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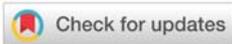
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Research Article

Demonstration and performance evaluation of dual purpose chicken “Potchefstroom Koekoek” under agro pastoral management condition at Asayta districts of Afar regional state in Ethiopia

Abstract

Dual purpose poultry package demonstration was undertaken at Awsi resu zone, Asayta district, Korodora kebele agro pastoral association with the objectives of demonstrating and evaluating the performance of chicken under agro pastoral management condition. Agro pastoral association and participant were selected purposively from the district, on the basis of experience and willingness to construct poultry house and cover all the associated package costs. A total of ten households were selected based on the package requirements. Training was given on poultry house & housing, health care, feeds & feeding systems. Finally one hundred eighty (180) Koekoek of two month old chicks (18 chicks to each agro pastoral) were distributed with two month feeding and medication materials at the agro pastorals gate. The average survival rates of chicken up to 24 weeks of age were 98.3%. But after 24 weeks of age later the total number of chicken declined to 93.3%. The average survivability rates of the chicken per household at 52 weeks of age were 91.7%. Chicken mortality rate were observed 1.7% in the first 24 weeks of age but after 24 weeks of age later the rate had increased to 6.7%. That could be due to the onset of the hot season, difference in management and feeding condition. The average weight at 20 weeks of age under agro pastoral management condition was 2.23kg and 1.91kg for male and females respectively. The average egg weight at initial laying stage (5% production stage) was observed 39.4g while the average weight (49.7g) recorded at pick stage. The average egg production performance of the breed in the study area was 182 eggs per year. The variable costs and income earned the average income generated per individual agro pastorals were 8987.00 birr.

Introduction

Potchefstroom Koekoek South African breed of chicken developed in the 1960s at the Potchefstroom Agricultural College in the city of Potchefstroom by Chris Marais. Pure Koekoeks have a black-and-white barred appearance, with the chicks sexable soon after hatching due to distinct sex markings. The name Koekoek refers to the barred pattern of the birds. The Potchefstroom Koekoek is a composite of White Leghorn, Black Australorp and Bared Plymouth Rock to obtain specific characteristics of each, making the resulting breed more suitable to Southern African conditions [1].

The breed is popular among rural farmers in South Africa and neighboring countries for egg and meat production as well

as their ability to hatch their own offspring [1]. The breed was intended as a dual purpose, free ranging chicken with laying capabilities as well as a large structure for meat production. Potchefstroom Koekoeks maintain good egg production even with poor quality or insufficient feeding. Most importantly, the chickens are a liquid asset and allow owners to convert them into cash [2]. However, it is crucial to assess the feasibility and economic viability of family poultry interventions in each specific operating environment, and to develop an appropriate and tailored response in order to achieve sustainability [3].

Family poultry production has been widely perceived as a fast way to ensure food security, generate employment and income, and promote women's empowerment at a relatively low investment [3]. Poultry production plays a vital role in the

improvement of the income and food security of communal poultry producer [4].

Chicken are the most important avian species for the resource challenged families of the developing world, because they are sources of income and animal protein, and can be raised in varying agro climates with limited resources, feed and housing [5]. In sub Saharan Africa, 85% of all households keep chicken under free range system, with women owning 70% of it; providing cheap/affordable animal protein in the form of meat and eggs as well as being a reliable source of cash income [6]. Besides the sector significantly constitutes to human livelihood and food security of poor households and can be considered an initiative enterprise owing to its low cost [6].

In Ethiopia, like other African countries, attempts have been made at various times by the Ministry of Agriculture and Rural Development (MOARD) and several other institutions including research, higher learning institutions and NGOs to improve village poultry production systems through introduction of exotic breeds and fertile eggs [7]. Distribution of a day-old and 2 months old improved chicken breeds, has been some of the livestock extension packages implemented by the ministry of agriculture.

Objectives

To demonstrate and evaluate the performance of the chicken under agro pastoral condition

To promote and disseminate the approved full-fledged poultry packages to the users

To build the skill of participant community of the study area on chicken production.

To aware the contribution of poultry technologies to household income and food security

Material and Methods

Description of the study area

The study was conducted at Asayta district (Figure 1) (Awsi resu) of the Afar national regional state. The research was conducted under agro pastoral household management condition at Korodora kebele. The target kebele's (Korodora) was located 10 km far from the town of Asyata district. The target kebele and participants were selected in consultation with the respected districts administration and Pastoral agriculture development offices.

Climate

Asyta districts is climatically characterized as largely arid and some of semi-arid agro-ecological area, where livestock production is the main occupation of the community. The average temperature of the area is about 32°C while during the hot season (May, June, July, August and September) the temperature reaches 42°C and the rainfall is bimodal with erratic distribution, with the long rainy season (*Kerma*) between Mid-June to Mid-September and short rainy season

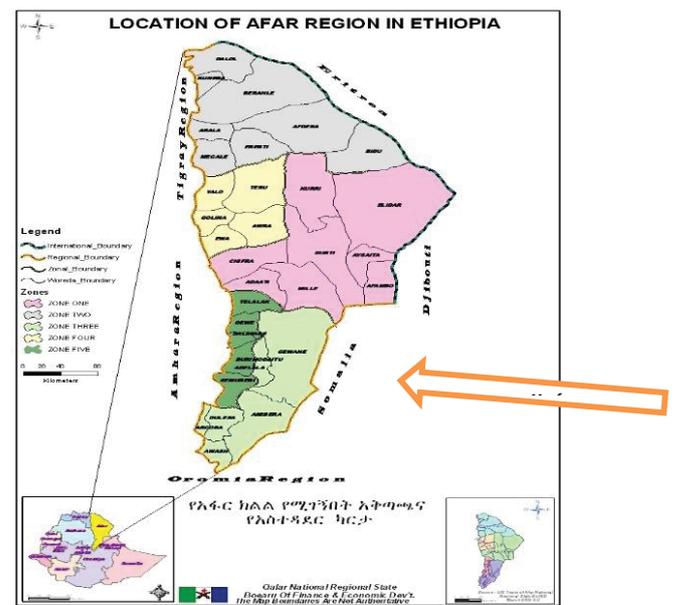


Figure 1: Location of afar region in Ethiopia.

(*Sugum*) occurs between March and April, and the average annual rainfall is between 200 and 250 mm [8].

The altitude range of the area is between 400-420 m [8] and most of the rangeland of the study area falls under below 450 m above sea level. The dominate soil types in these areas are vertisols, sandy, and deposits of silt and fine sand particles occur in the plain flat areas where cultivation is practiced [8]. In most of the study area, the topography is lowland plains.

Farming system

The study area of Asayta districts consisted of 13 kebeles of these 2 were in the city, 6 were pastoralist entirely dependent on livestock production and the remaining 5 were agro-pastoralists practicing both crop production and extensive livestock rearing.

Design of the experiment

The study was conducted to demonstrate and evaluate performance of Potchefstroom koekoek chicken under agro pastoral management system. For this study, ten female house headed were selected on the bases of previous experience in poultry rearing, willingness to construct or modify poultry house. Training was given on all management aspects and data to be collected. Accordingly, 8 weeks age of 15 pullet and 3 cock koekoek chicken along with other inputs (housing materials, feeder, drinker, and medicaments) were given per households. Technical backup, data collection, monitoring and evaluation were under taken by researcher and wereda's developmental agents (DAs) in a regular base. Data was collected from day of chick's delivery up to start of the first egg lay and continued until 52 week of age.

Disease prevention and control

The health follow up were undertaken using the respected

district livestock health department and animal health researcher from Afar pastoral agro pastoral researcher institute.

Feeds and feeding system

A balanced ration provided from Kaliti animal feed factory was fed to the chicken in the first 20 weeks of age. Prior to end of this commercial balanced ration, the agro pastorals were getting started feeds preparation from locally available crops like maize, sorghum, salt and home food refusals. In this study the average amount of supplemental feed used were recorded 80gm/day/chicken. Browsing improved forages (grasses and legumes) in the backyard and scavenging home wasted was the major means of satisfying their nutrient requirements.

Feeder, drinker, formulated feed, medicaments and poultry house construction materials (mesh wire, wood, nails, corrugated iron, etc.) was used as a full-fledged packages for individual households.

Housing: the size of the house were 2.5 x 2.5 meter (Length x Width) and a 2 meter height poultry house were constructed for each participant.

Data to be collected

Mortality (as occurred due to either disease, predator, mechanical, nonproductive/spent hens or others)

Age at first laying

Average weight of eggs

No. of female chicken at first egg laying

Weight of chicken recorded at first egg laying

Income from sale of, eggs, cocks,

Cost of feed/feed ingredients and medicaments

Profit earned by Agro-Pastoralist

Data analysis

Descriptive statistic such as mean and percentage were used to summarize the data (mean egg production, weight gain and profit earned compared) using Microsoft Excel.

Results and discussion

Dual purpose Koekoek breed technology package demonstration and evaluation were properly employed in the target kebele. The data revealed that, the average survival rates of chicken up to 24 weeks of age were 98.3% but after 24 weeks of age later the total number of chicken declined to 93.3%. This mortality and predator attacked could be due to difference in management from household to household (especially for predator attacked in some households); poor management and feeding condition were the main reason for dropped of chickens. This result is slightly lower than that of Araka area (20.2%) southern Ethiopia [9]. Status of chickens and cause of mortality on the distributed chicken presented in table 1.

The average survivability rates of the chicken per household at 52 weeks of age were 91.7 %, which presented in Figure 2 and Table 2. The reason might be the developments of managerial skill of the participants and the adaptability of the chickens were increased from time to time. In some households hatching were started with using local breed this indicated that, the breeds were well adapted to the area and the managerial skill of the participants were increased.

Chicken mortality rate were observed 1.7% in the first 24weeks of age but after 24 weeks of age later the rate had increased to 6.7%, That could be due to the onset of the hot season, difference in management and feeding condition were the main reasons for dropped of chickens. Mortality rate at different age of weeks (Table 2)

Body weight measurement of koekoek chicken at 20 weeks of age

The average body weight of female and male Koekoek chicken at different weeks of age presented in table 3 and 4. The average weight at 20 weeks of age under agro pastoral management condition was 2.23kg and 1.91kg for male and females respectively. The result obtained in the present study (2.23kg and 1.91kg for male and females) is better than (1.5kg) result was reported in Araka area for male chicken body weight at 20 weeks of age similar breed and (1.1kg) achieved for female chicken [9]. Similarly this result was higher as compare to reports of Aman et al., [9], (1.04kg and 1.01kg for male and

Table 1: Status of chickens and cause of mortality on the distributed chicken.

No	Participants	No. of chicken distributed	Number of death				Current flock number
			Disease	Predator	Slaughter	Sell	
1	HH1	18chicken	1	1	-	-	16
2	HH2	18chicken	-	1	-	-	17
3	HH3	18chicken	-	1	-	-	17
4	HH4	18chicken	1	1	-	-	16
5	HH5	18chicken	1	1	-	-	16
6	HH6	18chicken	-	-	-	-	18
7	HH7	18chicken	1	1	-	-	16
8	HH8	18chicken	1	-	-	-	17
9	HH9	18chicken	2	-	-	-	16
10	HH10	18chicken	1	1	-	-	16

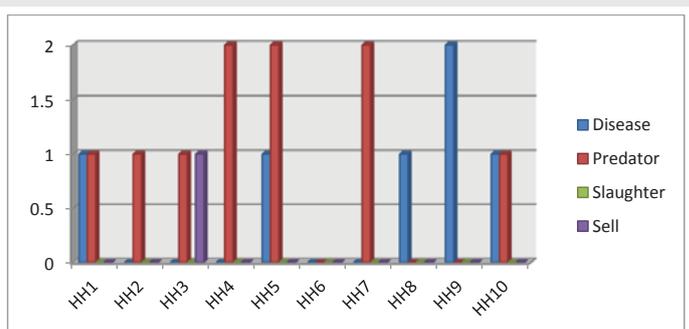


Figure 2: Survival rates of chickens on different cause of mortality.

Table 2: Mortality recorded at different age of weeks.

participants	Number of chicken received	Number of chickens present at the end of experiment			Mortality of koekoek chickens due to diseases and predator attacked						
		Male	Female	Total	Number of chicken lost				Overall lost	%	
					Within 24 weeks age	%	After 24 weeks age	%			
HH1	18	1	1	16	1	94.4	1	94.4	2	88.9	
HH2	18	0	1	17	0	100	1	94.4	1	94.4	
HH3	18	1	0	17	0	100	1	94.4	1	94.4	
HH4	18	1	1	16	1	94.4	1	94.4	2	88.9	
HH5	18	2	0	16	0	100	2	88.9	2	88.9	
HH6	18	0	0	18	0	100	0	100	0	100	
HH7	18	2	0	16	0	100	2	88.9	2	88.9	
HH8	18	0	1	17	1	94.4	0	94.4	1	94.4	
HH9	18	1	1	16	0	100	2	88.9	2	88.9	
HH10	18	1	1	16	1	100	1	94.4	2	88.9	
Total	180	9	6	165	4	98.3	11	93.3	15	91.7	

Table 3: Body weight measurement of Female Koekoek Chicken at different weeks of Age.

No	Participants	8 th weeks	12 th weeks	16 th weeks	20 th weeks	24 th weeks	28 th weeks
1	HH1	393.40	821.90	1.42	1.92	2.20	2.31
2	HH2	362.10	734.96	1.33	1.89	2.15	2.23
3	HH3	371.30	799.23	1.37	1.83	2.12	2.79
4	HH4	343.40	899.21	1.44	1.99	2.21	2.33
5	HH5	400.61	881.12	1.40	1.96	2.20	2.32
6	HH6	385.49	735.10	1.39	1.86	2.19	2.26
7	HH7	356.39	831.21	1.40	1.91	2.29	2.35
8	HH8	388.34	846.89	1.42	1.90	2.28	2.34
9	HH9	399.11	837.49	1.43	1.98	2.25	2.32
10	HH10	368.78	781.45	1.38	1.85	2.11	2.20
	Average	376.89	816.85	1.40	1.91	2.20	2.35

Note:-HH1, HH2.....HH10 = House Hold number.

Table 4: Body weight measurement of Male Koekoek Chicken at different weeks of Age.

No	Participants	8 th weeks	12 th weeks	16 th weeks	20 th weeks	24 th weeks	28 th weeks
1	HH1	483.10	938.60	1.62	2.21	2.49	2.76
2	HH2	452.90	894.25	1.59	2.17	2.39	2.66
3	HH3	472.20	889.85	1.50	2.10	2.30	2.69
4	HH4	613.30	959.51	1.69	2.28	2.45	2.71
5	HH5	530.67	894.32	1.59	2.23	2.40	2.73
6	HH6	465.39	825.17	1.53	2.13	2.36	2.61
7	HH7	569.29	941.31	1.64	2.22	2.42	2.76
8	HH8	696.31	836.89	1.50	2.18	2.39	2.61
9	HH9	647.21	947.79	1.61	2.21	2.43	2.73
10	HH10	478.32	898.35	1.53	2.19	2.31	2.61
	Average	540.87	903.51	1.59	2.23	2.40	2.70

females of body weight) at Areka areas. And similarly, Kasa and Saba 2016 1.3kg at Chicken Package at Jimma Zone western Ethiopia

Egg weight

The average egg weight at initial laying stage (5% production

stage) was observed 39.4g. This is almost similar to the weight achieved at Araka area (40.2gm) [9]. As indicated in table 5, the increases in egg weight were observed as the production stage increases from 5% to pick stage (49.7gm). The average weight (49.7g) recorded at pick stage in this study was slightly similar to DZARC (51.9g) under intensive production system.

Egg production

The average egg production performance of the breed in the study area was 182 eggs per year. This is production yield were similar to [10], in East Showa zone, Lume distric under farmers management condition who reported 187.04±13.49. While the average age of first lying in the study area was recorded 24.5 weeks. This result also similar to Ada”a district under farmers management condition which was reported 5.3 months age at first egg laying for the same breed. Production performance and average age of first laying presented in table 6 [11,12].

Partial budget analysis

In calculating the partial budget analysis includes all variable costs, change in net income and change in net profit. In this study feed, medication and chicken cost were considered as variable costs whereas the sale of eggs and the existing chicken/egg also used as an income source. In this study the average cost of items for chicken purchase, feed cost and medication cost were 1080.00 birr, 2028.00 birr and 172.00 birr respectively. While the average total variable cost across the participants were 3280.00 birr. Hence, the variable costs and income earned the average income generated per individual agro pastorals were 8987.00 birr. Variable costs and income earned Presented in tables 7,8.

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

$$\Delta NI = \Delta TR - \Delta TVC$$

$$\Delta NI = 12267.00 - 3280.00$$

$$\Delta NI = 8987.00 \text{ Ethiopian birr}$$

Conclusion and Recommendation

The result of the current demonstration showed a good performance of “Potchefstroom Koekoek” under agro pastorals management condition; indicating productivity could be increased through improved housing, feeding and health management. More over attitudinal change were observed

Table 5: Average weight of eggs at different production phase.

No	Participants	5% production	50% production	Peak production
1	HH1	40.5	42.5	50.2
2	HH2	37.4	40.1	49.3
3	HH3	39.4	41.9	50.0
4	HH4	40.1	42.1	50.8
5	HH5	40.2	41.7	49.9
6	HH6	38.3	40.9	49.1
7	HH7	39.8	41.0	49.6
8	HH8	38.2	41.0	49.4
9	HH9	39.9	41.2	49.0
10	HH10	40.3	42.3	50.1
	Average	39.4	41.7	49.7

Table 6: Production performance and average age of first laying.

Participants	The average age of first lying (week)	Number days of egg production/year	Total eggs/hen/year
HH1	24.6	180	180
HH2	24.6s	183	183
HH3	24.4	179	179
HH4	24.5	181	181
HH5	24.6	183	183
HH6	24.5	184	184
HH7	24.4	184	184
HH8	24.4	181	181
HH9	24.6	182	182
HH10	24.4	183	183
Average	24.5	182	182

Note:-HH1, HH2.....HH10 = House Hold number.

Table 7: Variable cost along participants.

Participants	Unit	Variable cost			Total
		Chick purchase	Feed cost	Medication cost	
HH1	Birr	1080	2114	178	3372
HH2	Birr	1080	2054	169	3303
HH3	Birr	1080	2156	190	3426
HH4	Birr	1080	1960	145	3185
HH5	Birr	1080	2100	180	3360
HH6	Birr	1080	1890	160	3130
HH7	Birr	1080	1750	175	3005
HH8	Birr	1080	2209	165	3454
HH9	Birr	1080	1856	185	3121
HH10	Birr	1080	2193	170	3443
Average		1080	2028	172	3280

Table 8: Amount of income earned along participants.

Participants	Unit	Sell of eggs/hen	Egg price consumed at home	Total
HH1	Birr	720	200	11720
HH2	Birr	732	320	12764
HH3	Birr	716	210	12382
HH4	Birr	724	240	11824
HH5	Birr	732	320	12032
HH6	Birr	736	244	13492
HH7	Birr	736	260	12036
HH8	Birr	724	300	12608
HH9	Birr	728	180	11828
HH10	Birr	732	272	11982
Average		728	255	12267

among the farmers involved in this demonstration on the possibility of earning profit from chicken rearing providing the necessary management practice. Agro pastorals have got better experience and management of improved poultry husbandry practices. They became aware about the importance

of the breed that adapted well under the existing agro pastoral condition and perform better than indigenous breeds for egg production. Therefore, the scaling up should need to be done efforts should be made through careful selection of women for proper management and accessibility of the breed in the region

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