BIBLIOGRAPHY

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ABSTRACT

The study aims to find out the commercial viability of establishing a quail farm in Poblacion, Itogon, Benguet using the Japanese Seattle breed and its adaptability to supplemental feeding in the form of duckweed. Specifically this aims to measure the egg laying capacity of this breed using two different feed inputs – one treatment utilizing pure quail feed and another with a combination of quail feed and duckweed. Housing conditions, handling, and general conditions was similar. Egg quality will also be compared between the two groups as to weight, and bird adaptability to the conditions of Poblacion, Itogon, Benguet.

The different treatments were T_0 – commercial feeds only T_1 – commercial feeds with duckweed.

Based on the result of the study, it is concluded that quails given purely commercial feeds and those supplemented with duckweed have the same effect in total feed consumption, feed conversion ratio, and total feed cost per dozen eggs. Furthermore, adding duckweed to commercial feeds resulted in more final weight gain, more and heavier eggs produced, and higher percent hen day average.

INTRODUCTION

In the Cordilleras and most places, the notion of poultry is always equated with chicken. This is because it is common and is cooked into tasteful dishes that many love. But poultry is not just chicken and to explore other fowls that fall into this category to enhance our body of knowledge about them, studies must be conducted. As an alternative to more popular poultry birds, this student-researcher thought of the quail. It is of smaller size and can be raised in big numbers to suit a regularly-sized flatland in the mountains. Quails are also noted to be hardy and resistant to diseases and can survive in both hot and temperate weather. They can be raised for egg and meat production. Also, quails and their eggs are alternative protein source at less cost compared to chicken

In Poblacion Itogon, Benguet there is no existing quail-raising enterprise either of the backyard or the commercial type. It is the desire of this researcher to start a study on the viability of raising quail for egg and meat production in that area. There is a ready market for these produce in Baguio City, 13 kilometers away from Poblacion Itogon.

If you ask egg vendors around the City Market of Baguio for the source of quail eggs that they sell, all would name a source based in the lowlands—either Pangasinan, Pampanga, or Bulacan. If their source is nearer like Itogon, Benguet, their patrons would be assured of fresher produce.

Recently there has been growing interest in adjuncts or additives to regular animal feeds which increase food-to-mass conversion ratio and lessen the cost of feeding. Duckweed is gaining popularity as adjunct to tilapia feeds in aquaculture. Because this researcher has obtained duckweed from the Bureau of Fisheries and Aquatic Resources of the Department of Agriculture in Guisad, Baguio City, it is my desire to integrate in my

study the effect of adding duckweed to quail feed in my study. Duckweed is easy to grow in nutrient-rich water added with manure or rock salt. It becomes a rich source of potassium, phosphorus, and nitrogen needed by animals for optimum growth.

There is virtually no study yet to show the effect of adding duckweed to regular quail feed. It is desired that this research will pave the way for more inquiries into the full utilization of duckweed in the poultry industry particularly in quail farming.

This study will establish the viability of putting up a quail raising industry in Itogon, Benguet and will benefit the researcher, the population of the locality, other localities with similar climatic conditions as Itogon, Benguet, the research community, and consumers and entrepreneurs in general. This was also determining whether the addition of duckweed to quail feed will enhance growth and egg production.

The study aims to find out the commercial viability of establishing a quail farm in Poblacion, Itogon, Benguet using the Japanese Seattle breed and its adaptability to supplemental feeding in the form of duckweed. Specifically this aims to measure the egg laying capacity of this breed using two different feed inputs – one treatment utilizing pure quail feed and another with a combination of quail feed and duckweed. Housing conditions, handling, and general conditions will be similar. Egg quality will also be compared between the two groups as to weight. Bird adaptability to the conditions of Poblacion, Itogon, Benguet will be monitored using bird mortality rate.

The study was conducted from January to March 2012 in Poblacion, Itogon, Benguet.

REVIEW OF LITERATURE

On quails in general. Casiwan (2001) said that quails are classified as game birds along with pheasants and partridges. It has become a popular source of eggs and meat in countries like Philippines, Japan, France, Britain, Italy, China and other Asian countries. In developed countries, quail is raised for gourmet cooking using its eggs and meat. In our country, the interest is mainly on quail eggs such as those sold in plastic packets in bus terminals and peddled by balut vendors at night to assuage hunger.

On quail feeds. Varghese (2000) said that all poultry and game bird feeds are called complete feeds. They contain protein, energy, vitamins, minerals, and other nutrients needed for bird growth, egg production, and general health. Using additional grains or supplement is discouraged as this upsets the balance of nutrients in the complete feed. Mature laying/breeder birds are fed with laying diets only.

Farrel *et al* (1982) said that the nutrients that comprise a quail's diet are water, protein, carbohydrates, fat, mineral, and vitamins. Although all are essential, adequate water may be considered the single most important nutrient. Fresh clean water should be provided continuously to all birds especially under the tropical environment. Quails require more water if there is excessive salt in the feeds or during hot dry season.

Shanaway (1994) said that the feed consumed by the quail hen is used mainly for maintenance and egg production. The quantitative and qualitative requirements of laying quail eggs depend on the same factors. If there is a marked deficiency of any required nutrient, egg production will decrease and may even stop completely. The feed intake depends on the energy content of the diet, the age of the birds, their reproductive status, and the ambient temperature. When the birds are fed with diet low in energy content, egg

production decreases. Even though feed consumption is increased, reduced efficiency of feed utilization is evident. Birds on low-energy diets require approximately twice as much feed as those on high-energy diets to produce the same egg yield.

Shanaway also said that the diet of Japanese quail should contain 18% to 20% crude protein for maximum egg production

Woorard *et al* (1973) said that protein provides the amino acid for tissue growth and egg production. The dietary requirement of quail is influenced by metabolizable energy content and the ingredients used to formulate the diets. The earlier investigators raised their flocks successfully on turkey starter diets containing about 25 – 28% crude protein.

Shim *et al* (1983) said that a high quality ingredient is essential when making bird feeds. If poor quality feedstuff is used in quail diets, there will be production problems. Never use feed ingredient unless it is of highest quality. You can however substitute comparable turkey feeds for quail feeds without hurting performance. Also, chicken diets can be fed to growing quail that are raised for slaughter.

De Guzman (2003) said that laying quails should be fed *ad libitum* to have better performance in egg production.

On quail egg-laying. Delmo (2001) said that quails lay eggs twice a day—in the morning and in the afternoon. Their egg-bearing period can last from 126 days to 17 months once they reach adulthood.

Capitan (1981) said that the average egg production of Japanese quails ranged from 49.5% to 52.6%.

On egg quality: According to Mauldin (2001) the quality of the eggshell greatly influences contamination levels, cracks, and hatchability. Thin shells provide an easier passage for microorganisms into the egg and allow the evaporation of moisture from the egg. Thin shell will also cause increases in the number of cracked eggs during handling.

On duckweed. The cyclic nature of a synchronized duckweed mat (i.e. all the same age) could be over at least 1 month as the life span of fronds from early to late daughters can be 33 or 19 respectively with a 3 fold difference in frond rate production (See Wangermann and Ashby, 1950).

The use of duckweed as envisaged by Skillicorn *et al* (1993) appears to have only limited application in the rural areas of developing countries because it largely exports the nutrients to a central site where sewage works are installed and the cost of transporting nutrients back to the farm where they can be an asset would be extremely high.

When conditions are ideal, in terms of water temperature, pH, incident light and nutrient concentrations they compete in terms of biomass production with the most vigorous photosynthetic terrestrial plants doubling their biomass in between 16 hours and 2 days, depending on conditions. An idea of their rapid growth is illustrated by the calculation that shows that if duckweed growth is unrestricted and therefore exponential that a biomass of duckweed covering 10 cm^2 may increase to cover 1 hectare (100 million cm^2) in under 50 days or a 10 million fold increase in biomass in that time.

If duckweed can be harvested at frequent intervals and fed fresh or partially dried this would be a major advantage at the village level However, the small farmer who is more and more advised to use supplements often feed brans or pollards. These have considerable fiber and therefore the duckweed used should not increase the fiber load.

There would be great benefit therefore in growing duckweed as a crop, managed so as to minimize fiber and ensure it blends with primitive diets and equally with the more nutrient rich compounded feeds.

Duckweed is found to have high concentrations of nitrogen, phosphorus, and potassium which it absorbs from its growth medium and these minerals are important to the optimum growth of poultry, including quail, which makes duckweed a viable addition to quail feed either in its natural or semi-dried form.

MATERIALS AND METHODS

The material that was used in this study are as follows: 120 heads of pullet quail, brooding and rearing cages, incandescent electric bulb, feeds, feeders, weighing scale, egg trays, vernier caliper, duckweed-growing ponds, duckweed, and record book.

Prior to the start of study, all the brooders feeders, and waterers were cleaned and disinfected. The lighting system was installed and lighted a few hours before the arrival of the pullets. The duckweed ponds were seeded and growth was maximized to prepare them for harvesting immediately at the start of the study. (Figure 1)

Treatment

T_0 –Commercial feeds (Figure 2)

T_1–Commercial feeds with 50% of duckweed (Figure 3)

Just after the pullet was placed into their respective cages, water and feeds was given to them. Feeding was done from 6:00 to 6:30 in the morning and from 4:00 to 4:30 in the afternoon. The amount of feeds offered was weighed and recorded. Clean and fresh water was made available at all times.

Data Gathered

1. Initial weight (g). This was taken at the start of study at 30 days of age.
2. Final weight (g).This was taken at the start of the study 60 days of age (Figure 4).
3. Number of layer quails. A daily inventory was done.
4. Total daily egg production. The total number of eggs laid everyday was counted.

5. Weight of egg (g).The weight of each egg laid.

6. Feed offered (g).Feed offered to the birds.

7. Feed leftover (g). Feed not consumed by birds.

8. Yolk color. A comparison of yolk color was done use the Roche color (Figure 5).

9. Feed conversion ratio/ dozen eggs. This was obtained by dividing the total feed intake by total gain in weight.

10. Feed cost/ dozen eggs. This refers to the cost of commercial feeds, and duckweed.

a b

Figure 1. a) The improvised duckweed ponds and b) close – up view of duckweed

Figure 2. Quails in treatment 0 fed commercial feeds (CF)

Figure 3. Quails in treatment, fed with CF plus duckweed

Figure 4. Final weight being taken

a b

Figure 5. a) egg yolk from quails fed Commercial feeds only; b) egg yolk from quails fed feeds supplemented with duckweed

Data Computed

1. Hen-day egg production. The number of egg collected in one day expressed as a percentage of the number of layer in the house on that day.

2. Feed consumption (kg).This was obtained by adding the feed consumed by the quail from the start of the study to the end of study.

2. Return of investment (ROI).This was taken using this formula.

$$ROI = \frac{\text{Total Cost- Total Cost of Production}}{\text{Total Cost of Production}} \times 100$$

RESULTS AND DISCUSSION

Initial Weight

The initial weight of the quails in the different treatments is shown in table 1. The average initial weights were taken when the quails were 30 days old. Statistical analysis revealed that there were no significant differences among the treatment. While there are slight differences in the body weight of the experimental quails as presented in the table, such differences were very minimal to cause a significant difference among the treatments. The result also implies that the experimental quails had more or less the same weight at the start of the study. The average initial weights are 106.25g and 104.84 g respectively.

Final Weight

Table 2 shows the quail's average final weight in grams per treatment in the study. Statistical analysis showed that there is a highly significant difference in the final weights averaging 111.66 g for the commercially fed and 114.15 g for the duckweed-supplemented. The result indicates that quails fed with duckweed as supplement on top of commercial feeds were heavier compared to quails fed with purely restricted

Table 1. Initial Weight of the quail at 30 days of age

TREATMENT	MEAN (g)
Commercial feeds only	106.25
Commercial feeds supplemented with Duckweed	104.84

Means with no superscript are not significant different at 0.05 by DMRT

Further study on the mechanism of the duckweed's effect on the weight of fowl such quail is recommended as it is beyond the scope of the current study.

Commercial quail growers who raise quail for the purpose of meat production would benefit to take notice of this result as duckweed production is relatively inexpensive to undertake but makes quail heavier and therefore would make them earn more.

Average Daily Egg Production

Table 3 shows the average daily egg production per treatment with a mean of 1.706 for those given pure commercial feeds and 1.864 for those fed with a supplement of duckweed. Statistical analysis showed that there is a slightly significant difference in the average daily egg production for the two treatments.

This means that aside from increasing significantly the weight of quails, duckweed also increases daily egg production.

It is recommended that further studies on the mechanism of duckweed to stimulate and produce more eggs be made by other researchers as the concept is beyond the scope of this present study.

Table 2. Final weight of the quail at 30 days

TREATMENT	MEAN (g)
Commercial Feeds only	111.66
Commercial Feeds Supplemented with Duckweed	114.15

Commercial quail growers who raise quail for the purpose of egg production would benefit to take notice of this result as duckweed is easy to propagate and process as feed supplement for quails.

Average Weight of Daily Egg Production

Table 5 shows the average weight of an egg laid per bird in the two treatments. Statistical analysis showed there is a significant difference among the treatments. Quails given pure quail layer mash had a mean of 15.70 g while those fed quail layer mash supplemented with duckweed had a mean egg weight of 17.37 g.

This means that quails fed with a supplement of duckweed laid heavier eggs compared with those fed purely with commercial quail layer mash. To combine the two other factors which showed statistically significant effect in the study, this means that feeding quails with a supplement of duckweed increases body weight, egg production, and egg weight.

Table 3. Average daily egg production

TREATMENT	MEAN (g)
Commercial Feeds Only	1.71
Commercial Feeds Supplemented with Duckweed	1.86

Total Feed Consumption

Table 6 shows the total feed consumption per quails in the two treatments for 60 days. Results showed that quails fed restricted using quail layer mash and quail layer mash with duckweed had mean total fed consumption averages of 101.67 g and 142.33 g respectively.

Statistical analysis showed that there are no significant differences among the treatments. This means that the total feed consumption of the birds in the different treatments are statistically similar

Table 4. Average weight of the quail eggs

TREATMENT	AVERAGE WEIGHT (g)
Commercial Feeds only	15.70
Commercial Feeds Supplemented with Duckweed	17.37

Table 5. Total feed consumption a quail for 60 days

TREATMENT	MEAN (g)
Commercial Feeds Only	101.67
Commercial Feeds Supplemented with Duckweed	142.33

Means with no superscript are not significant different at 0.05 by DMRT

Feed Conversion Ratio

Table 6 shows the amount of feeds needed per bird to produce on a per treatment basis their average gain in weight. The table reveals that quails fed quail layer mash, had a mean of 1.62 and quail layer mash with duckweed had a mean of 1.32.

Statistical analysis revealed that these real differences were not significant. This means that the feed conversion ratios in the different treatments are more or less the same.

Total Feed Cost/Dozen Eggs

Table 7 shows the total feed cost per treatment to produce a dozen eggs which are P17.50 and P19.55 respectively. Statistically these two costs have no significant difference. The slight difference in real value is due to production cost (actually transportation cost) of the creating air-dried duckweed which are freely obtained from a water-cress swamp in Camp 7.

Table 6. Feed Conversion Ratio

TREATMENT	FCR (g)
Commercial Feeds Only	1.62
Commercial Feeds Supplemented with Duckweed	1.32

Means with no superscript are not significant different at 0.05 by DMRT

Percent Hen Day Average

Table 8 and Figure 7 shows the percent hen day average in the different treatments ranging from 13.97 and 15.41. These are the number of eggs collected per day expressed as a percentage of the number of layers per treatment. Statistical analysis showed that there is a significant difference in the number of eggs collected per day per treatment. There is a higher percent hen day average in the population supplemented with duckweed (15.41%) compared with the group fed with pure commercial feeds (13.97%).

This is just a natural offshoot of the statistically significant higher daily egg production of the duckweed fed group.

However when compared to other studies, these percentages are significantly lower compared to what was cited by Capitan (1981). He said the average production of Japanese quails ranges from 49.5% to 52.6%. Further studies must be made regarding the effect of temperature extremes (very cold evenings and very hot daytime) which are the prevailing conditions at the time of the study in Poblacion, Itogon, Benguet to the egg-laying performance of the quails.

Table 7. Total feed cost/dozen eggs

TREATMENT	MEAN (Php)
Commercial Feeds Only	17.50
Commercial Feeds Supplemented with Duckweed	19.55

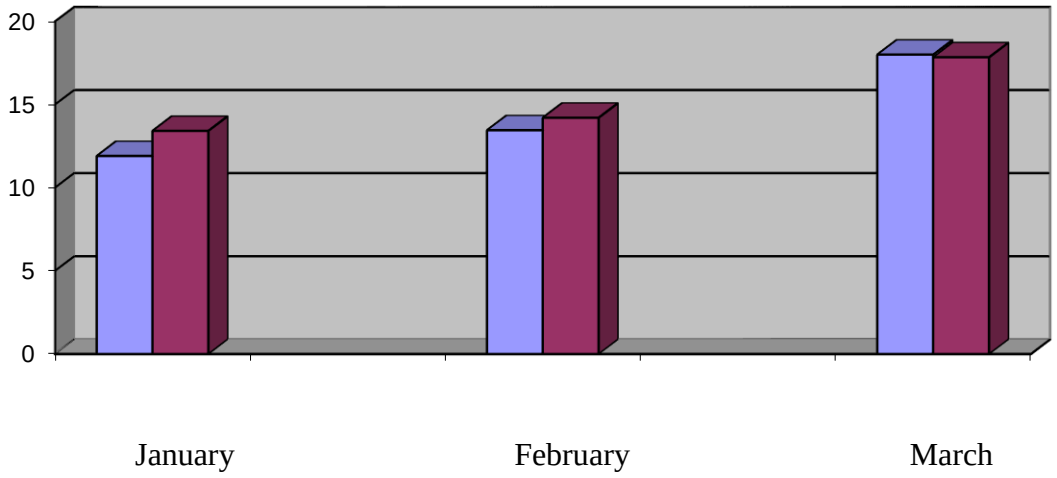

Figure 7. Egg productivity in percent hen day January to March 2012

Table 8. Percent Hen Day Average

TREATMENT	MEAN %
Commercial Feeds Only	13.97
Commercial Feeds Supplemented with Duckweed	15.41

Return on Investment

Table 9 shows the return on investment obtain from the different treatments ranging from -20.24% to -20.09%. The negative returns reveal that the number of 120 quails is considered too small to be profitable. This because generally in animal production, the more the number of the animals produced, the higher is the returns (Casiwan, 2002). Another reason is that the quails had just laid for barely 60 days. This attributed to the length of the data collection. This covered only the first two months of lay. Results will differ if a whole year production period is considered. According to Delmo (2001), the egg

bearing period of quails can last from 16-17 months once they reach adulthood. Furthermore, the lower ROI obtained from commercial feeds and commercial feeds with duckweed.

Table 9. Return on investment

Cost and return analysis	Commercial Feeds	Commercial Feeds With Duckweed
PARTICULAR		
A. Gross Sales (Php)	3,424 .00	3,518.00
B. Cost of Production		
Cage	1,500.00	1,500.00
Quail Pullets	1,800.00	1,800.00
Feeds	915.00	1,035.00
Medicine	70.00	70.00
Total (Php)	4285.00	4405.00
C. Return on Investment	-20.09	-20.24

*Gross sales include the sales of egg and quails after two months of lay.

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

This was conducted to determine the egg productivity of Japanese quails fed with commercial feeds supplemented with duckweed. Specially, the study aimed to evaluate the as egg productivity of quails in terms of number, weight, yolk color, daily egg consumption and feed consumption; and to compare commercial feeding with that of with duckweed supplementation; which will give better egg productivity.

Following the Complete Randomized Design (CRD), 120 ready-to-lay quail pullets were distributed into two treatments. Each treatment was replicated five times with the 12 g birds per replicate making a total of 60 birds per treatment. The two treatments used were the pure commercial feeds T_0 and commercial feeds with duckweed T_1 as feeding regimen.

Statistical analysis showed no significant between the treatment in terms of initial weight, total feed consumption, feed conversion ratio, and the total feed cost/dozen egg. This means that the bird in all treatments gave more or less the same performance in this parameter.

For a period of 60 days the total feed consumption was monitored at an average of 101.67 g to 142.33 g. the total feed conversion ratio was from 1.318 to 1.624 which is not far from the ideal feed conversion ratio among fowls of 2. the total feed cost per dozen eggs was P19.546 to P21.496.

However, significant differences were observed in terms of final weight, average daily egg production, average weight of daily egg production, and percent hen day average. Quails supplemented with duckweed had significant gain at 114.148 g, higher average

daily egg production at 1.864, higher average weight of daily egg production at 17.366 g and higher percent hen day average at 15.408.

Conclusion

Based on the result of the study, it is concluded that quails given purely commercial feeds and those supplemented with duckweed have the same effect in total feed consumption, feed conversion ratio, and total feed cost per dozen eggs. Furthermore, adding duckweed to commercial feeds resulted in more final weight gain, more and heavier eggs produced, and higher percent hen day average.

Recommendation

According to the result of the study, it is advised that the quails be feed with a supplemented of duckweed to produce a significant gain in weight especially for meat production, and to increase egg production and weight.

It is further recommended that studies on the mechanism that allows duckweed to create the enumerated effects on the growth and egg production be made. A longer of quails in a hot environment (like the lowlands) and a cold environment (like the Cordillera upsland).

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