

Partial Budgeting of floor bedding to improve poultry health in Western Java

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Abstract—Poultry litter function is to absorb several compounds or gasses from outside of the poultry house that affects poultry health. Poultry litter is a habitat for microbe's growth coming from chicken's gastrointestinal pathogens. Many studies found that the composted manure had more soil fertility which consists of many organic components. Thus, more complete nutrients and other growth factors in manure were found higher than chemical fertilizers (inorganic). It is suggested that the type of application of floor bedding could improve poultry health and increase income from manure. The objective of this study was to measure the cost of several types of floor bedding in poultry sheds. The partial budget was employed based on the literature study. The cost of the application and its related income were calculated. The calculation was modeled based on the poultry sheds then the poultry house. The study found that the partial budget analysis identified the findings lead to a strongly positive incentive for farmers to apply of floor bedding in their poultry farms. The incentive may drive poultry farmers in West Java to pay attention to invest in decent poultry barn to improve poultry health.

Keywords—poultry, floor bedding, partial budgeting, gastrointestinal pathogens

I. INTRODUCTION

Poultry litter is a valuable by-product on poultry farm. The most common types of bedding used are ___ and the alternative bedding materials used are, for instances wood, papers, dry straw, rice hulls, and other possible materials. Estimated everyday litter produced by a broiler and laying hen are 0.09 kg and 0.18 kg, respectively [1] where types of the bedding material affected the composition of litter/manure [3, 4]. The manure from poultry litter had more complete nutrients and other growth factors compared to chemical fertilizers (inorganic) [6]. Previous study on the composted manure found more soil fertility which consists of many organic components [5]. As such, poultry's litter is a habitat for microbes' growth included various chicken gastrointestinal pathogens that potentially influence poultry health and production growth in commercial farms. The poultry litter absorbs several compounds or gasses from outside of the poultry house that affects poultry health. When reared in suboptimal conditions, broilers may show respiratory problems and locomotion problems [2]. Several studies explore experimental attempts at replacing the traditional litter material to increase poultry health and productivity [2, 5] where it was suggested that the application of floor bedding could improve poultry health and increase income from manure. As poultry bedding is widely used, the yearly cost of production could be increasing.

Therefore, choosing the right bedding material in association with poultry production and economic performance becomes more complicated. Thus, it is important to evaluate floor bedding material impact on poultry health, poultry production, and economic performance [7].

Identifying suitable and affordable bedding material is important in poultry production in developing countries, as it makes a significant contribution to the farm's business [6]. This study aimed to evaluate how alternative poultry bedding materials used separately or in combination affected poultry production in association with a different types of farm's business and economics performances. Therefore, the objective of this study was to estimate the costs of several types of bedding materials in poultry farms.

II. MATERIALS AND METHODS

The study employed partial budgeting to evaluate six different litter materials namely rice husk, sawdust, rice husk mixed with sawdust, rice husk mixed with silica, wood shavings, and rice straw. We evaluated activities that changed the costs and income in poultry farms as the consequence of using the alternative different litters. The partial budget models were developed as follows:

1. The model was developed based on the combination of six types of floor bedding and three types of a poultry farm business.
2. The calculation was modeled based on the poultry sheds then the poultry house.
3. The cost of the application and its related income were calculated.
4. The effect of health and production was measured and compared for one production cycle.
5. The mean cost and revenue for each farm business were calculated based on each type of floor bedding.
6. The cost and revenue were compared to examine added cost and revenue and/or cost and revenue reduction.

The inputs for cost and revenue of the different types of floor bedding in three types of a poultry farm business, which are company, Makloon and independent were based on Western Java situation in 2019. Company is a large commercial farm, Makloon farm is farmers that reared poultry based on fee, and an independent farm is small-medium commercial farms. Other information related to these floor beddings impact on animal health and production efficiency was collected from the literature studies provided by secondary data [8, 9].

III. RESULTS

The study found that the top two floor beddings were from mixed rice husk. The floor bedding from rice husk mixed with silica came up as the highest productivity, the lowest unhealthy poultry and the lowest mortality rate for all types of farm business compare to other types of floor beddings (Table 1). Floor bedding from risk husk mixed with sawdust came as the second best. Whereas, floor bedding made from wood shaving has the lowest productivity, had the highest unhealthy poultry and the highest mortality rate among these alternatives floor bedding for poultry production.

The results of the productivity, the unhealthy poultry and the mortality rate of floor bedding applications were found to have a different impact on the poultry performance. In the farm business, each performance of the alternative floor bedding was found to give different impact on cost reduction and revenue improvement for each type of farm business. When comparing the partial bedding simulation of floor bedding in the company type of farm business (Table 2), we found that the bedding material of rice husk mixed with silica gave the most cost reduction compared to other materials (rice husk used as the comparison baseline). This material performed better than other materials. The material could reduce the cost of workers, feed, and heating. Moreover, the material increased the revenue and farm profit since it could increase productivity. On the contrary, sawdust gave the least cost reduction, revenue improvement and negative farm profit as compared to other materials.

Almost similar performance was found in the partial bedding simulation of floor bedding in the makloon type of farm business (Table 3). The rice husk mixed with silica was found as the floor bedding material that gave the highest cost reduction compared to other materials (rice husk used as the comparison baseline). The heating cost, medicine, vaccines and vitamins, and rope were reduced by the usage of rice husk mixed with silica. Also, revenue and farm profit were increased by poultry productivity. Differently, in makloon business, we found that rice husk mixed with sawdust gave the worst performance in cost reduction, revenue improvement and farm profit compare to other materials.

In the independent type of farm business, all floor bedding materials came up unprofitable was rice husk (Table 4). The rice husk was found as the floor bedding material that gave a better profit as compared to other materials (rice husk used as the comparison baseline). While rice straw usage as the floor bedding gave the most cost reduction compared to other materials, this material also gave the lowest revenue and farm profit.

IV. DISCUSSION

The findings show the alternative floor bedding material usage provides the possibility to reduce the health problem and mortality rate. Even though the usage floor bedding could not drastically reduce the problems, there was an incentive for farmers to apply floor bedding in two types of a farm business, namely company and makloon. We suspected that the efforts to reduce health and mortality problem in independent farms may be caused by the

limited knowledge and discipline in performing the application of litter procedures.

We found that the cost reduction and the revenue improvement were possible to achieve by the application of floor bedding materials. In the different type of business, the impact on the cost of the application of floor bedding was found in a different activity. In company and makloon farms, the rice husk mixed with silica bedding application could reduce the cost and increased the revenue. Therefore, the application of floor bedding especially the rice husk mixed with silica bedding gives the benefit for farmers. This result gives an incentive to motivate farmers to applied the rice husk mixed with silica bedding voluntarily.

These findings prove that the benefit of using floor bedding leads to a positive incentive for farmers to apply floor bedding. This incentive may motivate poultry farmers in a different type of business in Western Java. Furthermore, the farmers could start to pay attention to invest in decent material for bedding and sheds to improve poultry health.

V. CONCLUSION

The study found that the application of different type of floor bedding in poultry farms could reduce the farm cost and increased the farm revenue in the company and makloon farms. The usage of rice husk mixed with silica gave the best performance. Consequently, the application of rice husk mixed with silica as a floor bedding confirmed an economic impact gives an incentive for the farm business. However, the usage of alternative floor bedding in the independent farm gave unexpected results. This may be caused by farmers' knowledge, behavior and farm management.

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APPENDIX

TABLE I. COMPARISON OF FLOOR BEDDING IMPACT IN THE DIFFERENT TYPE OF POULTRY BUSINESS IN WESTERN JAVA

Floor Bedding	Company	Makloon	Independent
Rice husk			
Harvest (%)	93.00%	92.90%	93.00%
Unhealthy (suspected)	10.00%	10.10%	10.00%
Mortality	7.00%	7.10%	7.00%
Sawdust			
Production (kg)	93.62%	93.85%	93.92%
Unhealthy (suspected)	8.88%	8.65%	8.58%
Mortality	6.38%	6.15%	6.08%
Rice husk mixed with Sawdust			
Harvest (%)	94.45%	93.21%	93.45%
Unhealthy (suspected)	7.85%	9.09%	8.85%
Mortality	5.55%	6.79%	6.55%
Rice husk mixed with Silica			
Production (kg)	94.53%	94.15%	93.37%
Unhealthy (suspected)	7.57%	7.95%	8.73%
Mortality	5.47%	5.85%	6.63%
Wood shavings			
Harvest (%)	92.97%	92.34%	92.10%
Unhealthy (suspected)	10.23%	10.86%	11.10%
Mortality	7.03%	7.66%	7.90%
Rice straw			
Harvest (%)	93.08%	92.50%	92.02%
Unhealthy (suspected)	9.82%	10.41%	10.88%
Mortality	6.92%	7.51%	7.98%

TABLE II. COST AND BENEFIT COMPARISON OF FLOOR BEDDING APPLICATION IN THE COMPANY TYPE OF POULTRY BUSINESS IN WESTERN JAVA (RICE HUSK AS A BASELINE)

Descriptions	Sawdust	Rice husk mixed with Sawdust	Rice husk mixed with Silica	Wood shavings	Rice straw
Cost					
• Workers	-	-	(0.17)	-	-
• DOC	-	-	-	-	-
• Feed	-	-	(0.01)	-	-
• Litter	0.33	0.11	0.25	0.11	0.22
• Heating	0.10	(0.02)	(0.02)	(0.02)	(0.02)
• Medicine, Vaccines and vitamins	-	-	-	-	-
• Disinfectant	-	-	-	-	-
• Rope	-	-	-	-	7.33
Total Cost	0.00	0.00	(0.01)	0.00	0.00
Revenue	(0.01)	0.00	0.01	0.01	(0.00)
Profit	(0.11)	0.01	0.09	0.05	(0.02)

Note: Positive sign means higher than the baseline. Negative sign means lower than the baseline.

TABLE III. COST AND BENEFIT COMPARISON OF FLOOR BEDDING APPLICATION IN THE MAKLOON TYPE OF POULTRY BUSINESS IN WESTERN JAVA (RICE HUSK AS A BASELINE)

Descriptions	Sawdust	Rice husk mixed with Sawdust	Rice husk mixed with Silica	Wood shavings	Rice straw
Cost					
• Workers	-	-	-	-	-
• DOC	-	-	-	-	-
• Feed	-	-	-	-	-
• Litter	0.33	0.11	0.25	0.11	0.22
• Heating	-	(0.02)	(0.02)	(0.02)	(0.02)
• Medicine, Vaccines and vitamins	(0.20)	(0.20)	(0.60)	(0.20)	(0.20)
• Disinfectant	0.05	0.05	0.05	0.05	0.05
• Rope	(0.17)	(0.17)	(0.17)	(0.17)	(0.17)
Total Cost	0.00	0.00	(0.00)	0.00	0.00
Revenue	0.01	(0.00)	0.02	(0.00)	(0.01)
Profit	0.05	(0.03)	0.12	(0.02)	(0.10)

Note: Positive sign means higher than the baseline. Negative sign means lower than the baseline.

TABLE IV. COST AND BENEFIT COMPARISON OF FLOOR BEDDING APPLICATION IN THE INDEPENDENT TYPE OF POULTRY BUSINESS IN WESTERN JAVA
(RICE HUSK AS A BASELINE)

Descriptions	Sawdust	Rice husk mixed with Sawdust	Rice husk mixed with Silica	Wood shavings	Rice straw
Cost					
• Workers	-	-	-	-	(0.33)
• DOC	-	-	-	-	-
• Feed	-	-	-	-	-
• Litter	0.33	0.21	0.26	0.12	0.23
• Heating	(0.03)	(0.18)	(0.18)	(0.18)	(0.18)
• Medicine, Vaccines and vitamins	-	-	-	-	-
• Disinfectant	-	-	-	-	-
• Rope	0.11	0.11	0.11	0.11	0.11
Total Cost	0.00	0.00	0.00	0.00	(0.00)
Revenue	(0.02)	(0.01)	(0.01)	(0.02)	(0.03)
Profit	(0.10)	(0.04)	(0.05)	(0.10)	(0.19)