

3. Results and Discussion

3.1. Mortality

Some of the participants achieved zero mortality (4 households) until first egg laying age. The average chick mortality to 8th weeks were 5.43% (ranges 1 to 9 chicks per household). The chicken mortality varied between farmers could be due to the management difference (house cleaning, feeding, watering, and etc.) among the participant farmers.

3.2. Age at First Laying and Average Weight of Egg

The average age of first laying recorded at each farmer was 201.43 days. It ranges from 126 to 291 days. This variation indicates the significant management difference among participant farmers. Farmers who managed their birds very well from brooding were reached laying age in early (126 days), which is even earlier than the place where Koekoek was originated/adopted/ i.e., 130 days reported by [14] in South Africa.

3.3. Body Weight Gain

The body weight was recorded at 8 and 20 weeks of age from representative samples of each household chicken. The average weight of chicken at 8 weeks of age was 0.61 kg and 0.53kg for male and female, respectively, whereas average body weight at 20 weeks of age was found 1.39kg and 1.26kg for male and female, respectively. Similarly, average body weight at 52 weeks of age was found 2.59kg and 2.01kg for male and female, respectively. This result was comparable with the previous reports such as: 1.5k and 1.1kg for male and females at 20 weeks of age, respectively [5], 1.7kg for Koekoek breed at 26th week of age [14]), 1.39 kg of body weight at 19th weeks of age [6], 1.04kg and 1.01kg 15 weeks of age: [7] and [1], respectively. In general the body weight of koekoek breed achieved at 20 weeks of age evaluated under farmer management condition was showed good performance.

Table 1. Body weight of koekoek chicken at 8 and 20 weeks in farmers' management.

Age weeks	Male (kg)			Female (kg)		
	Max.	Min.	Mean	Max.	Min.	Mean
8	0.97	0.32	0.61	0.78	0.30	0.53
20	2.50	0.93	1.39	2.00	0.67	1.26
52	3.00	2.00	2.59	2.40	1.67	2.01

3.4. Feeds and Feeding

Most of farmers in the first 8 weeks age provided their chickens with formulated starter feed purchased from commercial suppliers. Few of the participants formulated feeds from homemade grains after 25 days based on the ratio given during training. Most of farmers purchased feeding and watering equipment for better management of feeding and watering.



Figure 1. Feeder and waterer.

3.5. Partial Budget Analysis

The overall partial budget analysis of Koekoek chicken demonstration in both districts indicated that rearing improved chicken breeds with better management practices resulted higher net benefits and higher marginal rates of return (MRR) over local chicken rearing in the study area. The net benefit and marginal benefits of rearing of Koekoek chicken obtained 24,036.20 and 20,616.37 ETB, respectively. This revealed that rearing of Koekoek breed with improved management practices the farmer enables to obtain the better gain is increased by 602.72% of the local chicken rearing.

The MRR of keeping Koekoek chicken was 511.41% in the study areas. This implies that a unit invest in purchasing inputs for chicken production obtained 5.11 ETB. Generally, the result of the study indicated that rearing improved chicken breeds with improved management practices using locally available materials and feed are gainful and the farmer's enable to diversified their income and ensure their livelihood.

Table 2. Partial budget analysis of poultry demos at East Gojjam zone.

Parameters	Local birds	Improved birds
Revenue and Operating cost		
Income from male birds' sale	2,500.50	5,732.17
Income from female bird's sale	3,750.00	8,226.00
Income from egg sale	3,460.00	20,400.00
Gross income	9,710.50	34,358.17
Feed cost	6,247.60	10,160.25
Medication	0.00	68.40
other cost	42.35	92.60
Total variable cost	6,289.95	10,321.25
Net benefit (ETB)	3,420.55	24,036.92
Marginal cost (ETB)	4,031.30	
Marginal net benefit (ETB)	20,616.37	
Marginal rate of return (MRR (%))	511.41	

3.6. Field Day Demonstration

Field day was organized to demonstrate the performance of individual households and thereby to understand each other and fill the gap during the rearing season. Experts and officials from zonal to kebeles level, participant farmers, and non-participant farmers of each district were participated in the field day events. Field day participants had the chance to observe individuals' performance, chance to ask questions in relation to poultry production, share experience from one another and practical lesson had been gotten.

The feedback during the field day and individual interview towards Koekoek chicken breeds in comparison to local and

other exotic breeds were recorded. The feedback of the participant farmers was positive. The participants of rearing the chicken stated that the koekoek breeds are raised easily and hardy at chick stage, resistant to disease, have good body size, gain better price due to the egg shell color is preferred in the market, better egg size relative to local, have watchful/alert character relative to other exotic breeds, good scavengers ability (suited to semi-scavenging production system) and fastest growth rate as a positive feedbacks. They also stated that delayed in egg laying, feather color not prime in the market, consume high amount of feed and less continuous laying eggs are the drawback of the koekoek breed in the study area. The non-participant farmers are convinced to adopt and use the technology and the management practices.



Figure 2. Field day participant at Gozamin district.

4. Conclusion and Recommendations

The current demonstration activity shared an experience on rearing Potchefstroom koekoek chicken breed under farmers' management condition. From this demonstration, the participant of the host farmers shares their rearing and management experiences to non-participant farmers. Moreover, huge gap was observed between host farmers on management practices of chicken from brooding to lay stages. This is manifested in an age at first laying, body weight at 8 and 20 weeks of age, the chicken growth performances and the overall management practices. The study result revealed that providing practical training and close follow up has significant positive impact on the growth and egg laying performance of the breeds. The participant farmers were gained knowledge about the koekoek breed can produce more if they are fed and looked after carefully, but some of the farmers did not provide the recommended management practices. The current demonstration indicated that rearing a day-old chicken have significant impact on the farmers' income generation and improve the livelihoods. According to farmers perceptions and observations there was no doubt on the importance of chicken breed. The partial budget analysis indicated that producing improved chicken breeds resulted higher net benefits and higher marginal rates of return (MRR) over rearing local chicken in the study area. The MRR of keeping Koekoek chicken was 511.41% in the study areas. Based on the current study production of Koekoek chicken can play an important role reduction of malnutrition and improve livelihood income of the households.

Based on the current study we recommend the adaptability and performance of Koekoek chicken in East Gojjam zone was very well and impressive. Therefore, farmers can produce this chicken breed widely. Consequently, concerned

government and private organizations should pay due attention on the establishment of chicken incubation and multiplication center for ease of chick accessibility and production mechanisms in the study area.

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