African Chicken Genetic Gains

More productive chickens for Africa's smallholders

Brief 2

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Preliminary information on chicken strains to be tested in Ethiopia

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The African Chicken Genetic Gains (ACGG) is an International Livestock Research Institute (ILRI) led Bill & Melinda Gates Foundation (BMGF) funded five-year (2015–2019) project that seeks to increase access of poor smallholder farmers in Tanzania, Ethiopia and Nigeria to more productive and agro-ecologically adaptable chicken strains. ACGG follows an agricultural research for development (R4D) strategy focusing on women empowerment, functioning community innovation platforms, strong public-private partnerships, and capacity development to tackle poverty and improve food security.

ACGG Ethiopia will test five introduced (*Koekoek, Fayoumi, Sasso, Kuroiler, Embrapa 051*) and at least two local chicken strains (*improved Horro* and a few others) for eighteen months under semi-scavenging and on-station management conditions for egg and meat productivity, adaptation and preference by farmers and actors in the poultry value chain. The Ethiopian Institute of Agricultural Research (EIAR) is a principal national partner while all activities of the project are overseen by the Ministry of Livestock Development and Fisheries.

A total of 2500 smallholder chicken-keeping households from the Oromia, Amhara, Tigray, SNNP, and the Addis Ababa regions, residing in 21 districts and 63 *kebeles* (villages) will take part in the on-farm chicken performance test.

The design of the chicken performance tests was informed by *ACGG Producer Level Baseline Survey* and employs a paperless open data kit tool in tablet computers for real-time data collection and submission to the ILRI server. Apart from the private and small- and medium-scale enterprises which will play active roles in input and service delivery, two public research stations (Debre Zeit Agricultural Research Centre and Haramaya University) will also take part in the on-station chicken performance tests.

Information generated from the performance tests will be used to prepare a roadmap for long-term chicken genetic gains program in Ethiopia. The performance tests are conceived based on the hypotheses that:

1. There are measurable phenotypic differences among the selected chicken strains to be tested in terms of productive, reproductive and adaptive traits and preference by farmers;
2. Observed differences in performance among the chicken strains subjected to on-station tests are principally due to variations in genetic make-up; and
3. Confounding of environmental factors with genetics during the tests will be accounted for by proper experimental designs.

Embrapa 051

Embrapa 051 are hybrid hens resulting from the crossing between lines Rhode Island Red and White Plymouth Rock. These chickens are specialized in the production of table eggs and adapt well to less intensive systems. The performance targets for hens of this lineage, presented in Table 1, demonstrate the potential.

Table1. Performance of Embrapa 051 under less intensive systems in Brazil

Trait	Value
Body weight (g)	
Final weight	2820
Feed consumption (g)	
Total, 1-21 weeks	8092
1-80 weeks	55097
Daily, feed when in production	90-120
Production age (w)	
Age at onset	21
Age at 50% production	24-25
Age at peak	30-31
Production at peak (%)	86-88
Total eggs no. 21-60 weeks of age	208-211
Average weight of eggs (g)	58-67
Colour of the yolk and egg	Brown

Figure 1. Embrapa 051 hen

Improved Horro

The productivity of indigenous Horro chickens (Table 2) has been improving through an ILRI, EIAR and Wagenigen University and Research Centre (WUR) collaborative research program since 2004. The program successfully increased egg production of 11 month-old hens from a mere 34 eggs to 79 within eight generations of mass selection (Figures 2 and 3) and was recognized by H.E. Hailemariam Desalegn, Prime Minister of the Federal Democratic Republic of Ethiopia, during the Sixth National Science, Mathematics, Research and Innovation Award on 14 November 2015.

Figure 2. Genetic improvement in cumulative egg number at 45 weeks of age through eight generations of selection

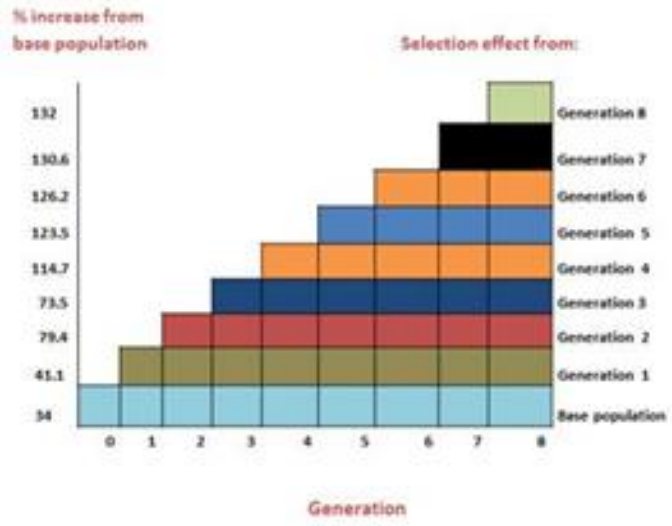

Table 2. Performance of Horro breed at Debre Zeit Agricultural Research Centre

Trait	On-station performance		On-farm performan
	Un- improved	Improved (G 7)	Improved (G7)
Hen housed egg production (12m)	23.3	48.7	43.46
FCR (kg feed / kg gain)	15.3	12.4	NA
Fertility (%)	NA	77.00	NA
Hatchability from set eggs (%)	NA	43.80	NA
Body wt (g) at 20 w (females)	684.8	964.2	NA
Survival 20 w (males)	88.8	98.8	NA
Survival 24 w (females)	NA	NA	88.8 (1.3)

Figure 3. Improved Horro hens

Potchefstroom Koekoek

Potchefstroom Koekoek (Figure 4) was bred at the Potchefstroom Agricultural College during the 1950s. This breed is a composite of the White Leghorn, Black Australorp and Bared Plymouth Rock. This breed can therefore be considered as a locally developed breed. The Potchefstroom Koekoek cocks and culled hens are used for meat production. The Koekoek's colour pattern is a sex-linked gene that is very useful for colour sexing in cross-breeding for egg producing types of hens used in medium input production systems. This breed is very popular among rural farmers in South Africa, and neighbouring countries for egg and meat production as well as their ability to hatch their own offspring. Performance of the strain under different management conditions in Agricultural Research Counsel (ARC) of South Africa is presented in Table 3.

Table 3. Performance of Potchefstroom Koekoek at Debre Zeit Agricultural Research Centre

Trait	Value	Station
Number of eggs per hen	195.9	ARC, South Africa
Egg weight (g)	53.2	DZARC, Ethiopia
Fertility (%)	77.7	DZARC, Ethiopia
Hatchability from set eggs (%)	79.8	DZARC, Ethiopia
Hatchability from fertile eggs (%)	83.0	DZARC, Ethiopia

Figure 4. Potchefstroom Koekoek chickens.

Table 4. Performance of Fayoumi at INRA, France

Trait	Value
Age at first egg (d)	146.5
Egg layed until 34 weeks	83.6
Egg production rate	73.5
Male body weight (g) at 247 days	2056.1
Female body weight (g) at 247 days	1564.3

Fayoumi

The Fayoumi (Figure 5) is a tropical breed of chicken originating in Egypt. The breed is hardy and particularly well suited to hot climates. The breed is also proven to be especially resistant to some viral and bacterial infections. It is also very good forager and suitable to scavenging production systems. The breed is fast to mature, with hens laying by four and half months, and cockerels crowing at five or six weeks. Fayoumi hens are good layers of small, off-white eggs. The on-station performance of Fayoumi chickens at French National Institute for Agricultural Research (INRA) is presented in Table 4.

Figure 5. Fayoumi hen

Sasso

SASSO (Figure 6) is a commercial breed originating from France and being distributed to different regions of Ethiopia. ACGG plans to test the breed for its production performance, adaptability and likability by smallholder farmers. The performance of the Sasso is presented in Table 5.

Table 5. Performance of Sasso breed based on information obtained from the company's website

Age (d)	Male (g)	Female (g)
21	566	533
28	907	837
35	1332	1158
42	1793	1528
49	2291	1913
56	2785	2279
63	3235	2647
70	3672	2944
77	4072	3199
84	4465	3438
91	4844	3654

Figure 6. Sasso C44 rooster

Kuroiler

The Kuroiler (Figure 8) is a commercial dual purpose hybrid chicken from India derived through crossing either coloured broiler males with Rhode Island Red females, or, White Leghorn males crossed with female Rhode Island Reds. The breed has a reputation for its low maintenance requirement and ability to thrive on household and agricultural waste. Data collected under extensive management conditions in Uganda indicate the breed can produce 150-200 eggs annually. The performance of Kuroiler chickens under intensive management conditions is presented in Table 6.

Table 6. Growth performance of Kuroiler chicken under intensive management condition in India

Trait	Value
Mean body weight (g) at 5 weeks of age	756.67
Mean body weight (g) at 7 weeks of age	1339.53
Mean feed conversion ratio (5-7 weeks) of age	2.43
Mean feed conversion ratio (1-7 weeks) of age	2.19

Figure 7. Mean body weight gain in male Kuroiler chickens (KC) and indigenous chickens (IC) raised under scavenging conditions in Uganda

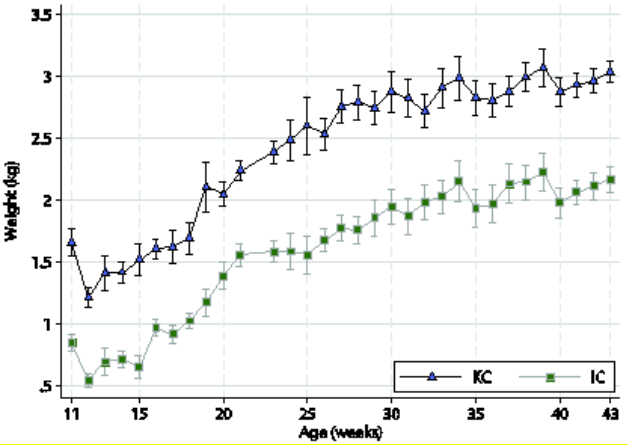

Figure 8. Kuroiler chickens

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African Chicken Genetic Gains is an Africa-wide collaboration that uses genetics so the continent's smallholder can get more productive chickens.

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