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Demonstration and Performance Evaluation of "Potchefstroom Koekoek" Chicken Package at Jimma Zone, South Western Ethiopia

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Abstract
Dual purpose poultry package demonstration was undertaken at Jimma zone, Mana district, Somodo Peasant Association with the objectives of demonstrating and evaluating the performance of chicken under farmers management condition so as to promote and disseminate the approved technology packages to the users. The district, peasant association and participant farmers were selected purposively on the basis of willingness to construct poultry house and cover all the associated package costs. Based on the package requirements, training was given on poultry house & housing, health care, feeds & feeding and data recording. Finally three hundred forty two (342) day old chicks (57 chicks to each farmers) were distributed with two month feeding and medication materials at the farmers gate. Survival of chicks during the first 8 weeks of brooding by using hay-box at the farmers management condition was found 64.1%. The average daily body weight gain were 9.3gm in-case of male chicken and 7.1gm in female chicken during the first twenty weeks of age. The average age at first egg laying was 220 days. The egg production performance of these chicken under farmers management condition were found 51.8% percent in the first phase of production (45 weeks of age) but grows to 79.4% in the case of pick production stage. The partial budget analysis result indicated that Koekoek breed production was profitable with a net average benefit of 2731.02Ethiopian birr per the package (farmer). The average egg weight were 41.6 gm, 44.7gm and 47.9gm both at 5%, 50% and peak production stage respectively. The major challenges observed during the study was lack of skill of the farmers to manage the chicks, disease and lack of appropriate feeding. Irrespective of the challenges indicated the demand for the chicken was observed very high in the area. Therefore, a mechanism by which the disease and alternative feed options can be improved needs attention.
Keywords: Koekoek chicken breed, mortality, egg production, farmers management

Introduction

Poultry production has an important economic, social and cultural benefit and plays a significant role in family nutrition in the developing countries. In sub Saharan Africa, 85% of the rural population keep chicken and support the provision of affordable animal protein and household cash income (Aklilu et al., 2007). It is an employment opportunity for the youth, elders, women and sick in the urban and peri-urban areas.

Recent estimates put the poultry population in Ethiopia at around 56.87 million out of which native chicken (none descriptive breeds) representing 95.86 percent, hybrid chicken 2.79 percent and exotic breeds of chicken 1.35 percent (CSA, 2015).

In spite of their great importance to the lives of most rural people, the contribution of village chicken is not proportion to its huge number. The low productivity of local breeds; prevalence of diseases; less availability and poor quality of feeds; limited research and poor extension service; and lack of organized marketing and processing facilities are some of the most important constraints affecting the village chicken production system (Singh, 1990).

Literatures indicated that different strategies have been implemented so far to improve production and productivity of the country's poultry sector through introduction of exotic breeds and fertile eggs, distribution of a day-old and three months old improved chicken breeds by Ministry of Agriculture and Rural Development (MOARD) of Ethiopia and several other institutions including research, higher learning institutions and NGOs have been attempting to improve village poultry production systems (Alemu and Tadelle, 1997). Despite all the efforts, the contribution of improved chicken in the current production system is less than two percent (CSA, 2015).

The total national annual poultry meat and eggs production is estimated at 72 300 and 78 000 metric tons, respectively and indigenous poultry contribute almost 99% of the national egg and poultry meat production (Tadelle et al., 2003). To increase the production potential of the current poultry system the need of transformation from the traditional scavenging family poultry system (TFP) to the improved semi-scavenging family poultry system (IFP) and then increase the scale of specialized layer and broiler production so as to cover the domestic red meat consumption is indicated in the National Livestock Road Map (Shapiro, 2015). This transformation will make a substantial contribution to reducing poverty and malnutrition among rural and urban

poor in addition to boosting the contribution of poultry meat share in national meat consumption from 5% to 30% by substituting red meat that comes from larger high emitting ruminants (Shapiro, 2015).

A recent study by Nigussie et al. (2010), 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. Farmers involved in 100 day old commercial layer chicken package came up with fascinating attitudinal change by recalling back that they were reluctant on the success of the project. Besides, at five months of egg production on the average each farmer earns 2372.5 birr net cash income from the sale of eggs.

Dessie (2013) indicated the necessity of intervention in village chicken low input and output system based on his study on village chicken production in the central and western highlands of Ethiopia which include technical interventions like introduction of improved breeding practices to improve the genetic merits of the indigenous genetic resources through recurrent selection within the indigenous population and crossbreeding with exotic breeds, rational utilization of the exotic chicken resources and introduction of sustainable exotic chicken multiplication and dissemination strategies with intensive management interventions including control of diseases, particularly NCD, and improved feeding and housing.

There was no information weather Koekoek breeds of chicken could survive and produce using locally processed feeds under farmers management condition in Jimma zone. Therefore demonstration and evaluation of this chicken breed in this area using locally processed feed was mandatory to enhance the production and productivity of chicken throughout the region.

Objectives

- to demonstrate and evaluate the performance of the chicken under farmers management condition
- to promote and disseminate the approved technology packages to the users

Materials and Methods

Description of the study area

Mana District; which is one of the 18 Districts of Jimma Zone is found in Oromiya regional State, south western Ethiopia. The District is located 369 km away from the capital city of Ethiopia, Addis Ababa. It is bordered on the south by Seka-Chekorsa, on the west by Gomma, on the north by Limmu -kossa, and on the east by Kersa. It is classified in to Dega (12%), Woinadega (63%) and Kolla (25%) agro-climatic zones. Average rainfall is 1,467mms. The total population for this woreda were 183,852 out of which male accounts 93,305 and the women accounts for 90,547 (CSA, 2014).

Mixed cropping system is mainly practiced in the District. Maize, teff, sorghum, barley, wheat, coffee, chat and horse bean are the most widely cultivated crops in the district. Chat and coffee are important cash crops. The households purchase cereals from the market through the income they generated from sale of coffee and chat. This implies that those perennial crops encourage farm households to be food secured.

Participant household selection

The demonstration was conducted in Mana district Somodo Peasant Association. Participant farmers were selected purposively in collaboration with respective Mana district agricultural office expertise on the basis of willingness to construct poultry house, cover all the associated package costs and record the required data. Training was given to the selected farmers on poultry house and housing, health, feeding and data recording. Accordingly, six farmers were found fulfilled the required preconditions; house construction, hay box, feeding and watering materials, litter materials preparation and cost to buy chicks. Then the day-old koekoek chicken was distributed among those farmers at their get with starter ration and some medication materials.

Disease prevention and control

The health follow up aspect was undertaken using the respected district livestock agency health expert.

Experimental Birds and Their Management

A total of 420 day old chicks of "Potchefstroom Koekoek" breed were purchased from Debre Zeit Agricultural Research Center and transported to Jimma zone Mana district and distributed to the selected farmers the same day at their gate. Each participant farmers were received 57 chicks. Brooding was done using hey box (Solomon box). Data collection formats were prepared and given to each participant to record all the required data.

Data collected

The amount and type of feed offered, body weight gain, egg production, egg weight, disease symptom and medication cost, mortality and its cause, income from live chicken and egg sale.

Data analysis
Descriptive statistic such as mean and percentage were used to summarize the data using Microsoft Excel.

Result and Discussion
Mortality
Chicken mortality rate were observed 35.9% in the first eight weeks of age. This result is slightly lower than that of Araka area (20.2%) southern Ethiopia (Aman et al., 2016). The mortality rate declines as the age increases (Table 1). On average about 53.5% of the chicken survived to the laying age. Slightly higher result (41%) was reported from evaluation of the performance of Isa Brown chicken under farmers condition at Gomma district (Meseret, 2010). The same is true in the case of Fayoumi chicken breed (54.85%) evaluated under farmers management condition at Arsi-Negele district in which occurrence of other economically important diseases other than Newcastle and Gumboro, the ineffectiveness of the vaccine delivered, failure of cold chain and/or faulty administration of the vaccine were suggested to be the cause for the mortality (Samson et al., 2013).

Higher rate of mortality were observed in the first eight weeks of age which indicates the need of strict fellow up in the first eight weeks of age. The mortality of the chicken varied between farmers ranging from 16-31 chicks/farmer that could be due to difference in management from farmer to farmer. Lack of skill/experience/, poor health management and the time of chicken distribution (rainy season) were observed the major causes of mortality in this study.

Table 1. Mortality rate of chicken to the age of start of egg laying

Participant farmers	Chicken distributed	First 8 weeks	To the start of egg laying	Survival
AA	114	39	8	67
B	5 7	20	3	34
C	57	17	2	38
D	57	16	8	33
E	57	31	15	11
Total	342	123	36	183
Average by %		**35.9**	**10.5**	**53.5**

Disease symptom and medication
The health follow up were done in collaboration with the Mana district animal health responsible professionals as per the packages. Accordingly regular vaccination were administered on Newcastle and Gumboro diseases as recommended by the manufacturers. Treatments for other diseases were also given as it was occurred. But frequent disease occurrence were observed throughout the raring period which might be due to efficacy problem of the administered vaccine as a result of poor storage facility for those medication materials at a district level and frequent communication with indigenous none vaccinated chicken at farmers backyard in the free ranging time.

Even though, disease take the major reason (47.37%) for the mortality of chicken, stress (as traveled a long distance about 415km), mechanical damage, poor management and predators also contributed for the loss of chicken in this study (Table 2).

Table 2: Suggested causes of chicken mortality till the onset of egg production

Causes	**Number Loss**	**Percentage (%)**	**Remark**
Stress	64	37.4	as transported a long distance
Mechanical	4	2.34	-
Disease	81	47.37	***
Poor management/lack of skill	15	8.77	More in the first two weeks of age
Found dead (no clinical sing)	6	3.51	-
Predator attack	2	1.17	-
Total death	**171**		

*** shows the loss in one farmer which accounts for more than 50%

Age at first laying
The average age at first egg laying recorded at farmers management condition was found 7.3 months. Differently 5 months were recorded for onset of laying at Debrzeit Agricultural Research Center under intensive management condition (DZARC Annual Report, 2012). Compared to the indigenous chicken better achievement were reported by Meseret (2010) in which the mean sexual maturity of indigenous chicken at Gomma district of Jimma zone were about 6.33 months. But Mekonnen (2007) reported age at first egg of 7.07 months from indigenous pullets of Dale district which is longer than that of the Gomma district by 0.73 months but nearly similar to the current study. Late onset of egg laying observed in this study might be due to the complications

related to the season of chicken distribution, poor management provided because of lack of experience in feed preparation and feeding and health care.

Table 3: Age at first egg laying of Koekoek chicken under farmers management

participant farmers	Female chicken reached for egg laying	Average age at first egg laying
AA	17	214
B	4	217
C	10	240
D	5	204
E	6	227
	42	**220.4**

Body weight gain

The average body weight recorded in the first twenty weeks of age were 1.34kg in the case of male chicken and 1.03kg for the females (Table 4). A little higher (1.5kg) result was reported in Araka area for male chicken body weight at 20 weeks of age but found nearly similar result (1.1kg) achieved for female chicken (Aman *et al*., 2016).

Table 4. Body weight gain of chicken at different stage of growth

Age of chicken in weeks		Sample weighed	Body wt./chicken	average daily gain
Day old chicks weight		342	34gm	-
20 weeks old	Male	26	1.34kg	9.3gm
	Female	25	1.03kg	7.1gm
72 weeks old	Male	2	2.8kg	4.01gm
	Female	2	1.4kg	1.02gm

Feeds and feeding

A balanced ration provided from DZARC was fed to the chicken in the first 16 weeks of age. Ahead of exhaustive utilization of this commercial balanced ration, the farmers were advised to prepare feeds from locally available materials/crops which include maize, sorghum, wheat, soybean, salt and lime stone based on different stages of development (grower and layer stages). The overall average amount of supplemental feed used in this study were recorded 60gm/day/chicken irrespective of the two stages (grower and layer stages) which is bellow their requirements both in quantity and quality. Scavenging was the major means of satisfying their nutrient requirements.

Egg production

The egg production performance of the chicken were found 51.8% in the first phase of production (45 weeks of age) but grows to 79.4% in the case of pick production stage. Slightly similar performance was reported by Debrezeit Agricultural Research Center (DZARC) at on station condition during the laying stage (25 to 45 weeks) ranged from 56.97% to 63.73% (DZARC Annual Report, 2012). In this particular study the egg production were observed 0.51 eggs/day/chicken on average bases. This is lower than the yield reported by Dessalew (2012) which was 187.04±13.49 in East Showa zone, Lume distric under farmers management condition. The decline in egg production of the chicken in this study might be due to the poor management applied and less quantity and quality supplementary feeding of the birds. Solomon (1996) found out that the egg production performance of the layers were linearly related to the levels of supplement offered. The same author further stated that scavenging plus 30 g/day of supplement failed to support maintenance requirement and resulted in gradual body weight losses and death of 50% of the birds. The birds which received intensive feeding and scavenging plus 120 g/day of supplement were equally productive, 0.57eggs/day.

Literature indicated that the annual egg production for the indigenous chicken in the country ranges from 32-52.2 egg/head/year which is by far lower than the performance of Ckoekoek under nearly similar management system.

Table 5: Number of days in production and total egg yield

Participant farmers	Number of days in production	Total egg yield
AA	308	2593
B	287	854
C	41	183
D	213	538
E	228	573
Total yield		**4741**

Egg weight

The average egg weight at initial laying stage (5% production stage) was observed 41.7g. This is almost similar to the weight achieved at Araka area (40.2gm) (Aman *et al*., 2016) but lower in weight than that of Dessalew (2012) which was (48.84± 6.77). As indicated in table 3, the increase in egg weight was observed as the production stage increases from 5% to pick stage (47.9gm). The average weight (47.9g) recorded at pick stage in this study was slightly lower than that of DZARC evaluation (51.9g) under intensive production system. The lower egg weight obtained in this study might be due to lack of proper feeding and management.

Table 6. Egg weight at different production stages

Participant farmers	W't at 5% production(gm)	W't at 50% production(gm)	W't at peak production(gm)
AA	41.5	45.33	43.3
B	38.6	40.93	47.4
C	42.3	na	na
D	43.4	44.85	49.6
E	42.8	47.3	51.3
Average	**41.72**	**44.65**	**47.9**

na = not available

Partial budget analysis

In computing the partial budget analysis the feed, medication and chicken cost were considered as variable costs whereas sale of live chicken, eggs and the existing chicken till the time of this data collected were used as income source. Based on the listed variable costs and income earned the average income generated per individual farmers were 2453.42 birr.

The change in net income (ΔNI) was calculated as the difference between the change in total return (ΔTR) and the change in total variable costs (TVC)

ΔNI = ΔTR - ΔTVC

ΔNI = **21382 - 7726.89**

ΔNI = **13655.11Ethiopian birr**

Table 7: Partial budget analysis

Participants	**Variable Cost (Eth. birr)**				**Total revenue (Eth. birr)**			
	Feed cost	Chicken cost	Medication cost	Sum	Live chicken sale	Egg sale	Sum	Profit
AA	2459.25	600	250	3309.3	4000	5186	9186	5876.75
B	997.54	300	150	1447.5	2100	1708	3808	2360.46
C	724.1	0	120	844.1	3100	366	3466	2621.9
D	468	300	200	968	1500	1076	2576	1608
E	612	300	246	1158	1200	1146	2346	1188
Total	**TVC= 7726.89**				**TR= 21382**			**13655.11**
Average profit								**2731.02**

Conclusion and recommendation

A full package demonstration and evaluation of Koekoek "Potchefstroom" chicken under farmers management condition showed an acceptable performance indicating the possibility of using exotic breeds of chicken with a little additional input on housing, feeding and health management. More over attitudinal change were observed among the farmers involved in this demonstration on the possibility of earning profit from chicken rearing providing the necessary management practice.

Even though farmers skill were observed less to appropriately manage the brooding, health care and feeding, Koekoek breed of chicken found good in adaptation and productivity under the farmers management condition. Therefore the scaling up should need to be done in large through careful selection of potential farmers particularly women and children focused with well designed health care strategies.

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