

### C-33: Testing and evaluation of paddy husk furnace for tobacco barns

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Until recently, the heat for a tobacco barn furnace was generated by firewood. As firewood is increasingly less available and due to depletion of forest resources, most of these domestic type barns have been transformed to function on paddy husk. On the other hand, farmers find it increasingly difficult to find sufficient amounts of paddy husk even from far places.

The existing furnaces and the barns have been gradually developed empirically and there is high potential for further improvement. In order to reduce the consumption rates of fuel, the potential of increasing the efficiency of the furnace and heat transfer was considered. In addition a study was necessary to provide feasible methods of modification and operation of the furnace.

Observation of the firing of the furnace in the conventional way revealed many opportunities for improvement. There were no proper provisions for effective aeration. Then the ash which was covering the front aeration panel was cleared and 2 new openings were created, one in the top portion and the other in the bottom portion. The top portion clearance is to facilitate secondary air and the bottom portion clearance to facilitate primary air.

Then the clearance sizes were altered until the best flame with least amount of black smoke was obtained. Trials were done in order to find the optimum feeding rate. The temperature variation in the barn and the chimney and the characteristics of the flame and the smoke were noted. Other physical parameters such as angle of repose of paddy husk and ash for concrete was also measured. The shortcomings during the operation and places where improvements could be made were noted.

The study revealed that the optimum paddy husk feeding rate should be 385 g/min. A mathematical model was developed to simulate the barn temperature variation over time at the above feeding rate. Modification of the feeding hopper in consideration of the angle of repose of paddy husk with the building material would facilitate smooth inflow of husk. Introduction of mechanism that will agitate the paddy husk while feeding would prevent clogging.

Introduction of separate clearances for primary and secondary air would optimize the efficiency of the combustion. For effective ash removal a movable grating system could be introduced. Increasing the chimney height and painting it in black would facilitate effective airflow.