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Article

Evaluation of Solar Dryer Use in Corn Drying Process in Aur Serumpun Farmer Group, Simpang Village, Pasaman Regency

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Abstract

Corn drying is a crucial process in maintaining the quality of the harvest and reducing the risk of contamination by fungi. Traditional drying methods that rely on sunlight often have constraints on efficiency and quality of results. Solar dryer technology is present as an innovative solution that is more effective and environmentally friendly. This activity aims to evaluate the effectiveness of solar dryers in the corn drying process in Aur Serumpun Farmer Group, Simpang Village, Pasaman Regency. Evaluation methods include measuring water content before and after drying, time efficiency analysis, and farmer satisfaction surveys. The results of the activity showed that solar dryers were able to reduce the water content of corn to <14% in a shorter time compared to conventional methods. In addition, farmers reported labor efficiency and improved crop quality. Thus, solar dryers can be adopted as an alternative technology to improve agricultural productivity and sustainability.

INTRODUCTION

Corn is one of the main agricultural commodities in Pasaman Regency and has an important role in the food and animal feed sector (Janjai & Tung, 2019). Pasaman Regency is known as an area with quite high corn production, most of which is used as raw material for animal feed and the needs of the local food industry. However, the main obstacle faced by farmers in managing their harvest is the post-harvest process, especially in terms of drying. Suboptimal drying can have an impact on the quality of corn and a shorter shelf life (Hossain, Bala, & Ullah, 2014).

Conventionally, the drying method used by farmers in Pasaman Regency still relies on drying with direct sunlight. This method has several weaknesses, such as dependence on weather conditions, uncertain drying times, and a high risk of contamination from dust, insects, and microorganisms (Mujumdar & Law, 2017). One of the biggest problems in traditional drying is the high water content that can cause mold growth and the production of mycotoxins, especially aflatoxins, which are harmful to human and livestock health if corn is consumed in the long term (Kumar & Tiwari, 2018).

Along with the development of agricultural technology, solar dryers have emerged as a more efficient and environmentally friendly alternative in drying corn (Akoy, 2014). This technology works by utilizing solar energy in a closed space, thereby accelerating the drying process and reducing the risk of contamination from the outside environment (Afolabi & Agarry, 2014). With a

more closed system, solar dryers also allow for more even drying and maintain the quality of the color and nutritional value of the dried corn (Sharma, Chen, & Vu Lan, 2019).

Solar dryers have several advantages over conventional drying methods. First, the drying process can take place faster because the temperature in the drying room is more stable and higher compared to drying in the open air (Chauhan & Kumar, 2016). Second, this technology is more hygienic because the corn is not directly exposed to dust, pollutants, and insects. Third, this technology is also more energy efficient because it only relies on solar resources without the need for additional fuel (Tiris & Ozbalta, 2015). Fourth, the end result of corn dried with a solar dryer is more uniform in terms of water content, which allows for longer-term storage (Bassey, 2016).

METHODOLOGY

This activity is carried out in several stages as follows: • Discussion Group Forum (FGD): this activity begins with FGD activities related to the implementation of activities with related stakeholders. • Sampling: Fresh corn samples were taken from the harvest of the Aur Serumpun Farmer Group to be tested for drying. • Water Content Measurement: Carried out using a moisture meter before and after the drying process. • Drying Process: Corn is dried using a solar dryer and compared to traditional methods that have been used by farmers. • Efficiency Analysis: Compared based on drying time, final water content, and quality of the harvest (Banout et al., 2011). • Satisfaction Survey: Carried out by distributing questionnaires to farmers to assess their experience in using solar dryers.



Figure 1. Discussion process regarding the use of solar dryers with partners

RESULT AND DISCUSSION

Figure 2 is a picture of the drying process before using a solar dryer, while Figure 3 is the drying process using a solar dryer. The results of the activity show that the use of a solar dryer can reduce the water content of corn from an average of 22% to less than 14% within 2-3 days, while conventional drying methods take 4-5 days depending on the intensity of sunlight (Boroze & Osei, 2017). This difference in drying time provides significant benefits for farmers, especially in reducing the risk of corn rot due to high water content.

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Figure 2. Overview of the drying process before using a solar dryer

In addition to time efficiency, corn dried using solar dryers has better quality compared to conventional methods. The color of corn dried using solar dryers looks brighter, indicating that the drying process is more even and controlled (Ekechukwu & Norton, 2017). This brighter color contributes to the attractiveness of the product in the market, which can increase the selling price of farmers' corn. In addition, the level of corn damage due to fungus and pest attacks is also lower because the environment in solar dryers is more controlled compared to open drying which is susceptible to exposure to dust, insects, and microorganisms (Tiris & Ozbalta, 2015).



Figure 3. Illustration of the drying process using a solar dryer

Another advantage of using solar dryers is energy savings. This technology makes maximum use of solar energy without requiring additional energy sources such as fossil fuels or electricity (Mekhilef, Saidur, & Safari, 2012). Thus, farmers' operational costs can be reduced, thereby increasing the profitability of farming businesses. In addition, this drying system is more environmentally friendly because it does not produce greenhouse gas emissions like fossil fuel-based drying methods (Bala & Debnath, 2012).

In terms of hygiene, the use of solar dryers also provides major benefits. Farmers reported that corn dried in a closed system was better protected from dust and dirt contamination, which are often major problems in conventional drying methods. In addition, the presence of solar dryers helps

reduce the risk of pest infestation during the drying process, thereby reducing the need for pesticides or additional treatments to maintain the quality of the harvest.

Despite the many advantages obtained, there are several challenges in implementing this technology. One of the main challenges is the limited drying capacity. The solar dryer used in this Activity is only able to accommodate a certain amount of corn in one drying process, so for farmers with large production scales, additional investment is needed in the form of solar dryers with larger capacities or an increase in the number of units used. In addition, the ventilation system in the solar dryer needs to be continuously developed so that the heat distribution and air flow are more even, so that the drying process can take place more efficiently.

Another challenge faced is the need for routine maintenance. Solar dryers must be kept clean and checked regularly to ensure that there are no damaged parts, such as cracked plastic or glass covers, which can reduce drying efficiency. Therefore, training for farmers in terms of maintenance and optimization of the use of solar dryers is an important aspect to ensure the sustainability of this technology.

Overall, the results of this Activity show that the use of solar dryers in the Aur Serumpun Farmer Group, Nagari Simpang, Pasaman Regency, has a positive impact on increasing the efficiency and quality of corn drying (Janjai & Tung, 2019). However, to increase the widespread adoption of this technology, support is needed in the form of design innovation, capacity building, and training for farmers so that they can utilize solar dryers optimally in the long term (Sharma, Chen, & Vu Lan, 2019; Mujumdar & Law, 2017)

CONCLUSION

The evaluation results show that solar dryers are an effective solution in increasing the efficiency and quality of corn drying. With shorter drying times and cleaner results, this technology can be a sustainable alternative for farmers in Pasaman Regency. To increase the adoption of this technology, it is recommended that socialization and training be carried out for farmers on how to use and maintain solar dryers. In addition, support from the government and related institutions is needed to expand the application of this technology to improve farmer welfare and food security in the region.

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