A comparison of the productive performance of New Hampshire and White Leghorn laying hens under small scale farming conditions in South Africa

C. Pretorius, J.P.C. Greyling & L.M.J. Schwalbach
Department of Animal, Wildlife and Grassland Sciences,
University of the Free State, P.O.Box 339, Bloemfontein 9300, South Africa.

Introduction:

Poverty is a major problem that affects a large part of the South African population, particularly in peri-urban and rural areas of South Africa. In 1990, 83% of black households living in rural areas and the homelands lived below the breadline (ABSA, 1993). These communities are surviving on a high carbohydrate diet, based on the South Africa's staple diet–maize meal- that lacks protein. Alleviating poverty and malnutrition is a major objective defined by the South African government. Traditional small scale livestock production in South Africa is based on ruminant production on communal grazing areas. Most of these areas are overstocked and therefore there is a need to improve non-ruminant animal production to prevent further overgrazing of the veld and soil degradation in rural poor areas of the country.

Sustainable small-scale poultry production is a possible way to improve the income and the diets of rural poor communities, as it requires a relatively low capital investment and very little space, it has a fast production cycle and it produces high quality protein-rich products (eggs and meat).

Egg-production using point-of-lay hens seems to be an attractive preposition, because they are fairly resistant to diseases, do not require artificial heating and can start producing and generating an income very quickly. Therefore it seems to be a better option than broiler production for the resource-poor farmers.

An egg is a big enough portion to provide most of the daily protein requirements that a child needs (*Luven et al., 1972*). A simple mobile cage-unit to keep 12 laying hens for small-scale egg production has been designed and successfully tested by MacGregor and Abrams (1996). This production system requires little work and investment and can be used for integrated small-scale egg-and vegetable household production. The mobile hen-laying unit can be placed on top of a patch of growing vegetables and the hens can provide organic fertiliser for vegetable production. This type of farming can lead to the generation of some extra income for resource-poor households, it can create an opportunity to improve the quality of living of small scale farmers and provide the community with high quality products.

The main objective of this trial was to compare the productivity of point of lay New Hampshire and White Leghorn laying hens, two of the most important commercial breeds in South Africa, for small-scale egg production.

Materials and Methods:

Cage units: Two small and low-cost layer production units identical to those described by MacGregor and Abrams (1996), which can be placed in the backyard of a rural home and managed by the housewife after very limited training, were used in this trial. They consists out of 3 cage type units that can house 4 hens each (a total of 12 hens per unit) made of commercially available weld mesh and a metal frame, covered with a piece of corrugated iron with the following dimensions: 1,2 m long, 0,7 m wide, and 0,4 m high.

Water: Water was provided *ad libitum* through a small drinking trough attached to a 2-litre plastic cool drink bottle at the back of the unit (refilled on a daily basis).

Feed: Feed was available in a trough placed in the front part of the unit. Hens were fed *ad. libitum* a Meadows' complete laying mash (Mesolay 102). The composition of the feed was:

Protein (min)	15%
Fat (min)	25 g/kg
Fibre (max)	70 g/kg
Moisture (min)	120 g/kg
Ca (min)	27 g/kg
Ca (max)	40 g/kg
Phosphorus (min)	7.7 g/kg

Hens: Twelve New Hampshire and twelve White Leghorn laying hens at point-of-lay (20 weeks old), were randomly divided into 3 groups of 4 hens of the same breed and randomly allocated to cage for this trail. Hens were individually identified using a coloured ring in the left leg at the beginning of the trail and could be individually recognised according to the specific colour and cage number. After an adaptation period of a week, a 12 week trial period started. During this period all hen groups were managed under the same conditions. Feed consumption per cage of 4 hens and individual body weights were measured weekly. Egg production and water consumption per cage was measured daily. During weeks 3 and 7 Dicalcium phosphate was supplemented in the feed, due to the occurrence of soft eggs from both breeds. The amount of time needed daily to feed, provide water and collect the eggs from these 2 cage units was also noted. Data was statistically analysed using ANOVA procedures.

Results and Discussion

The results from this study are summarised in table 1.

Table 1. The productive performance of Leghorn and New Hampshire laying hens managed under small-scale conditions.

Parameter	New Hampshire Mean ±SD	Leghorn Mean±SD
Hen weight (start) (g)	1872.75^{c}±148.93	1815.91^{d}±194.35
Hen weight (end) (g)	2760.17^{a}±245.09	2208.75^{b}±298.87
Feed consumption (g)	124.0377^{c}±14.07	97.35615^{b}±11.94
Water consumption/hen/day (l)	0.201547±0.037	0.217647±0.067
Average daily gain (g)	8.81 ^{a} ±1.9	1.13 ^{b} ±1.6
Total amount of eggs (units)	260^{a}±15.20	568^{b}±11.44
Average egg weight (g)	49.05^{a}±5.25	48.91549^{b}±4.94
Mortality rate (%)	0	8.33
Total Feed cost @ R95.03 /bag	R125.05	R190.06
Total egg income@ R7.00@dozen	R151.67	R331.33
Total profit (Rand)	R26.62	R141.27

a, b ,means with different superscripts within rows differ significantly ($P < 0.01$)
c,d, ,means with different superscripts within rows differ significantly ($P < 0.05$)

Both the Leghorn and New Hampshire hens started laying in the first week of trail (21 weeks of age). The Leghorn hens started laying larger and more eggs in the first weeks than the New Hampshire hens. The total number of eggs produced by the Leghorn laying hens was significantly ($P < 0.01$) higher than that of the New Hampshire laying hens. The New Hampshire hens took much longer time to get into full production, produced significantly ($P < 0.01$) less eggs than the Leghorn hens, in fact less than half, but their eggs were significantly heavier ($P < 0.01$).

The water consumption in the two breeds was comparable and the 2 L bottles were more than sufficient to provide the water consumed in a day. In fact, the 4 hens in a cage only drank about 1 L of water per day.

The White Leghorn hens had a significantly ($P < 0.05$) better (lower) feed consumption than the New Hampshire hens, despite the fact that they produced more eggs. The New Hampshire hens however, grew significantly ($P < 0.01$) faster and were heavier that the White Leghorn hens during the trial.

Although both breeds produced enough eggs to cover their feed costs, the White Leghorn hens were much more profitable under the experimental condition, as it can be seen in Table 1. These hens generated 530% more profit than the New Hampshire laying hens during the 12 week trial period. The productive parameters of the White Leghorn hens are acceptable and comparable to those obtained under commercial farming conditions.

The time used to feed, provide water and to collect the eggs from all 24 hens was between 5-6 minutes per day (once a day). These hens produced under harsh climatic conditions with outside air

temperatures as high as 28-30 °C during the day and as low as 0-3 °C during the night. During cold days, curtains made of empty feed bags were rolled down during the night.

At current prices and based on the results of this trial, 24 Leghorn laying hens lay on average 20 eggs per day, from which 11.5 eggs will be enough to cover the feed costs. The other 8.5 eggs produced daily can be partly used for household consumption and the rest can be sold and generate some income to resource poor families.

A small-scale egg production project targeting the housewife, that is the person responsible for putting food on the family's table, using these production units and Leghorn hens (at point of lay) is an idea to be considered. The time needed to provide feed and water to the hens and to collect the eggs, is very little and likely to be accepted by the housewife in exchange for some extra income and a better diet for the family.

Conclusion:

According to the results obtained in this trial, the point-of-lay White Leghorn breed is more productive and economically viable for small-scale egg production than the New Hampshire breed. The small-scale egg production system based on a low cost cage unit seems to be feasible for household production.

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