Effect of Partial and Total Replacement of Broken Rice Instead Wheat on Some Economic Traits of Laying Hen

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Abstract

A total of 105 laying hens (ISA Brown), 60 weeks age, were used in the experiment. They were divided into five treatments with three replicates, were as the following: T1: without replacement of the rice broken. T2: replaced 25% of the broken rice instead by 75% of the wheat. T3: replaced 50% of the broken rice instead by 75% of the wheat. T4: replaced 75% of the broken rice instead by 50% of the wheat. T5: replaced 100% of the broken rice instead by 0% of the wheat. The best measure of economic profit, the highest net cash income, and the shortest period of capital recovery was in T3 compare with other treatments. All replacement treatments of rice broken instead of wheat in the diet achieved the best economic profit, net cash income, and the shortest period of capital recovery compared to the control treatment.

Keywords: Rice, Economic, Laying Hen.

1. Introduction

The nutritionist resorts from time to time and whenever possible to the use of cheap and locally available fodder alternatives, with the condition that the nutritional value of this alternative food material is available in the diets of farm animals, especially poultry. The nutritional value is low, so some chemical processes can be carried out to increase its nutritional value [1]. For some grains, such as corn and wheat, in order to reduce the costs of feeding poultry birds and to achieve the largest profit margin while raising laying hens or broilers [2]. Among those fodder materials that are frequently obtained as a by-product in the mills and grain mills for rice extraction, are cracked rice or the wheat bench, which is characterized by its low price compared to the main crop [3].

The nutritional value of the rice fraction is reflected in its high caloric energy content, since the largest part of it is carbohydrates, while its protein content is almost similar to the content of yellow corn [4]. In addition, the rice fraction is rich in its content of vitamins B1, B2 and niacin, which are important in the metabolic processes of carbohydrates and fats inside the chicken body [6,7]. The content of the rice fraction of the essential amino acids of lysine, methionine and tryptophan is 0.48, 0.23 and 0.16%, respectively [8]. It is also characterized by a high content of minerals such as magnesium, manganese, iron and zinc, with their values reaching 0.85%, 410 mg/kg, 120 mg/kg, and 40 mg/kg, respectively, with a high content of the rice fraction of total phosphorous, which reached 1.6% [9]. Rice grains are manufactured in several stages, the first is cleaning the grains, the second is the peeling of the grains (crunching), the third is the stage of isolating the husks, which is called “Spous” from the rice seeds. The isolation of the seeds from the husks is by means of air sieves (Aspiration) [10], so that the seeds are at the bottom as a result of gravity, and the stage of peeling the grains (separation of the outer barley husks) is called gridding, and the stage of separating the husks from the seeds is called the husk separation. In the presence of unhulled rye, rice bran (Sahala), broken rice (Al-Dakah), and the percentage of rice cracking may reach 6-10% of the weight of the grains. Which ranges in size from medium to soft, it is called rice broken or chits or Brewer rice and the nutritional value of rice crack lies in its high energy content because the main part of the rice break is carbohydrates, while the protein content is 7.9% and the rice protein contains gluten and that the biological value of rice reaches 80%, while the biological value of wheat reaches 50% [8].

The current study aims to determine the effect of partial and total substitution of rice for wheat in some economic traits (calculating the expenditure costs, which include both feed consumption, workers’ wages, electricity, transportation, water, medicines and vitamins, according to the sale returns of eggs produced in each transaction, calculating the resulting financial returns about selling eggs for each transaction and comparing them with the costs spent in each transaction to know the
benefits (profits) resulting from each transaction, making a comparison between the financial returns for each of the experiment’s transactions to determine the best of the transactions used in the experiment).

2. Materials and Methods

2.1 Experiment design and chick managemen:

This experiment was conducted in the field of laying hens at the Agricultural Research and Experiment Station, College of Agriculture, Al-Muthanna University, from 1/7/2020 to 22/9/2020 and for a period of 12 weeks. A total of 105 laying hens (ISA Brown) at the age of 60 weeks, distributed to five treatments with three replicates distributed into five houses (3 x 3 m) and each was divided into three equal sections so that each section contained 7 laying hens (21 laying hens/treatment) and the transactions were shown in the following form:

T1: (control treatment): The basal diet was given without any substitution.
T2: Replacing 25% of the broken rice for 75% of the wheat (2.5 kg of broken rice + 7.5 kg of wheat/100 kg of diet).
T3: Replacing 50% of the broken rice with 50% of the wheat (5 kg of broken rice + 5 kg of wheat/100 kg of diet).
T4: Substituting 75% of the broken rice with 25% of wheat (7.5 kg of broken rice + 2.5 kg of wheat/100 kg of diet).
T5: Replacing 100% of the broken rice with 0% wheat (10 kg of broken rice + 0 kg of wheat/100 kg of diet).

The water was continuously supplied using hanging plastic pipes, and the lighting program was 16 hours a day (from five in the morning until nine in the evening), and the temperatures were between 32-34 ° C during the duration of the experiment. No vaccinations took place on the herd during the trial period, except for giving the herd vitamin C at a rate of 1 ml/5 liters for one week only. He used broken rice (the Jasmine variety) available in the local markets for the experiment.

2.2 Studied traits

2.2.1 Economic traits

2.2.1.1 Economic Profit

It is one of the important measures used to measure the performance efficiency of economic projects, on which the investor bases when making his productive decisions, as the investor always seeks to reach his goals of increasing profit by increasing the differences between total revenue and total costs [11]. It was calculated according to the following equation:

\[ \text{Economic Profit} = \text{Total revenue} - \text{Total Cost} \]

2.2.1.2 Net cash in come

It is a measure of investors' ability to earn cash [12]. Where it is considered a starting point for each project to calculate the project’s ability to pay off debts and is calculated by the difference between the total cash revenue of the project and the cash costs spent in the project, and the total cash revenue of the project includes both project sales of eggs and the sale of chickens after the end of its productive period or any income Another comes from the project. As for the cash costs spent, it includes the ongoing expenses in the project over the length of the laying hens’ period, including buying feed, workers’ wages, deaths, treatments, fuel costs, maintenance matters, and others. The project aims to develop and expand and increase its economic profits [13]. The net cash income is calculated through the following equation:

\[ \text{NCI} = \text{Cash revenue} - \text{Cash cost (V.C)} \]

2.2.1.3 Pay Back Period

It was considered one of the most widely used measures in determining the economic efficiency of investment projects, and it can be defined as the time period required to recover the initial expenses of the project from the total profits realized from the project [14]. The Pay Back Period is calculated according to the following equation:

\[ \text{Pay Back Period} = \frac{\text{fixed capital}}{\text{profit} + \text{waste}} \]

It is considered one of the most widely used metrics in evaluating projects due to its ease of application, and the efficiency, ease and suitability of this metric emerges in the case of investment projects that are affected by the factors of fluctuations and changes, as this criterion is considered a criterion for the degree of risk that the project is likely to face [15]. The investor aspires to recover the invested funds in the shortest possible period of time, and therefore the investor turns to projects that are likely to return his total invested money in the shortest period of time than those projects in which the period of recovery of the total invested funds is delayed [16].
2.2.1.4 Benefic Cost Ratio

It is one of the measures that are used to know the financial evaluation of the efficiency of production inputs. This indicator does not differ from the net present value of the investment in its uses in terms of the data required for the evaluation of the past performance through the project’s financial records and it looks through indicators to correct the financial problems, if any, and increase the positive elements In the project business from the financial point of view, and it is calculated by the annual returns of the project over the annual costs of the project, all of this is related to the present value, whether in terms of returns or costs, and if the value of this scale is greater than one integer, this indicates the financial success of the production unit But if this value is equal to the correct one, this means that it is financially equal, but if the value is less than the correct one, it indicates the existence of a financial defect in production that needs to take decisions to address this imbalance with different measures [17]. The return on the invested dinar is calculated according to the following formula [18, 19]:

$$\text{Benefic Cost Ratio} = \frac{\text{Annual revenue for the project}}{\text{The annual costs of the project}}$$

2.2.1.5 Operation Ratio

It is one of the indicators of the economic efficiency of using fixed and variable costs and the project’s ability to pay its financial and non-financial obligations for the production process. The lower this percentage, the higher the economic efficiency of the project in using its revenues. It is calculated by the following equation [20]:

$$\text{Operation Ratio} = \frac{\text{Total Cost}}{\text{Total Revenue}}$$

2.2.1.6 Productivity Profitability

It is a criterion for determining the productive and economic efficiency of the project [21]. This criterion is calculated according to the following equation [13]:

$$\text{Productivity Profitability} = \frac{\text{Profit}}{\text{Total Cost}} \times 100$$

2.3 Statistical analysis

Completely Randomized Design (CRD) was used to study the effect of partial or total replacement of powder date palms soaked in vinegar instead of wheat to laying hens diet on the studied traits. The significant differences between the means were compared with Duncan [22] multiple range under the significance level of 0.05 and 0.01. SPSS [23] were used.

3. Results and Discussion

3.1 Economic traits

3.1.1 Economic Profit

The economic profit scale was calculated and as shown in Table 1. and the total economic profit was recorded for all research transactions, which amounted to (332,496,10338) thousand dinars, where the third treatment, in which the fraction of rice was replaced by wheat, outperformed by (50%) over The control treatment and all study transactions had the highest economic profit, which amounted to (67,577,875) thousand dinars, and based on the economic profit scale, it is noted that substituting the fraction of rice for wheat in the laying hens' diets gave a higher economic profit than the control treatment and in all replacement ratios, as well The economic profit indicator for all experiment transactions shows that laying hens breeding projects give excellent economic profits, and the transactions recorded economic profit as shown in the table below:

| Treatment | Total costs (thousand dinars) | Total revenue (thousand dinars) | Economic profit (thousand dinars) |
|-----------|------------------------------|--------------------------------|----------------------------------|
| T1        | 191.403.1                    | 256.831.54                     | 65.428.44                        |
| T2        | 189.957.72412                | 256.654.16                     | 66.696.43588                     |
| T3        | 188.632.345                  | 256.210.22                     | 67.577.875                       |
| T4        | 187.066.9675                 | 253.492.68                     | 66.425.7125                      |
| T5        | 185.621.59                   | 251.989.23                     | 66.367.64                        |
| Total     | 942.681.72662                | 1.275.177.83                   | 332.496.10338                    |
3.1.2 Net cash income

The measure of net cash income is the minimum production efficiency of the productive activity, and the measure was applied and as shown in Table 2., it was found that the net cash income for all research transactions amounted to (451,861,10338) thousand dinars, and the highest net cash income was recorded in the transaction The third in cash amounted to (91,450.875) thousand dinars, in which the fraction of rice was replaced by (50%) in the place of the wheat crop in the laying hens’ diets, superior to the control treatment without substitution and the rest of the substitution coefficients in the experiment, and based on the study of the net income scale It is noted that the substitution of the rice fraction for the wheat crop and for all ratios in the laying hens’ diets gave a net cash income superior to the control treatment without substitution. It is also noted from the values of net cash income for all experiment transactions that the laying hens' projects achieve a good productive return, the table below shows Net cash income values for all transactions:

| Treatment | Variable costs | Total revenue | Net income       |
|-----------|----------------|---------------|------------------|
| T1        | 167.530.1      | 256.831.54    | 89.301.44        |
| T2        | 166.084.72412  | 256.654.16    | 90.569.43588     |
| T3        | 164.759.345    | 256.210.22    | 91.450.875       |
| T4        | 163.193.9675   | 253.492.68    | 90.298.7125      |
| T5        | 161.748.59     | 251.989.23    | 90.240.64        |
| Total     | 823.316.72662  | 1.275.17783   | 451.861.10338    |

3.1.3 Pay Back Period

The measure of the recovery period of invested capital is one of the most widely used measures to know the efficiency of projects, due to its ease of application and simplicity, as Table 3. indicates the total capital recovery period and for all experiment transactions amounted to (2,503337) months, where it is noted that the lowest capital recovery period was recorded The money in the third treatment in which (50%) was substituted for the fraction of rice in place of wheat in the rations of laying hens is superior to the control treatment without substitution, as well as on the rest of the substitution transactions in the experiment, where the period of capital recovery for the third transaction reached (2.468075) months, as well The table shows the superiority of all the substitution coefficients for the rice fraction in the experiment over the control treatment, which recorded the highest period of capital recovery in the experiment, as it amounted to (2.53935) months, meaning that replacing the rice fraction with the wheat crop in the laying hen rations enables the recovery of the trial capital in a shorter period From the control treatment, that is, it is economically efficient.

| Treatment | Capital Payback Period (month) |
|-----------|--------------------------------|
| T1        | 2.53935                       |
| T2        | 2.496815                      |
| T3        | 2.468075                      |
| T4        | 2.505776                      |
| T5        | 2.507707                      |
| Total     | 2.503337                      |

3.1.4 Return of the Dinar Invested

The indicator of the return on the invested dinar is important in knowing the total economic efficiency of the projects. Table 4. shows that the effect of partial and total substitution of the rice fraction for the wheat crop in the laying hens’ diets achieved a total return higher than the correct one, which amounted to (1.352713) dinars for the total experiment transactions, and it was recorded The highest return for the invested dinar in the third treatment, which amounted to (1.358251) dinars, is superior to the control treatment and the rest of the substitution transactions in the experiment, where the lowest return for the invested dinar was recorded in the first treatment (control), which amounted to (1.34183) dinars, this shows the superiority of all fraction substitution transactions. Rice replaces wheat in laying hens’ diets in the investor’s return index, as this indicates that every dinar invested in laying hen projects in general returns with (352713) fils. This measure shows that the expansion of laying hen projects leads to a higher economic efficiency of laying hen projects.
Table 4. Return of the Dinar Invested for the Research Sample.

| Treatment | Invested Dinar Return (ID) |
|-----------|-----------------------------|
| T1        | 1.34183                     |
| T2        | 1.351111                    |
| T3        | 1.358251                    |
| T4        | 1.355090                    |
| T5        | 1.357542                    |
| Total     | 1.352713                    |

3.1.5 Operating Ratio Standard

This scale shows the extent of the economic efficiency of project management, as the less this ratio is from the correct one, it indicates the efficiency of the projects to reach its objectives, i.e. the project’s initial acceptance from the economic point of view and an indication of positive economic efficiency, and the results of table 5. indicate that all experiment transactions have been achieved a percentage less than the correct one, as the operating ratio of the total experimental transactions amounted to (0.73795), as the third treatment recorded the lowest operating percentage, which amounted to (0.73624), superior to the control treatment as well as to the rest of the experiment transactions, as it is noted that all the substitution transactions in the experiment are superior to the control without substitution, and the first treatment (control) recorded the highest percentage of employment, which amounted to (0.745247).

Invested Dinar Return (JD)

Table 5. Run rate of the research sample.

| Treatment | Operating ratio (ID) |
|-----------|----------------------|
| T1        | 0.745247             |
| T2        | 0.74013              |
| T3        | 0.73624              |
| T4        | 0.73795              |
| T5        | 0.73662              |
| Total     | 0.739255             |

3.1.6 Productive profitability of the research sample

This scale is considered one of the most important and most accurate measures for calculating economic efficiency. Table 6. shows that all experiment transactions achieved a productivity profitability of about (35.321)%, as it is noted that the third treatment is superior to the control treatment, as well as the rest of the substitution transactions in the experiment in the scale Productive profitability as recorded (35.8145)%, the table also shows the superiority of all coefficients of substitution of rice fraction for wheat in laying hens' diets over the control treatment without substitution, where the productivity profitability of the control treatment reached (34.1835)%, meaning that the laying hens projects in general were achieved Good economic efficiency.

Table 6. Productive profitability of the research sample.

| Treatment | Productivity Profitability (%) |
|-----------|-------------------------------|
| T1        | 34.1835%                      |
| T2        | 35.1111%                      |
| T3        | 35.8145%                      |
| T4        | 35.5090%                      |
| T5        | 35.7544%                      |
| Total     | % 35.32165877                 |

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