SOLAR RICE DRYING IN ACEH

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ABSTRACT

This paper presents the results and observations to date from the solar energy program at the University of Syiah Kuala in Aceh. The solar energy program is starting its second year of projects which include the following: development and construction of a solar water distillation unit, the recording of solar radiation intensity data, the investigation of traditional methods of rice drying and the construction of a one ton solar rice drier, based on an A.I.T. design.

A summary of some of the water distillation project results helps set the background for an examination of solar radiation energy in Aceh and possible new solar rice drying methods. Results and observations from a study on the traditional rice drying methods of bamboo matt and concrete surface drying are given. And, data from a sociological study on rice drying and storage in Aceh are discussed.

A brief description of the A.I.T. solar rice drier is given; and its advantages, place in the UNSYIAH solar energy research program and possible future uses in Aceh are discussed. Comments concerning the long range integration of large volume solar rice drying into the Acehenese culture are also made.

SOLAR ENERGY RESEARCH AT UNSYIAH

In 1982, the University of Syiah Kuala at Banda Aceh contacted the BKS-WUEA educational development project about an instructor to help teach and develop a program in the area of solar energy. The idea was to develop not only a course in solar energy at the under-graduate level that would help train future teachers and researchers, but at the same time, begin some low level solar energy experiments that could be used by extension programs in the province of Aceh. I was applying for a position with the BKS-WUEA project at that time and arrived at my post in January of 1983.

The BKS-WUEA project is administered under a contract from the American Embassy by the University of Kentucky in the U.S.A., with a focus on developing the college of agriculture in eleven universities in Sumatra and Kalimantan. Because of this agricultural focus, we were concerned that the research done at UNSYIAH not only be solar in nature, but also related to the agricultural or rural development problems in Aceh. Several areas of study were discussed, of which, the development of a solar water distillation - salt production unit and a solar rice drying unit were judged as most suitable.

In August of 1983, construction was begun on a 16 m^2 water distillation unit which was completed in November 1983. During this past year, data on the distillation of low salt concentration well water was taken, which is

pointing the way towards a more inexpensive design for village use and development. Future experiments are also being laid for the testing of ocean water distillation, which we hope will lead to ways of greatly reducing the energy requirements for salt production in Aceh.

During the past school year we have also considered ways to begin our research in solar rice drying. One student expressed interest in studying the traditional methods of rice drying in Aceh for his senior design project, and at this time, is finishing a sociological and heat balance study of rice drying on bamboo matt and concrete. We are following up on this background work with the construction of a one ton solar rice dryer that was developed at A.I.T. in Bangkok. Construction has begun and should be finished sometime in September. Basic performance in rice drying will then be tested and compared to the results published by A.I.T. and if successful, additional tests on clove drying will be done next year.

In this report, I will present some of the results from the various aspects of our budding solar energy program, and then proceed to describe some of our ideas for future research in solar rice drying for Aceh.

TRADITIONAL RICE DRYING METHODS IN ACEH

In Aceh, most families own less than a hectare of land and harvest an average of 2 metric tons per hectare, per harvest. Harvest times come three times per year, with the first rice season running from August to November, to be followed by an alternate crop from December to March and returning to rice again from April to July. Turn around time between harvesting and planting is around one month, during which all of the post-harvest and soil preparation work needs to be done.

Harvesting is done by hand, using a sycle, as is common in Indonesia. After the grain is cut, it is piled on the side of the sawah and left to dry for approximately 3 to 6 days before it undergoes threshing. The threshing itself is done by hand and is accomplished by simply striking the rice stalks against something. Afterwards, the grain is cleaned by pouring the grain from a 1 ½ meter height to the ground. The wind takes away most of the chaff and the rest is cleaned by hand. The moisture content at this point was measured and found to average around 22%.

At this point in the process, people generally set aside a small portion for reseeding and sell the rest to a cooperative. Sacks of approximately 80 kg capacity are used for this and most family complexes will have several of these sacks stored in a corner. For some households, however, an alternative method of storage is used. This consists of a container of about 2 cubic meters volume constructed of wood. On the bottom is a bamboo matt and along its four sides are pieces of wood or oil-palm branches. These containers many