Small-scale Laying Hen Feeding Trial

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With rising costs of imported feed, livestock systems based on local pasture offer several advantages provided forages can meet animal nutrition needs. A base diet of forages can generally help weather import supply inconsistencies and reduce direct feed costs. Risks in depending on forages include drought, land tenure insecurity, and variable feed quality over space and time. Livestock producers must find the balance between reducing costs through grazing and loss of or inconsistent production. Chickens, which are simple stomach omnivores as opposed to specialist grazers like cattle, have high requirements for protein and energy which are difficult to meet with forages alone for consistent egg production.

A series of backyard chicken raising workshops held on Kauai and Maui from 2010 – 2011 revealed a need for more information on feeding strategies for small flocks in Hawaii. To that end, we designed a demonstration trial to test four simple feeding approaches many small-scale flock owners use for laying hens.

Chickens

In May 2011, 30 Rhode Island Red chicks were bought through a local feed store on Kauai sourcing from a mainland hatchery. The chicks were approximately a week old at purchase and were brooded in an outdoor 32 ft^2 cage. The cage was secured with heavy gauge cage wire and set about 4 inches in the ground to help prevent predation. Chicks were fed free-choice medicated commercial starter ration. In the first week, one chick died from cannibalism and one chick died of unknown causes. No other losses occurred during the brood phase. In October 2011, the pullets were gradually transitioned to a 20% layer ration in addition to daily moves in a grazing cage. Some chickens started laying in early November.

Treatments

This trial was conducted at the CTAHR Kauai Agricultural Research and Extension Center (KARC) in Wailua. By December 2011, all chickens had come into lay. Individuals were ran-

Table 1. Hens were randomly assigned to four feeding groups: 100% pasture, pasture + 50% pellets, pasture + fly larvae/kitchen scraps, and 100% commercial pellets.

Feeding Type	Number of Hens	Period
100% Pasture	6	December 2011 – May 2012
Pasture + 50% Pellets	6	December 2011 – May 2012
Pasture + fly larvae/scraps	6	December 2011 – May 2012
100% Pellets (battery cage)	6	December 2011 – May 2012

domly assigned to 4 groups of 6 birds each. Four hens were kept in reserve. Table 1 explains the 4 feeding groups. Egg laying data collection by group began in January 2012.

The group fed only commercial 20% layer ration were kept in individually stalled battery cages (Figure 1). They were fed 125g once a day in excess of the minimum 110g each suggested by National Research Council (2000) to account for wasting.

Figure 1. Hen from the 100% Pellet group in a battery cage stall.

Pastured hens were kept in 32 ft2 open bottom grazing cages moved daily. Each of the pastured groups were gradually acclimated to their new feeding regimes over a two week period before data collection began. The Pasture + 50% pellets group received a once daily supplement of 330g (55g per bird). The Pasture + larvae/scraps group received at first larvae harvested from a commercial composter, then later this was replaced with household kitchen scraps. The forage base consisted primarily of perennial peanut (*Arachis pintoi*) with some *Desmodium* sp. and a negligible amount of assorted grasses. Perennial peanut is a legume readily grazed by a number of livestock species.

Results

While all pullets came into lay by December 2011, only the 100% Pellet group and Pasture + 50% pellet group successfully laid eggs between January to May 2012. Two hens in the Pasture + larvae group died on the same night in January. Upon further investigation, the fly larvae harvested and fed from the commercial composter were not Black Soldier Fly larvae as intended. Suspecting potential pathogens from this source, the larvae supplement was eliminated and replaced with kitchen vegetable scraps akin to common homeowner feeding practices. These scraps were fed as they became available. Two reserve hens replaced the death loss to this group. A hen from the 100% pasture group died during a period of unprecedented heavy rains. This hen was also re-

Figure 2. Perennial peanut (Arachis pintoi) forage base used at KARC.

placed with a reserve hen. Reserve hens had been kept on 100% pasture until assigned to a treatment. Table 2 summarizes egg laying data.

Table 2. Summary of egg laying by the 100% Pellet group and Pasture + 50% Pellets group.

Month	100% Pellets Avg./day /group	Total eggs/ month	Range eggs/day/ group	Pasture + 50% Pellets Avg./day/grp	Total eggs/ month	Range eggs/ day/ group
Jan	2.5	76	0 – 6	1.4	42	0 – 4
Feb	4.0	113	1 – 7	2.6	73	0 – 5
Mar	4.1	128	1 – 6	2.3	72	0 – 6
Apr	4.7	140	3 – 7	3.1	94	1 – 6
May	4.0	85	2 – 6	2.3	49	1 – 4

Given that neither of the other two pastured groups had laid any eggs and that their body condition scores were low, the trial was terminated in the middle of May rather than continuing for up to a year after first lay. On average, the Pasture + 50% pellet supplement group laid 61% as much as the 100% pellet fed group.

Discussion

While this trial is too small to draw definitive conclusions, it was interesting to note that the 100% Pasture and Pasture + larvae/scraps groups did not lay a single egg even while on high quality forage. Also, the reduction in feed led to a nearly arithmetic reduction in laying. In other words, replacing 50% of feed with pasture gave only a modest advantage (39% reduction in productivity). Given that the trial was cut short out of concern for hen health, it is not recommended to offer pasture or scraps as the sole feed source to semi-confined flocks.

Further Research

This trial has shed light on refining new directions in this line of research. County Extension Agent Glen Fukumoto, Soil Fertility Specialist Dr. Jonathan Deenik, and myself have submitted a proposal to look at issues arising from this work. Namely, breed selection is reported to affect production efficiency off of pasture, and black soldier fly larvae still hold great potential as an alternative feed source if the nuances of its production can be worked out. We also propose investigating modified dry-litter based systems where chicken manure can be captured and applied as well as the role of direct manure application from semi-confined hens in grazing cages.

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