

*Full Length Research Paper*

# Introduction and evaluation of modified hay-box brooder, Fayoumi chicken and layers housing, addressing small-scale semi-intensive poultry farming at Beresa Watershade, Gurage Zone, Ethiopia

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Abstract

The study was conducted in two peasant associations at Meskan Woreda of Gurage Zone, Ethiopia. The objective of the study was to introduce and evaluate Fayoumi chicken, two types of hay-box brooders and small-scale poultry houses at the farmers condition. Twelve farmers were selected for the study and separated into two groups. One group undertook chicks rearing using one box brooder (modified hay-box brooder) while the other group two box brooder type. All households were provided with 20 day old Fayoumi breed chicks and starter ration. It was assigned that, women should be responsible for the given chicks and in handling them. Small scale layer houses were constructed to all household using a participatory approach. The study showed that both type of hay-box brooders (one box brooder or two box brooder type) had similar effect on chicken growth and survival rate, however due to low cost of purchase and smaller space requirement one box type brooder had a significant benefit for farmers. Layers housing got best acceptance by farmers and appreciated by concerned stakeholders with its merits of protection from predators, disease, thefts and easy collection of eggs. On the other hand, due to hardy nature, alert behavior and above all, their high egg production performance and remarkable adaptive fitness, Fayoumi breed had got higher acceptance by farmers.

**Key words:** Fayoumi chicken, growth, mortality, cost of purchase, households, farmers.

## INTRODUCTION

It is estimated that the country has over 56 million chickens, about 98% of which are kept under rural household conditions. There is no purposeful poultry feeding in rural Ethiopia. Scavenging is the most important component of the poultry diet. Full day scavenging poultry are usually capable of finding feeds for their maintenance requirement plus the production of few eggs and are vulnerable to predators and spread of infection (Tadelle and Ogle, 1996). According to Alemu (1995), poultry production system in Ethiopia show a clear distinction between traditional, low input systems on one hand and modern production system using relatively advanced technology on the other hand. There is also a

small scale intensive system with small number of birds (from 50 to 500) as an urban and peri-urban household income sources using exotic birds and relatively improved feeding, housing and health care.

Although no data is available about housing at national level, the local birds are set free on free range whereby they move freely during the day and spend the night in the main house. Overnight housing, perched in trees or on roofs and overnight housing within the main house are the common patterns of housing prevailing in the country.

Lack of housing is one of the major constraints of the smallholder poultry production systems. In some African countries, a large proportion of village poultry mortality was due to nocturnal predators because of lack of proper housing (Dwinger et al., 2003). Some research works also indicated that the mortality of scavenging birds could be reduced by improved housing. For instance, in the Gambia through livestock improvement program, which

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**Figure 1.** On the left one-box type brooder and on the right two-box type brooder.

included improved poultry housing resulted in lower chick mortality (19%) relative to that observed in Ethiopia (66%) and Tanzania (33%), where no housing improvements were made (Kitalyi, 1998).

There are various advantages which make poultry attractive in the context of poverty alleviation and quality protein supply. Poultry has hardly any religious or social taboos associated with it. It has a high reproduction rate per unit time, it is efficient in transforming feed protein and energy into human food. It requires a very low capital investment and space, hence, they are kept by even landless families. Eggs and meat represent consumable units which do not require storage and preservation facilities.

In Ethiopia, poultry production technology in using hay-box brooder was introduced in a number of decades back, but due extension packaging defects, its impact was not appreciated. This is a transitional technology towards small scale intensive system for rural farmers, because it can be controlled and afforded by farmers keeping up to 100 chicks without special training. Fayoumi was a recently introduced poultry breed to the country from Egypt. It has been found to be more resistant to viral diseases and Salmonella infections. Its feed consumption is moderate and is early maturing (Nigussie and Ogle, 1999).

It is eminent that Fayoumi provides a potential small-scale intensive poultry for producers, provided production technologies are improved through provision of improved brooding and housing technologies. This would contribute significantly to improve household incomes and food security. It would also promote gender equality since poultry keeping was female and children dominated. This study was therefore designed with the premise that introduction of Fayoumi breed of chicken, together with introduction of hay-box brooder and improved poultry houses would greatly improve livelihoods of the small

scale poultry farmers through increased productivity of chicken.

#### **MATERIALS AND METHODS**

The study was conducted in two peasant associations (Dubo-Tuto and Beresa) in Meskan Woreda of Gurage Zone, Ethiopia. Both PA found in the same agro-ecology at an altitude between 1700 to 1750 m, where farmers practice mixed farming system.

Twelve households were selected for the study. Selection was based on some basic questions regarding farmers' interest and possibility of benefiting through involvement in the trial. The Extension Department of the Woreda and Local Development Agents were involved in this exercise. Participating farmers were given formal and informal training on general aspects of managing the experiment through forum and regular individual farm visits to develop skill.

For hay-box brooders evaluation, two hundred forty day old chicks were purchased from Debre Zeight Agricultural Research Center. The birds were given Newcastle vaccine, three times. The birds were treated against common diseases. All selected farmers were given twenty day old Fayoumi chicks.

Selected farmers were divided into two groups. One group keeps chicks using one box type brooder while the other group was using two box type brooder. One box type brooder was 80 x 80 cm in size while two box type was 80 x 80 cm for run box and 37 x 37cm for brooder box. All farmers were trained on how to properly handle hay boxes (Figure 1).

For housing trial a total of twelve layers housing were constructed. As poultry requires a dry, draft-free housing, these houses were constructed with this perspective. The housing was small accommodating 15 to 20 layers. It was measuring 2.5 m in length and 1.6 m width. Window was aerated by wire mesh. Inside each house three nest boxes (25 cm height, 30 cm width and 30 cm depth and nests at 60 cm above floor) were constructed from locally available materials for egg laying. Rooster/perch was also constructed 1 m above the floor. They had doors (2 m x 80 cm) and fixed windows that aerated through mesh wire, feeder and waterer were also demonstrated. All houses were constructed in a participatory approach that farmers provided locally available materials and labor while the project supports industrial equipments.

**Table 1.** Feed intake and conversion efficiency of Fayoumi chicken in two box brooder.

Growth period	Feed offered (g)	Feed consumed	Weight gain	FCR
Day old	-	-	30.4	-
2 weeks age	345	213.9	93.88	2.28
4 weeks age	505	323.2	109.67	2.95
6 weeks age	660	422.4	119	3.55
8 weeks age	742	474.8	133.13	3.57

**Table 2.** Feed intake and conversion efficiency of Fayoumi chicken in one box brooder.

Growth period	Feed offered (g)	Feed consumed	Weight gain	FCR
Day old	-	-	30.4	-
2 weeks age	345	209.2	92.7	2.26
4 weeks age	505	327.6	110.2	2.97
6 weeks age	660	417.8	117.8	3.55
8 weeks age	742	471.2	132.8	3.55

**Table 3.** Survived chicks at two months, out of the 20 day old chicks initially delivered to 12 farmers.

Replication	One box brooder	Two box brooder
1	17	17
2	14	19
3	15	18
4	19	12
5	14	18
6	17	17
Total	96	101
Percentage survivability	80	84

These houses were demonstrated to be model for further extension programs adopted by farmers and other concerned bodies. To capitalize this housing technology field day and research presentation forum were organized and undertook.

Up to eight weeks of age, chicks were provided with commercial starter ration and water *ad libitum*. There after, farmers produced chicken feeds from locally available feeds. All farmers were trained on chicken management practices.

During the study data was collected on farmer perceptions, costs of inputs, chicken production parameters, morbidity and mortality. Data were analysed using a Student t-test and Chi-square test.

## RESULTS

Due to the hardy nature of Fayoumi breed there were no mortality and disease symptom during transportation of chicks to the farmers' village. Tables 1 and 2 shows the chicks feed consumption, weight gain and feed conversion efficiency (FCR) of the two different types of hay-box brooders. The statistical result of T-test, ( $\alpha = 0.05$ ) indicated that there were no significant difference in

all of the aforementioned three parameters for two types of brooders.

Details of survivability of chicks after 2 months were shown in Table 3. There was no significant difference of chick survivability between two brooders ( $P > 0.05$ ,  $t = 0.66$ ,  $df = 5$ ). There was no significant difference in mortality of chicks between tow brooders ( $P > 0.05$ ,  $\chi^2 = 0.709$ ). Details are shown in Table 4.

On set of egg production started at  $158.25 \pm 7.24$  days with a mean performance  $16 \pm 0.91$  eggs per month at  $\alpha = 0.05$ . During their full maturity, egg production was  $21.3 \pm 1.25$  per month (annual egg production of about  $255.6 \pm 1.25$ ). Mean egg weight of mature Fayoumi layer was  $39.4 \pm 0.75$  g and body weight during onset of egg was  $1.30 \pm 0.05$  kg. Male body weight was  $1.36 \pm 0.003$  kg.

Almost all farmers accepted the breed with its best egg production performance related to local chicken. Its best scavenging nature was also appreciated by farmers. Related to the hay box, all farmers accepted its usefulness in decreasing chicks mortality dramatically as

**Table 4.**  $\chi^2$ -test for analyzing effect of different hay-box brooders on mortality.

Type of brooders	No. of dead chicks	No. of initial/ sample/ chicks	n*p	Calculated $\chi^2$ value
One box type	24	120	21.5	0.3545
Two box type	19	120	21.5	0.3545
Total	43	240		0.709

compared to the broody hen. Other technologies were also approved. Market preference showed that due to the phenotypic characteristics of single-comb and smaller body weight of male Fayoumi caused lower market price.

All beneficiary farmers responded that after use of these housing technologies their chronic problem of chicken disease, predators and thefts were solved. Target farmers started expansion of housings for large scale production of chickens.

## DISCUSSION

Fayoumi chicken had a very low preference of selection of ingredients for the available concentrate or scavengeable feed sources and also they were good grazers. This result is inline with the finding of Ekarius and Carol (2007), who observed that Fayoumi chicken had very good foragers, and if left to their own devices on a free range basis they can feed for themselves in a nearly feral manner. This is a good merit enabling it to cope up in areas with grain shortages. Almost all farmers accepted the Fayoumi chicken because of its egg production performance related to local chicken. It's best scavenging nature was also appreciated by farmers. On market preference, it was shown that their single-comb and smaller body weight of male and smaller egg size caused lower market price, this indicate further breed improvement program to fill this gap.

Related to the hay box brooder, all farmers accepted its usefulness in decreasing chick mortality dramatically as compared to the broody hen. Due to the hardy nature of the breed there was no mortality during transportation and distribution. As shown in Table 2, at two months of age which is for chicks to be freed from hay-box brooders, 80% of the total 120 day-old chicks survived from one box brooder and 84% from two hay-box brooder type. Causes for the death of the majority of chicks were diseases. Using two box brooder, the study of Solomon (2007) clearly showed that about 95, 88 and 80% of the hay-box groups distributed survived to an age of 2, 4 and 8 weeks respectively, the values of which were high by the Ethiopian standard. The findings of this study are in line with the aforementioned findings, which show that confidentially indicate that the hay-box brooder is superior in promoting chick survival in traditional and semi-intensive production system.

One of influential factor in comparing different hay-box

brooders was purchasing cost. Two-box brooder was purchased at 250 Birr while one-box brooder by 170 Birr each. This indicates one-box brooder has a reduced cost of purchase by one third as compared to two-box brooder. This was because one box type is modified to provide as a brooder (at night) and run (during day time); however, for a two-box brooder these functions are provided in separate boxes. This shows that farmers can minimize their cost by using one-box brooder with a similar result of chicken growth and survival rate as compared to two box brooders. Other benefit of modified hay box brooder was that it required smaller space in farmers' house and ease of handling.

Demonstration of small scale layer housing got high acceptance by farmers due its merits of protection of chicken from predators, disease and thefts. In addition, it has been initiating the interest of farmers to produce chicken in larger scale. This could modernize chicken production system while improving the household economy thereby breaking the vicious cycle of poverty and malnutrition.

In conclusion, demonstration of low cost poultry production had high acceptance by the farmers. The hardy nature, alert behavior and above all, their high egg production performance and remarkable adaptive fitness in terms of survival make the Fayoumi breed one the best choice especially for transformation of back yard poultry production system to modern and business oriented production system. In addition, adoption and scale-up of hay box brooder, improved chickens, small scale layers housing, feeds, vaccination and training package would have a remarkable benefit to the extension and development programs.

## ACKNOWLEDGMENTS

First, we would like to thank Operational Research project, Irish Government, which cover financial and technical supports. The efforts of Awassa Agricultural Research Centre in coordinating of this research processes, were also greatly appreciated. Finally, we would like to thank Debre Zeit Agricultural Research Center, as they provide experimental chickens.

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