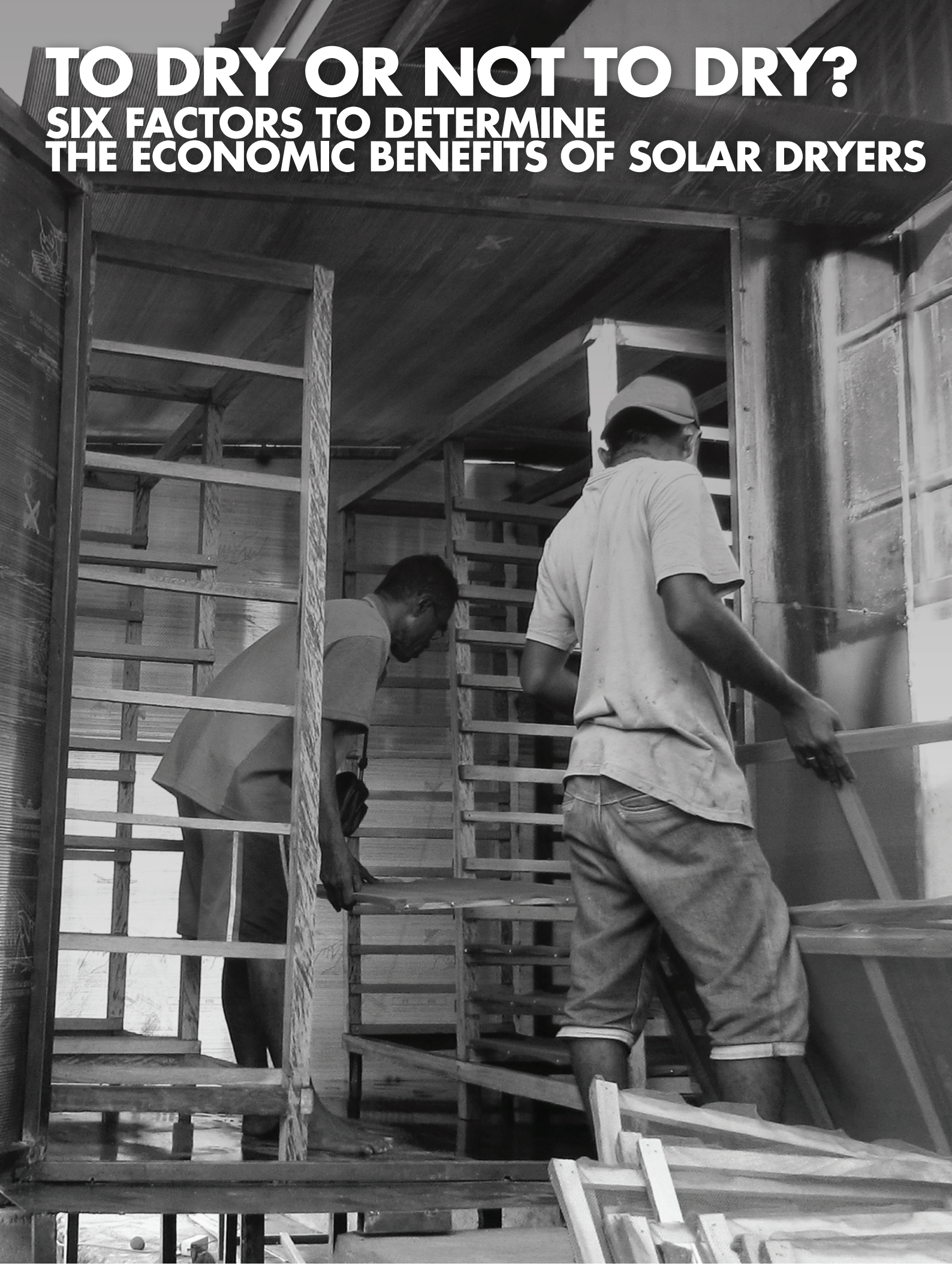
TO DRY OR NOT TO DRY?

SIX FACTORS TO DETERMINE THE ECONOMIC BENEFITS OF SOLAR DRYERS



KOPERNIK
FINDING WHAT WORKS

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INTRODUCTION

Indonesia is a major producer of several of the world's most in-demand soft commodities, such as cashews, copra and cacao. On the whole, the country's agricultural industry tends to export raw products as opposed to completing value-added downstream processing. As global demand for soft commodities grows in response to a growing appetite, particularly within emerging markets, Indonesia has the opportunity to increase the value of its agricultural industry. However, because the majority of farmers are smallholders who lack capital, market power and formal agricultural education, there are many challenges to completing these value-added processes.

One specific challenge is the drying process required to create consumer products. Most smallholders dry their produce by laying it out under the sun, a time-consuming and labor intensive process that can lead to contamination. While drying technologies could save farmers time and labor, Kopernik found in our Unmet Needs Report published in 2016 that very few commercial dryers exist that have been tested and proven beneficial for Indonesia's most important soft commodities. Among those dryers in production, there are essentially none that are affordable and make sense in terms of capacity for smallholder farmers.

In response to this need, Kopernik conducted a series of experiments, designing and testing solar dryers built from locally available materials, as well as testing one 'ready to go' technology, GrainPro's Solar Bubble Dryer. From these experiments, Kopernik was able to identify six main ways that solar dryers can increase farmer incomes. While Kopernik employs a lean research approach, we believe that the drying considerations discussed in this report are not limited to Kopernik's research circumstances. Rather, they are universal considerations that can be applied to any commodity and any location to aid making the decision on whether a smallholder farmer should invest in solar drying technology, or not.

DRYING CONSIDERATIONS

From our experiments, Kopernik learned that a solar dryer investment decision must consider the following factors for farmers within the local context:

- **Will they be able to dry more produce, quicker and do they have a market for the additional produce?**
- **Will they be able to dry their produce during the rainy season?**
- **Will they be able to conduct value-added processes to gain a higher income?**
- **Will they be able to save time and engage in another income generating activity during that time?**
- **Will they experience a decrease in operating costs?**
- **Will their produce have an improvement in quality?**

These potential benefits must be weighed against the cost of the dryer and contextualized within the supply chain facing smallholder farmers to determine the financial feasibility of the drying technology. Monetary amounts for each benefit can be calculated when taking into consideration the drying technology's cost, specifications and effectiveness and the farmer's location, production volume and market access. For a detailed explanation of how Kopernik calculated each benefit's monetary value in the context of its solar drying experiments, please see the Findings From Testing Three Drying Methods In Last Mile Settings.

1. INCREASING PROCESSING CAPACITY

By decreasing the number of hours needed to dry a crop, a solar dryer can potentially increase a farmer's drying capacity as long as the farmer has access to additional produce to dry. For example, a farmer who takes 10 hours to dry with traditional methods but whose drying time is cut in half by a solar dryer can now produce two times as much, assuming that he/she has access to more produce. A farmer's income from the commodity would increase by the same factor as the capacity increases.

Access to additional produce can come from expanded planting or from buying the raw crop from other farmers. However, there are many cases in which neither of these options are possible for smallholders and therefore this benefit would not be realised.

2. DRYING IN RAINY SEASON

If part or all of a crop's harvest occurs right before or during the rainy season resulting in raw produce that cannot be dried outdoors because of the weather, then a solar dryer is valuable because it facilitates drying during the rainy season. Because dried commodities typically earn much higher prices than their raw counterparts, the value of drying in the rainy season has the potential to nearly double farmer income.

For some crops, drying does currently occur during the rainy season because there is no market for the raw crop, such as cashews. The rainy season drying for these crops occurs indoors, which is an extremely lengthy process and results in lower quality processed commodities. Thus, a solar dryer in the rainy season would be able to save time and increase quality (discussed further below).

3. FARMER CONDUCTING OTHER INCOME EARNING ACTIVITIES DURING TIME SAVED

Time saved during the drying process is valuable if farmers are able to complete other income earning activities with the time they save. The design of the solar dryer requires no supervision during the day, unlike the traditional method, which must be monitored by the farmer to ensure that no pests disturb the commodity and often requires flipping the produce for even drying. If the farmer uses a dryer, they are then free to work in another capacity. The longer the traditional drying method takes, the greater the additional income a farmer can earn with the time saved. For farmers in Indonesia, other labor possibilities include working as ojek drivers (motorbike taxi) and day laborers on construction sites or other farms.

4. VALUE-ADDED PROCESSING

For some crops, drying is divided into stages based on additional processing that must occur between several drying stages. After each stage, the value of the dried commodity typically increases. If traditional drying cannot accomplish later stages of drying, then a solar dryer can increase a farmer's income by allowing the completion of value-added steps (assuming that farmers have access to a buyer for the upstream product). For some commodities, such as cashews, the higher price earned by later stage-dried commodities can double or triple a farmer's income.

5. DECREASING OPERATING COSTS FOR DRYING

Completing the drying process, even through the traditional method, is likely to require inputs other than just the dryer and labor, such as a tarpaulin or tools to flip the commodities to ensure even drying. Because a solar dryer removes the need for flipping and does not require any other inputs, it is able to save the cost of these tools. In many cases, the operating costs of the traditional method are small and would not result in significant savings. However, if farmers were currently using other methods of drying like an electric oven, then the solar dryer would save on electricity costs. Labor is also an operating cost of drying, but often times the only labor employed is the farmer's own. If, however, a farmer hires someone else to complete processes such as flipping, then the solar dryer would eliminate this labor cost.

6. INCREASING QUALITY

In some cases, the solar dryer is able to increase the quality of the commodity as compared to the traditional drying methods by achieving more even drying and protecting the commodity from contamination. The latter factor often results in less losses when using the solar dryer. The additional income earned by the farmer is the price differential multiplied by the volume of the commodity dried.

CONCLUSION

The above factors for a smallholder farmer's specific situation must be compared to the cost of the dryer. If the benefits are small compared to the cost, co-operative arrangements for the dryer's use should be considered to see if sharing the dryer's cost makes the benefits more comparable to the cost.

Most importantly, the supply chain and a smallholder farmer's place within it must be carefully mapped to determine whether and at what part of the process the farmers will have buyers for their dried commodities. A good understanding of the prices a farmer will receive for their crop, depending on whether the buyer is a middleman or a direct buyer, is also necessary to determine the feasibility of a solar dryer.

There are instances when the weight loss associated with drying outweighs the increased price that a dried commodity earns, which also must be considered to determine if drying technology is financially feasible.

Kopernik employs a lean research model, so this report only considers the data collected from the farmers we worked with directly, however we believe the factors identified within our limited sample size are applicable to farmers of any commodity in Indonesia. Our expertise lies in data collection, analysis and reporting and we still have a lot to learn in relation to improving agricultural efficiencies and income generation. This report provides an economic analysis, however there are still many other factors to consider including behavioral change, adoption barriers and the difficulties related to farmers cooperating with others for mutual benefit.