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Opportunities of Free-Range Laying Hens Farming and Economic Advantages (A Case Study in Indonesia)

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Abstract. The free-range system of laying hens farming has been unpopular in Indonesia, where farmers generally have applied a conventional cage housing system. The free-range system places greater emphasis on animal health and welfare, a healthy environment, and better quality egg products. The purpose of this study is to describe the opportunities and economic value of laying hens with a free-range system by calculating the income and revenue cost ratio (R/C ratio) on a household scale farm with 250 laying hens. This study was conducted at ARVITA laying hens farm in Moncongloe District, Maros Regency, South Sulawesi Province, Indonesia. The research showed that the free-range farm system had maintained several advantages such as low production costs, a simple maintenance management system, improving animal health and welfare with a mortality rate of 4.8 % during the laying period. Next, the average eggs production rate was 61.5%, with farmer income being IDR 6,641,250 per laying period or IDR 442,750 per month on average; and the R/C ratio value was 1.077. Based on the approaching model applied, the development of free-range laying hens in Indonesia has the opportunity to be developed with its considerable advantages.

INTRODUCTION

Population growth that continues to increase every year must be supported by sufficient food availability. Food security strategies and efforts in Indonesia, especially in the livestock sector, need to be continuously developed. One of the visions of livestock development is to create a healthy, productive, and creative community through the development of resilient livestock based on local resources. Facilitating people's livestock business by utilizing local resources can automatically increase people's purchasing power in this case is the provision of employment, especially in rural areas. However, livestock business is one of the biggest causes of environmental problems such as global warming, air pollution, and water pollution [1]. Therefore, it is important to build the integration of livestock farming as an option for the community in increasing income by promoting sustainable agriculture. Sustainable agriculture is a system that is both economically profitable and environmentally compatible [2]. Integrated crop and livestock farming can also improve the quality and efficiency of land use, increase product diversity, and assist pest management [3].

Chicken eggs as a source of animal protein are the people's choice because the price is relatively low compared to protein sources other animals such as beef, fish, and duck eggs. The increasing demand along with the increase in population, encourages egg producers to meet the market demand. There are generally two systems of laying hens farming, namely conventional and free-range systems. Indonesian producers or farmers commonly use conventional systems with cages because they can keep more chickens in a limited area. This intensive chicken rearing is where the chickens are placed in a limited space and cannot express instinctual behavior naturally. This condition could cause

the chickens to become stressed, the level of health decreases, and the quality of the eggs decreases. An experiment found that compared to US Department of Agriculture (USDA) official commercial egg nutrition data, pasture-raised eggs may contain one third less cholesterol, a quarter less saturated fat, two thirds more vitamin A, twice as much omega-3 fatty acids, three times more vitamin E, seven times more beta carotene [4]. Another study shows that in terms of nutritional value, the best eggs come from the family-type chickens that live in their natural environment [5].

In the poultry sector, the implementation of integrated farming, especially organic farming in Indonesia, is generally only applied to raising native chickens and ducks, where apart from being kept in housing, livestock can also access the outside environment. The prices for village chicken eggs and duck eggs are still more expensive than purebred chicken eggs that are kept conventionally or using battery cages. The laying hens farming system is not yet popular in Indonesia because generally, farmers use a conventional system, namely battery cages. In Australia, Europe, and America, the price of free-range eggs is more expensive than cage eggs. Apparently, this is an opportunity for farmers to implement a free-range system for laying hens. A study showed that there was a strong relationship between free-range eggs and perceived quality that motivates consumers to buy this product, even though more expensive than cage eggs [6]. Animal welfare is also one of the elements in a sustainable production system in addition to food quality and safety, worker health, environment, economics, and public concern [7,8]. Animal welfare is a condition in which animals have freedoms from hunger, malnutrition, thirst, fear, distress, physical discomfort, wound, disease, and freedom to express normal patterns of behavior [9].

Laying chicken farming using a free-range system is still not popular in Indonesia. This is because breeders or livestock companies are generally oriented towards large amounts of production, so they prefer to raise livestock with a battery (cage) system. Animal welfare is the main factor that is considered in the free-range system because laying hens are free in nature around the cage. Breeding with a free-range system will certainly affect the egg products produced. For example, the yolk is much darker in free-range eggs than in caged eggs [10]. One of the motivations of consumers to buy cage-free eggs is because the eggs are of higher quality, nutritious and safer to eat [6,8].

Indonesia is a country with a tropical climate with high rainfall, in addition to generally fertile soil that allows grass to thrive naturally and the development of organisms such as grasshoppers, worms, maggots, and other insects, which are a source of nutrition for laying hens. Furthermore, other commercial crop wastes such as straw and bran can also be used as a source of feed for laying hens. With an integrated farming system, farmers can minimize the cost of animal feed, which is increasingly expensive because it comes from imported materials such as pollard, meat flour, fish meal, blood meal, and so on. As it is known that the highest variable cost in laying hens is the cost of feed, which is 70%. With the free-range farming system, it is expected that farmers can save on feed costs because chickens can get outdoor access to find natural feed.

In addition, aspects of environmental conservation, animal welfare, and product quality are also important factors to be achieved in a free-range system. Laying hens with a free-range system can be the choice of the breeder community because it does not require expensive cage costs, simpler maintenance management, and can reduce production costs. Utilizing the land around the house by running a livestock business will help support the family's living expenses. Based on several advantages obtained by raising laying hens with a free-range system, this study was conducted to see opportunities for implementing a free-range system in Indonesia by conducting experiments and calculating the income of farmers and their business feasibility.

RESEARCH METHOD

The research was carried out at ARVITA farm located in Moncongloe District Maros Regency, South Sulawesi Province. In an effort to implement a sustainable business, the company conducted an adaptation test of 250 free-range laying hens. In this study, the analysis was carried out only during the laying period, specifically between week 20 and week 80.

The type of research used is descriptive research, which describes the free-range chicken rearing system at ARVITA farm, including feeding management, productivity level, mortality. Furthermore, it explains the characteristics of economic business opportunities by providing an overview of costs, revenues, income, and revenue cost ratios.

The type of data used in this study is quantitative data, namely data in the form of numbers which include the cost of feed, egg production, the purchase price of corn, bran, rejected fish, cage and equipment costs, drug and vaccine costs, mortality.

The data analysis was carried out in a descriptive quantitative, income analysis, and RC (Revenue – Cost) ratio analysis. To calculate the level of income use the following formula [11].

$$\text{Income} = \text{Total Revenue} - \text{Total Cost} \quad (1)$$

The R/C ratio is calculated using the formula in [12]:

$$\text{R/C ratio} = \frac{\text{Total Revenue}}{\text{Total Cost}} \quad (2)$$

Note:

R/C ratio > 1, then the farm is feasible

R/C ratio = 1, then the farm is even

R/C ratio < 1, it is not feasible

RESULTS AND DISCUSSION

Free-range System of Laying Hens

ARVITA farm developed a battery cage model laying hens farming business between 2002 and 2011. In 2019 ARVITA farm has started raising laying hens with a free-range system. In this system, pasture is provided for outdoor activities and housing for shelter and laying eggs. The free-range laying hens rearing system is an environmentally friendly farming system because the chickens are given the freedom to live in their natural environment. While in the battery cage system, chickens are housed with very limited space so that the stress level of chickens is very susceptible to change. Animal welfare is one of the factors that need to be considered in the livestock business. Chickens raised with a free-range system are more focused on health and animal welfare, a good environment, and healthy and quality products [13].

Free-range system farming can be done by utilizing the yard of the house as an additional source of family income. This system does not require a battery cage as in conventional models so that the cost of making the cage can be saved. Free-range cages are used as shelter, feeding, and egg-laying. By using a free-range system, farmers can start raising livestock without a large amount of capital, especially the investment cost of the cage. The availability of land in Indonesia, which is still very wide, is certainly very beneficial if every farmer who has land around his house can raise laying hens with a free-range model. According to Poole [14], the optimal grazing area is 1 acre to accommodate 400 laying hens. Water and chicken feeders are provided in the cage, which is adjusted to the number of chickens.

This case study observed the maintenance system of laying hens with a free-range system starting when the chickens entered the early stages of laying eggs (pullet), which is when the chickens were 22 weeks old, and reared until the age of 80 weeks and then discarded. In this study, ARVITA farm in addition to use mixed feed consisting of concentrate, corn, and rice bran, chicken were also given leftover kitchen food. In the free-range system, laying hens feed was combined with natural foods such as grass, worms, other small animals, and kitchen food scraps. The chickens were kept as perches at night, simple laying places, and places to eat and drink that must be checked regularly. Availability of water and feed. The average level of egg productivity in broilers at ARVITA Farm was 61.5 percent/day, with the average mortality rate of chickens being very small at 2 percent during the 15 months of production. Another study showed a mortality rate of less than 5% to 10% in free-range laying hens reared in a semi-intensive system, whereas the mortality is caused by several factors such as animal predators, disease outbreaks, cold or hot temperatures [15]. In this farm, vaccination activities were carried out routinely according to the maintenance schedule for laying hens. Treatment of sick chickens by giving broad-spectrum antibiotics. Controlling vaccinations and diseases of chickens on this farm is done regularly because the onset of disease or mortality will cause a decrease in egg production.

Egg collection activities were also carried out frequently to avoid damaged and dirty eggs. With the free-range system, sometimes the chickens lay their eggs on the ground or on the grass so that the eggs are easily dirty or damaged by being stepped on by the chickens. Thus, effective and efficient management is needed to improve chicken productivity and farmer's income [16].

Economic Advantages

Economic data such as income, costs, revenues are certainly different in conventional and organic systems due to different livestock management such as choosing the type of feed, type of housing, number of chickens [17]. One indicator that can be used to determine the economic advantages of a program or activity is to calculate the output,

income, and level of business feasibility of the program. In connection with this, in this study, the level of income and financial feasibility of the business is analyzed. The amount of income is calculated using the analysis of production costs and revenues. Revenue analysis is the difference between revenue and production costs. Farming revenue is the multiplication between the production obtained and the selling price.

Based on the results of research conducted at Arvita Farm, the level of income obtained by the free-range system can be seen in Table 1.

TABLE 1. Income level of laying chicken farms in the free-range system.

Description	IDR/Period
Variable costs	83,306,250
Fixed costs	2,750,000
Total costs (A)	86,056,250
Revenues	
Eggs	80,797,500
Culling	11,900,000
Total Revenues (B)	92,697,500
Income/Profit (B- A)	6,641,250

Table 1 shows the costs, revenues, and income for a population of 250 laying hens. Types of costs incurred are divided into two, namely fixed costs and variable costs. In the study, the fixed costs included the depreciation cost of tools and cages. Salaries of workers are not included in the analysis because as a household business, livestock can still be carried out by all family members with simple maintenance management. The variable costs consist of pullet, feed costs (yellow corn, bran, discarded fish, and kitchen waste), medicine and vaccination costs and mortality. Total costs incurred were IDR 86,056,259 per period. Total revenue is obtained from the sale of eggs and culling chickens.

The average productivity level was 61.5 percent during the production period of 15 months, so the number of eggs per day was 154 eggs/day (51.13 trays, whereas each tray contains 30 eggs) with a price of IDR 35,000 per tray. Then, the total revenue was IDR 92,697,500. The calculation of income or profit was IDR 6,641,250 per laying period or an average of IDR 442,750 per month. The Covid-19 pandemic has caused the price of feed to be very expensive, while the price of eggs has fallen drastically. This situation also affected the level of profit obtained by ARVITA farm. The revenue cost ratio was 1.0771 indicates that this farm is financially feasible to be continued.

The results of the income analysis showed that the free range of laying hens was profitable, with lower production costs because the percentage of mixed feed given was 75 grams per hen per day. Feed is the major cost in chicken production costs, which is around 70 percent of the total costs. Accordingly, the cause of the increase in production costs is because the price of imported feed is increasingly expensive, where the feed is the main component of production inputs [16]. So with the free-range system, this farm reduced the use of mixed feed and looked for alternative feeds other than pasture. To meet the needs of feed obtained from pasture and kitchen food waste and fish waste. Furthermore, besides being able to create jobs and increase farmer income, several other benefits can be obtained from the free-range system. Free-range chicken rearing allows the chickens to live in a very low-stress environment compared to battery systems. The cage system that is very dense in laying hens means raising chickens in an unnatural way because the chickens are housed in overcrowding. Accordingly, laying hens reared with a higher level of welfare will produce better quality egg products [18].

Research on the free-range system for laying hens is important to be carried out continuously in Indonesia because, in addition to providing farmers with a simpler business option with low production costs, consumers also have a variety of products in the market that suit their needs. To increase the income of rural communities, the laying hens farming system with a free-range system can be an alternative in maintenance techniques; besides that, product diversification will be achieved where consumers have the opportunity to choose types of free-range eggs other than eggs from the maintenance of the battery system. In addition, aspects of environmental conservation, animal welfare, and product quality are also important factors to be achieved in a free-range system. According to Serageldin et al. [19], there are three objectives of sustainable agricultural development, namely; (a) economic goals (growth, equity, and efficiency), (b) ecological goals (ecosystem integrity, carrying capacity, biodiversity, and global environmental issues), (c) social-cultural goals (such as empowerment, participation, social cohesion, cultural identity, and institutional building). It is hoped that with the free-range system, the three goals of sustainable agricultural development can be achieved. With the results of this study, it is expected that this will serve as input for the public, marketers, and policymakers that free-range chicken eggs are one of the livestock products that are feasible to be developed in Indonesia based on environmentally friendly livestock system and improvement of animal welfare.

Research on the free-range laying hen's system should be continued in particular to look at hen's eggs production and quality, health and mortality rates based on various types of feeding, housing, and the number of flocks kept.

CONCLUSION

Free-range farming systems for laying hens have prospects for development in Indonesia. This can be supported by public awareness of the importance of livestock production in synergy with the environment. This study shows that free-range laying hen farm has had the opportunities to be developed, especially in Indonesia, with respect to advantages obtained from the system that would be valuable for the chickens, environment, farmers, and customers.

REFERENCES

1. H. Steinfeld, P. Gerber, T. Wassenaar, V. Castel, M. Rosales, and C. de Haan, "Livestock's long shadow: Environmental issues and options," *Renew. Resour. J.*, **24**(4): 15–17 (2006).
2. C. Edwards, *Sustainable Agricultural Systems* (Florida, CRC Press, 2020).
3. K. Hilimire, "Integrated crop/livestock agriculture in the united states: A Review," *J. Sustain. Agric.*, **35**(4): 376–393 (2011).
4. C. Long and T. Alterman, "Meet real free-range eggs," *Mother Earth News* (2007), available at <https://www.motherearthnews.com/real-food/free-range-eggsmaz07onzgoe>.
5. G. Yenice, O. Kaynar, M. Ileriturk, F. Hira, and A. Hayirli, "Quality of Eggs in different production systems," *Czech J. Food Sci.*, **34**(4): 370–376 (2016).
6. H. J. Bray and R. A. Ankeny, "Happy chickens lay tastier eggs: motivations for buying free-range eggs in Australia," *Anthrozoos*, **30**(2): 213–226 (2017).
7. J. Mench, D. Sumner, J. T. R. Molina, "Sustainability of egg production in the United States: The policy and market context," *Poultry Science*, **90**(1): 229–240 (2011).
8. H. Buller, H. Blokhuis, P. Jensen, and L. Keeling, "Towards farm animal welfare and sustainability," *Anim.*, **8**(6): 81 (2018).
9. J. Bacelar, "Animal Welfare," *World Organisation for Animal Health* (2019), available at <https://www.oie.int/en/what-we-do/animal-health-and-welfare/animal-welfare>.
10. H. Van Den Brand, H. K. Parmentier, and B. Kemp, "Effects of housing system (outdoor vs cages) and age of laying hens on egg characteristics," *Br. Poult. Sci.*, **45**(6): 745–752 (2004).
11. D. McTaggart, C. Findley, and M. Parkin, *Economics* 3rd ed, (Addison Wesley Longman, Melbourne, 1999).
12. V. Tenrisanna and K. Kasim, "Livestock farming income analysis of farm households in Indonesia," *IOP Conf. Ser. Earth Environ. Sci.*, **788**(1): 012218 (2021).
13. International Finance Corporation, *Improving Animal Welfare in Livestock Operations* (IFC, Washington DC, 2014).
14. T. E. Poole, *Introduction to Developing a Free-Range Poultry Enterprise*, (Univesity of Maryland, Collage Park, 2007) pp 1–24.
15. M. Singh, I. Ruhnke, C. de Koning, K. Drake, A. G. Skerman, G. N. Hinch, P. C. Glatz, "Demographics and practices of semi-intensive free-range farming systems in Australia with an outdoor stocking density of ≤ 1500 hens/hectare," *PLoS One*, **12**(10): e0187057 (2017).
16. Sibel, "Factors affecting profitability of layer hens enterprises," *Am. J. Agric. Biol. Sci.*, vol. 7, no. 1, pp. 106–113, 2012, doi: 10.3844/ajabssp.2012.106.113.
17. J. Heinrichs, T. Kuhn, C. Pahmeyer, and W. Britz, "Economic effects of plot sizes and farm-plot distances in organic and conventional farming systems: A farm-level analysis for Germany," *Agric. Syst.*, **187**: 1–9 (2021).
18. M. Miele, "The taste of happiness: Free-range chicken," *Environ. Plan. A*, **43**(9): 2076–2090 (2011).
19. Serageldin, Ismail, Andrew D. Steer, and Michael M. Cernea, eds. *Making development sustainable: from concepts to action*. Vol. 2. World Bank Publications, 1994.