The Advantages of Implementing Integrated Farming Systems For Integration of Goats and Ducks with Terubuk (*Saccharum edule* Harl)

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**Abstract.** This research was conducted to examine the advantages of the application of integrated farming systems between goats and ducks with terubuk in Sukabumi. The research is a case study from the farmers who adjust integrated farming systems then the data was analyzed descriptively qualitatively. The result of the study show that the application of this integration between goats and ducks with terubuk has advantages in terms of cultivation, social and economic aspects. Based on the cultivation aspect, this system is efficient because of the continuous availability of feed. Furthermore, based on social aspect can minimize problems such as problem that arise due to presence of waste that cause pollution can be overcome because of the use of waste are more useful. Economic aspect of this system to be efficient because of an increase in income by reducing expenses for feed by 60% and reducing fertilizer requirement by 100%

1. **Introduction**

   Food as a basic need for humans brings consequences to the government to provide adequate food for its people, in concerning food there are three major paradigms about food, namely food sovereignty, food independence, and food security which places food sovereignty as the basis in [1] and adheres to the sustainable use of resources. Food referred to as stated in the Government Regulation of the Republic of Indonesia number 17 of 2015 is anything that comes from biological sources of agricultural, plantation, forestry, fishery, livestock, aquatic, and water products, whether processed or not processed which are intended as food or beverages for human consumption, including food additives, food raw materials, and other materials used in the preparation, processing and / or manufacturing of food or beverages. The development of the agricultural sector is a priority in Indonesia because agriculture is an important sector in development, because this sector is a food producer [2]. Supporting government programs in food security, it is necessary to optimize the use of resources so that the sustainability of production is maintained [3]. Therefore you should get a policy intervention that is in their favor, one of the efforts is to carry out agricultural integration [4].

   The fact that government policies are often found incompatible with breeders or small farmers. Meat import policy reaps controversy because it is not in accordance with the vision and mission of the livestock sector that is maximizing the utilization of local resources. Likewise, the import policy of
agricultural commodities often makes it difficult for farmers to compete and survive, especially small farmers. To be able to compete in the market, it requires various requirements that must be met and that requires no small amount of capital in fulfilling them. While on the other hand the benefits are still not predictable to increase. Other problems found include the low productivity of livestock and farming at the farmer level. The low productivity is partly due to the still low utilization of technology. Increasing productivity by investing huge amount for intensive farming activities are difficult for small and marginal farmers so that this integrated system is one form of increasing agricultural production with small amount of investing [5]. Based on this, various important efforts were made in order to overcome various problems that exist at the farmer level. One such effort is to implement an integrated farming system that integrates agriculture and animal husbandry. Based on this, various important efforts were made in order to overcome various problems that exist at the farmer level. One such effort is to implement an integrated farming system that integrates agriculture and animal husbandry. Based on this, various important efforts were made in order to overcome various problems that exist at the farmer / farmer level. One such effort is to implement an integrated farming system that integrates agriculture and animal husbandry.

Integrated agricultural system is a system that uses a system of recycling and recycling using plants and livestock as partners. With an integrated farming system, it can reduce expenditure because of the utilization of each side. The system can protect and enhance natural resources, ensure food security, and improve economy [6]. Integrated farming system is a system that applies the principle of zero waste because livestock waste will later be utilized as fertilizer and feed sources, while agricultural waste can become animal feed. Integration between livestock and plants can save costs for the needs of production inputs can also improve soil fertility conditions, by implementing integrated system less space is needed but with more production results so that it can increase income for small and marginal farmers [7].

Sukabumi Regency is known as an area with good agricultural potential based on the area and natural resources [8]. However, the utilization of natural resources is not all areas are managed properly, especially in the utilization of existing local resources. Whereas local resources in Sukabumi Regency, if they can be managed and developed fully, can become a leverage for the Sukabumi Regency. According to [8] on the development model of Terubuk as a local superior commodity found in 24 Districts of 47 sub-districts in Sukabumi District prove that terubuk as a local plant has the potential to become a local superior commodity. This terubuk plant also has many benefits from almost all parts of the plant [9]. On the other hand, Sukabumi Regency also has good potential in animal husbandry. BPS data [10] shows that the potential of livestock based on its population in Sukabumi Regency includes goats (86,217) and ducks (90,200). But in terms of meat and egg production, the livestock commodity must be increased further, because compared to other types of livestock, the production of goat meat and ducks is still lower [10]. The strategy that can be done is by implementing an integrated farming system. because compared to other types of livestock, goat and duck meat production is still lower [10]. The strategy that can be done is by implementing an integrated farming system. because compared to other types of livestock, goat and duck meat production is still lower [10]. The strategy that can be done is by implementing an integrated farming system. because compared to other types of livestock, goat and duck meat production is still lower [10]. The strategy that can be done is by implementing an integrated farming system.

Animal husbandry and agriculture efforts that integrate terubuk, goats and ducks are potential economic commodities. The integration system of goats, ducks with terubuk is one of the efforts to increase farmers’ incomes, through increased crop production which is integrated with livestock raising which is mostly maintained by the community. Integration of livestock and plants must be considered on the basis of the principle of minimizing competition for resources and increasing profits [11]. Collaboration between livestock and plants needs to be studied in more depth the application and excellence so that it can maximize productivity. Based on this, the study is directed at an analysis of the advantages of implementing integrated farming integrated systems of goats, ducks and terubuk. Therefore the purpose of this study is to find out how the integrated livestock integration system
between goats and ducks with terubuk in Sukabumi district and what are the advantages based on the aspect of cultivation, social aspect and economic aspect.

2. Methodology
This research was a case study research on the application of integrated farming system of integration between goats and ducks with terubuk which are seen based on its superiority. The method used in this study is a survey method. Research data are processed using qualitative descriptive analysis with the following stages: (1) Reducing information and research data in the form of description by focusing data reduction on important matters which are then arranged systematically; (2) systematically compile information and data and divide according to their types and patterns so as to form a meaningful set of information; (3) concluding and verification. According to Sugiyono (2009: 35), "descriptive method is used to determine the existence of an independent variable, either only on one or more variables (independent variables) without making comparisons and looking for the correlation of that variable with other variables".

3. Result and Discussion
Animal husbandry is the main source of national animal protein so that animal husbandry business has the potential to be developed as a profitable business and increase farmers' income. Livestock can produce products such as meat and eggs as a source of protein, in addition to their maintenance, livestock also produce feces that can be used as fertilizer and a source of food for other livestock. Agriculture is also a major vegetable resource that is much needed and has the potential to be continuously developed and increased in productivity.

Integrated agricultural systems can be done by utilizing natural resources optimally, sustainably and profitably, so that they can be utilized sustainably for the benefit of present and future generations. The selection of commodities and suitable business areas is one of the important things and needs to be considered in the implementation of the development of a sustainable integrated agricultural system, such as commodities that must be economically profitable and the community must also be accustomed to raising livestock and plants.

Goats, ducks and terubuk plants in Sukabumi Regency are things that can be integrated in an integrated breeding system, because the community is accustomed to raising goats and ducks, while terubuk are one of local plants in Sukabumi which are easily planted without requiring special treatment and can be available throughout the year [12] so that by implementing the integration of the three communities the community will have a positive impact on their livestock business. The concept of integrated agricultural development by implementing integration in the farming of goats, ducks and terubuk can be very developed because it can be related to one another.

3.1. Design Model of Goats and Duck With Terubuk Integration System
Based on field observations in general the aim of integrated breeding system integration model using goats and ducks with is increasing business output through livestock and crops that are well maintained, such as meat, eggs, fertilizer, terubuk flowers and terubuk waste. So with this integrated livestock integration system, the farmers can combine livestock and plants that they grow so that the products from livestock and agriculture can increase income.

The model of system integration by using goats, ducks and terubuk that applied can be described as follows:
The development of this integration system involves the community in the process of maintaining, processing the results of the processing of its waste with the aim of increasing the production of both livestock and plants. Community empowerment in rural areas in particular, by developing the potential that exists in the regions, it is hoped that the community will be able to contribute in encouraging the realization of animal and vegetable food security, especially for Indonesia. According to [13] that in general the integration of livestock with plants, both food crops, plantations and horticulture provides a fairly high added value.

Terubuk are one of indigenous vegetables. This plant is a type of flower vegetable. Terubuk, as local plants sukabumi. Flower plants are utilized for consumption, in Sukabumi Regency the processed plants are processed into many preparations such as sponge cakes, nuggets, vegetables and so on which are usually used for additional income sources other than farming or raising livestock [9]. But terubuk plant waste has not been utilized. Terubuk plants have a lot of waste, around 11,300 kg / ha [14], so that the waste of this terubuk plant can be utilized properly, one of which is as animal feed ingredients. According to [15] a large part of this terubuk plant has the potential as a good forage. Terubuk plant waste with sufficient quantities can be treated in advance so that it can be stored for a long time.

Silage is one way of preserving forage through a fermentation process with the aim of maintaining the quality of forage for a long time. Terubuk plants can be stored through the fermentation process into silage so that it can be stored for a long time. Terubuk plants fermented using EM4 for at least 14 days. Ground plant silage has a pH of 3.96 with a content of BK (dry matter) 31.15%, BO (organic matter) 92.69% and PK (crude protein) 12.63% [16]. While the protein requirement of goats according to [17] is 14-19%, so silage is able to meet the needs of goats by adding other feed ingredients.

The goat, which consumes silage from the waste of terubuk, will produce feces. The resulting feces can be used as a source of poultry feed, one of which is duck. Ruminant animal feces such as goats contain crude protein: 0.99 - 3.76%, dry matter: 89.87 - 92.21% and ash: 8.97 - 11.59% [18]. The nutritional value and digestibility of goat feces is still low and very varied because it needs to be processed such as fermentation in order to increase the nutritional value, palatability and protect food substances from the feces. There are several fermentation techniques used to process animal feed to be more useful, among others, by using yeast, laru oncong and so on.
Based on the results of research by [18], palm sap (nila lontar) can ferment goat and chicken feces well, proven to increase protein and reduce crude fiber. The use of palm sap as much as 15% as a natural fermentation ingredient in animal feces can produce good quality feces feed. The use of goat feces fermented with palm sap in rations can increase feed consumption and increase body weight in poultry.

In addition to being processed again into feed ingredients for poultry, goat manure can also be processed into organic fertilizer for terubuk plants. Organic fertilizer is processed by first destroying goat manure using a machine, then stored in dry land or plots (free from standing water and rain). Layer of fertilizer-making material by mixing goat manure and agricultural lime with husk until the thickness reaches 20-30 cm, after that it is splashed EM4 solution made using fruit or fruit skin from trees planted around the grazing fields mixed with sugar and palm water or water coconut. Make sure the EM4 solution mixture is not too much by squeezing the grip of the mixture, if there is no dripping water then the composition of the water is right. Heaps or layers that have been mixed are covered using a tarp and allowed to stand for 1 week after that open the tarp cover so that the fertilizer will be able to undergo a water process, if when the tarp is opened out the heat then the composting of fertilizer has been successful. For approximately 3 weeks the fertilizer is ready to use, but before using the fertilizer it is aerated first. Based on the results of some [19] that fertilizer derived from goat manure waste can increase growth and production of tomato plants, as well as another research [20] that goat manure can be highly reprocessed into fertilizer that will help fertilize soil and plants.

Duck manure can also be used as one of the organic fertilizer for powdered plants, but the use of its manure directly for plant fertilizer will cause the spread of sewage odors, increase the population of flies and will disturb the environment of the community, moreover most of the terubuk are planted around residential areas. Composting technology is basically stacking materials that have a low C / N ratio before being used as a fertilizer. The advantage of this composting process is reducing the risk of environmental pollution [21]. Composting can eliminate or minimize odors caused by organic waste, reduce the use of chemical fertilizers, maintain soil fertility naturally and sustainably [22].

During the composting process, in the pile of raw materials consisting of other organic materials will have a temperature of more than 700°C and at this temperature the pathogenic microbes, plant diseases, and things that will damage the plant will die killed by hot temperature.

Basically, the manure will affect the physical, biological, and chemical properties of the soil. The role of organic matter on the physical properties of the soil include stimulating granulation, improving soil aeration, and increasing the ability to retain water. The role of organic matter on soil biological properties is to increase the activity of microorganisms that play a role in nitrogen fixation and certain nutrient transfers such as N, P, K, and S. The role of organic matter on soil chemical properties is to increase cation exchange capacity so that it can affect nutrient uptake by plants.

4. Advantages of Integrated Farming Systems of Goats and Ducks with Terubuk

Based on observations and collected it is known that the implementation of the integration system of goats, ducks and terubuk plants has shown advantages based on aspects of cultivation, social and economic (Table 1).
Table 1. Advantages of Integrated Farming Systems of Goats and Ducks with Terubuk

| No | Aspect | Advantage |
|----|--------|-----------|
| 1  | Cultivation | - Promoting environmentally friendly technologies  
|    |         | - Optimizing all energy sources generated from livestock and plants  
|    |         | - Optimizing local resources  
|    |         | - Minimizing environmental damage  
|    |         | - Producing good soil fertility |
| 2  | Social | - Reducing waste one of which is sewage from livestock to reduce pollution  
|    |         | - Growing independence in farmers  
|    |         | - A culture of cooperation and mutual cooperation is established |
| 3  | Economy | - Reducing the use of external inputs by utilizing local resources used and maximizing natural processes.  
|    |         | - Waste utilization saves production costs by up to 60%  
|    |         | - Can be applied to small-scale business units |

Crop waste can be a source of forage for ruminants, for example goat. Goats will produce meat that can be sold and feces that can be processed into duck feed and organic fertilizer for terubuk plants, goat feces processed by fermentation which can be used as additional feed for ducks. Ducks will produce eggs and meat to be sold as well as manure that can be reprocessed into organic fertilizer for terubuk plants. So that with the relationship between the integration of livestock with plants can be mutually beneficial, such as goats get food from the waste of terubuk plants, ducks get additional food sources through goat manure and terubuk plants get compost from kept goats and ducks. According to [23] that in livestock production costs, feed is the largest cost component in livestock business reaching up to 60-80%. Based on the results of a survey on integrated farming this integrated system also obtained information that the use of reduced production inputs for feed based on this system has helped save production costs for feed up to 60%

The combination of animal husbandry and agriculture has long shown favorable results by using animal manure as a source of fertilizer for plants and crop waste as a source of animal feed. Most of the fertilizer loses half of its nitrogen content before it becomes available nitrate for plants, so that the amount becomes insufficient if the plant population increases and requires the use of chemical fertilizers and artificial food which causes the profits of farmers and farmers to decrease [24].

This integration system is sustainable, environmentally friendly and independent. So that this system can be applied to small scale business units such as family farm. When developed. This integration system is expected to be a new direction for future animal husbandry and agriculture, where each is involved in an element that gets commensurate and sustainable results. Animal husbandry business can be integrated with agricultural business by; by-products or livestock waste can be used as a source of animal feed, animal waste can be used or decomposed into compost to provide nutrients for the land.

Efforts to integrate livestock farming with agricultural business will have a positive impact on aspects of cultivation, social and economy. The cultivation aspect will be more efficient because of the availability of feed that can be carried out continuously. Social aspects such as problems that arise due to the presence of waste (livestock and agriculture) that cause pollution can be overcome because of the use of waste are more useful. On the other hand this integration system has also grown self-reliance in farmers, especially in making decisions in their farming, besides also growing a culture of mutual cooperation between farmers and farmers. Economic aspects can be improved because the
livestock and agriculture business can be efficient because of an increase in income by reducing expenditure, even saving expenses for production input costs, especially for livestock on feed requirements, up to 60%. As for the terubuk plant itself, because it does not require special treatment, the savings in using fertilizer reach 100%. Thus, the independence of livestock and animal husbandry businesses can be realized and the dependence of outside production facilities intake can be reduced or reduced to the maximum extent possible.

Animal husbandry as an energy source and economic driver in an integrated animal husbandry system. Energy sources derived from livestock business, for example, are meat and eggs, while the economic driving function comes from the sale of meat, eggs and by-products from other livestock businesses.

5. Conclusion
The integrated agricultural integration system for goats and ducks with terubuk is related to inputs, production processes and outputs. The input process is related to natural resources and human resources, the production process is related to time and the environment while the output relates to animal husbandry, agriculture and organic waste. The advantages of integrated farming systems are:
1. Efficiency at the optimum use of natural resources.
2. Independent where the system can run with minimum external input.
3. Sustainable which means that this system is environmentally friendly and more profitable as well as local wisdom and can be accepted by the community.

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