Improved Feeding Management of Indigenous Chicken Layers Raised in Semi-scavenging System by Pastoralist in Marsabit County, Kenya

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Research Brief

Feed the Future Innovation Lab for Collaborative Research on Adapting Livestock Systems to Climate Change

Abstract

Rural livelihood in the arid and semi-arid land of Kenya is mainly based on livestock production. This sector is often threathened by severe and prolonged droughts. Due to these unfavourable climate changes, men migrate with their livestock to far places in search of pasture while women and children are restricted to sendentary life around watering points. Rearing indigenous chicken (IC) has emerged as one of the strategies to diversify livelihood among settled pastoralist. However, the pastoralist lacked adequate knowldge on poultry rearing and as a result of this, Kenya Agricuture and Livestock Research Organization (KALRO) scientists saw the need for enhancing pastoralist knowledge on feeding management using locally available feed stuff. To achieve this, an evaluation of the nutritive value of locally available food stuffs was needed to determine the potential of incorporating these products as poultry feeds in the arid lands. An on-station feeding trial was conducted using Kenyan improved indigenous chicken (KIIC), at Sheep and Goats Research institute(SGRI), KALRO Marsabit in Northern Kenya. The study findings revealed that feed made from Balanites orbicularis seed cake + ground maize mix and ground maize alone are more palatable and high in energy. Egg weight gain was better in ground maize feed than Balanite orbicularis seed cake + ground maize mix. The study revealed that energy content of the feed was higher in mix (Balanite orbicularis seed cake + ground maize) than in commercial feed but low in calcium and phosphorus. Balanite orbicularis seed cake + ground maize mix has greater potential as alternative source of energy in poultry feed. However future intervention need to focus on improving nutritional quality of the feed by incoporating calcium and phosphorous sources.

Challenges facing poultry keeping in the pastoral system

The poultry sub-sector in Kenya contributes about 55% to the livestock sector and to 30% of the agricultural gross domestic product (GDP), or 7.8 % of the total national GDP (GoK, 2007). Therefore, it is an important component of rural houshold livelihood providing a source of income, nutrition, insurance against emergencies, and has the potential to reduce poverty. However,the production system is often characterized by a low input-output system and low commercialization of the enterprise (Ochieng 2013). This could be attributed to poor supply of nutrient to scavenging chickens.

In arid and semi-arid lands (ASAL), chicken rearing has come up as a coping strategy to sustain vulnerable groups such as lactating/pregnant women, children, and the elderly who are left at home without pastoralist stable food, meat, and milk. Knowledge about poultry management is lacking among the pastoralist. The chicken are mainly left to scavenge during the day and supplemented with a handful of maize grain in the morning and evening. This diet is not only insufficient but nutritionally inadequate to improve productivity.

Understanding the effects of supplementing semi-scavenging birds with energy and a protein sources could help design supplementation strategies to enhance their growth performance and ultimately, improve their egg production capacity.

Figure 1: Indigenous layer and her chicks scavavenging on bare land. (Photo credit: Qabale Diba)

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Feed Selection, preparation and feeding

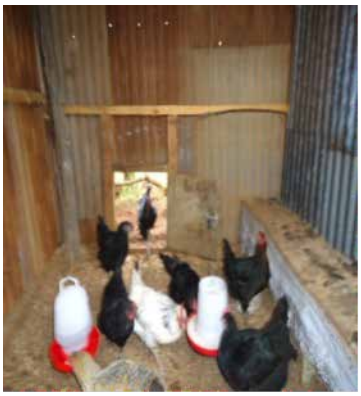

Figure 2: Layers feeding on provided supplement. (Photo credit: Qabale Diba)

One of the ways to increase the protein supply for feed formulation is to make more plant proteins available for human consumption and develop the production of proteins from unconventional sources for animal feeds (Lohlum et al., 2012). There are number of plants which are locally available who's nutritive value can be established and exploited for use in formulating affordable supplements for scavenging chickens.

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Desert dates (Balanites spp) whose fruits and seeds are consumed as food by some communties living Marsabit county is a good example. The seeds are boiled for hours while extracting oil from it and the seed cakes after boiling is eaten as food. Whole grain maize is the most commonly used supplement in the region. This study was set to evaluate the nutritive values of seeds of this plant and determine it's potential as feed suplement for scavenging indigeneous chicken. The Balanites Orbicualris seed were soaked for 12 hours and boiled for 5 hours while replacing the water to reduce the anti-nutritive factors (ANFs). The cooked seeds were then dried for 24 hours at 100 ^{0}C in a drying oven. The Seed cakes were then ground using a manual grinder. Whole grain maize was also ground in the same way.

Based on crude protein content of the maize grain (8%) and the protein supplement sources (Balanites Spp, 27%) and recommended energy level and protein requirement (3044 kcal/kg and 21% CP respectively) for layers, the feed ration was formulated to meet the required energy and protein need of the chicken using the pearson square method (Elfeel A.A,2010).

Figure 3: Balanites orbicularis seed oil. (Photo credit: Qabale Diba)

An on-station feeding trial was conducted using Kenyan improved indigenous chicken (KIIC), at Sheep and Goats Research institute (SGRI), KALRO Marsabit in Northern Kenya. A total of 44 laying birds,which were 52 months old, were used for the study. At the begining of the study, all hens were weighed and 11 birds were randomly assigned to each of the four treatment based on their weight. The four dietary treatments were Ground maize (T1), Whole grain Maize (T2), Ground Balanites Orbicularis seed cake + ground maize (T3) and Commercial feed (T4). The experimental birds were randomly allocated to the treatment in a

Figure 4: Staff formulating feed supplement ratio. (Photo credit: Qabale Diba)

Table 1: Composition of dietary component

Feed type	Nutrient composition (%)								
	Mcal/kg	DM	Ash	CP	CF	EE	NFE	Ca	P
Ground maize	2.274	88.93	3.33	9.61	4.81	4.82	77.43	0.03	0.48
Balanites seed cake + Ground maize	2.861	91.46	1.80	9.74	10.16	7.79	70.51	0.03	0.23
Commercial feed	2.748	92.20	19.88	11.67	12.21	5.27	50.97	0.15	0.54

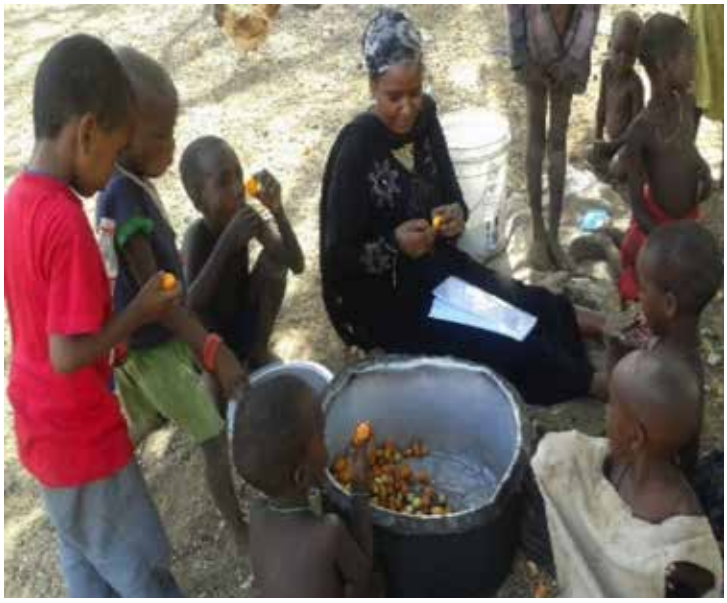

Figure 5: Children in Seren village and researchers enjoying the fruits of Balanites orbicularis. (Photo credit: Qabale Diba)

completely randomized design (CRD) based on their weight. The birds were given an adaptation period of 2 weeks during which they scavenged around the field for food and were given the supplement. Data on weight gain and production performance of the chicken was collected for 90 days.

Key Results

Dietary intake and quality of supplementary diets

The daily feed intake of commercial diet (109g) and Balanites seed cake (90.56g) were higher than that of ground maize (68.08g) and whole grain maize(58.8g). The high intake of commercial feed could be atributed to the good quality of the diet and also the fact that the layer were used to this diet even before the commencement of the experiment as opposed to sudden introduction of the birds to the rest of the diet. Poor intake of the whole grain maize could be due to digestability problem resulting from the structure of the feed.

Chemical analysis report shows that energy level of the feed was higher in mixture of Balanites seed cakes + ground maize feed (2.861Mcal/kg) as compared to commercial feed(2.748 Mcal/kg) and ground maize feed(2.274 Mcal/kg). Commercial feed is superior in crude protein content (11.67) to rest of the suplement. Both ground maize and Balanite + maize mix are very low in calcium and phosporous. See table 1.

Production performance

The initial average weight of birds at the start of the treatment was 1.88 kg. At the end of the experiment, birds feed on ground maize,whole grain maize, and the mix of Balanites orbicularis seed cakes + ground maize registered negative live weight gain while the birds on commercial feed gained weight by 0.12 kg. Weight loss was observed in all treatment with exception of those feed on commercial feed. Prior to the experiment, layers were fed on commercial layer feed and it is logical to observe this scenario upon introduction to inferior diet as in this experiment. The weight loss of the birds was less severe among birds supplement with Balanite orbicularis seed cake + ground maize mix than those fed on whole grain maize and ground maize. This could be due to higher energy level reported in Balanite orbicularis seed cake + ground maize mix which is even higher than that of commercial layer feed. However the higher energy in the mix did not translate to better egg quality in terms of egg production and egg weight. These fact was well supported by very low content of calcium and phosphorus in the mix.

Conclusion

Our study revealed that feed formulated from locally available feed stuff like Balanites orbicularis seed cake + ground maize is higher in energy and protein as compared to ground maize given alone. However, this feed is low in calcium and phosphorous which is important for egg production and growth of the birds. Future intervention need to focus on improving nutritional quality of the feed by incoporating calcium and phosphorous sources.

Figure 6: Staff taking weight of the layers. (Photo credit: Qabale Diba)

Table 2: Production performance

Treatment	Initial body weight (Kg)	Final body weight gain (Kg)	Body weight gain (Kg)	Initial egg weight(g)	Final Egg weight(g)	Egg weight gain(g)
T1	1.88	1.79	-.09	70	52	-17.00
T2	1.88	1.83	-.05	70	62	-8.00
T3	1.88	1.85	-.03	70	53	-18.00
T2	1.88	2.00	.12	70	71	1

Further Reading

GoK (2007). Kenya Intergrated Household Budget survey (KIHBS) 2005/06. Volume 1. Basic Report. Governement of Kenya (GoK), Nairobi, Kenya.

Lohlum S. A., Forcados E. G., Agida O. G., Ozele N. & Gotep J. G.(2012).Enhancing the Chemical Composition of Balanites aegyptiaca Seeds through Ethanol Extraction for Use as a Protein Source in Feed Formulation Vol. 1, No. 2 ISSN 1927-050X E-ISSN 1927-0518

Ochieng J., George O., Bockline O. B.(2013)Management practices and challenges in smallholder indigenous chicken production in Western Kenya. Journal of Agriculture and Rural Development in the Tropics and SubtropicsVol. 114 No. 1 (2013) 51–58

TIRI, Targeted Investment for Research Impact, identifies early-career researchers who are interested in tackling livestock production problems through innovative approaches and fresh perspectives. This small-grant program is open to early-career researchers (five or fewer years into research career) in any discipline, from student to professor, and from any organization that is engaged in applied research on livestock production in South Asia and East Africa — colleges and universities, government research centers or laboratories, or non-profit organizations.

Proposals are selected based on their potential to make livestock production systems more resilient to increasing climate variability and severity. At the end of one year, TIRI scholars are expected to demonstrate concrete outcomes and real potential for future impact. The 10 selected East Africa TIRI scholars and the 18 selected Nepal TIRI scholars are addressing research problems on various livestock and climate research themes.

Feed the Future Innovation Lab for Collaborative Research on Adapting Livestock Systems to Climate Change is dedicated to catalyzing and coordinating research that improves the livelihoods of livestock producers affected by climate change by reducing vulnerability and increasing adaptive capacity.

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