



Barn Rocket

A brief report from Malawi
about the development
of new energy efficient barns to cure
flue cured tobacco



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Date: 28.06.2006

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ROCKET BARNS make tobacco curing more fuel efficient

Within the past months ProBEC in Collaboration with KSVP (Kasungu Smallholder Virginia Project) has developed a new curing technology for small holder tobacco farmers. The close cooperation between ProBEC and tobacco industry in Malawi (Limbe Leaf) resulted in a “revolution” in the technology of curing flue cure tobacco which will reduce wood consumption by more than 50%.

The new ROCKET BARNS were designed by ProBEC’s consultant Peter Scott from Aprovecho Institute/USA.

Tobacco curing in Malawi – description of the challenge

The tobacco industry is one of the major forex earning sectors of the economy in Malawi. It is composed by both large farms as well as smallholder tobacco growers. In the past years, the farmers are getting a more favorable price for the flue cured tobacco than the air cured tobacco. The traditional process of drying the flue cured tobacco uses a lot of firewood while the Burley tobacco uses no firewood as tobacco is air Cured. Although improved barn



Picture: tobacco

technologies are available, the use is mainly restricted to the larger farms. Smallholder tobacco growers cure the tobacco leaves usually in very inefficient barns. As tobacco growers, in particular the smallholder growers, do not operate own firewood plantations, the increase in flue cured tobacco automatically accelerates the deforestation in Malawi.

Providing more and more firewood for the tobacco sector has become a multiple problem:

1. For the environment: A considerable proportion of wood for tobacco curing is taken from indigenous forests without replanting. Although not reliably determined, flue curing of tobacco contributes largely to the annual deforestation rate in Malawi.
2. for the production costs of tobacco: Firewood has to be collected from ever greater distant places, increasing the transportation factor and costs in the firewood , particularly in respect to the current oil price development.
3. For the logistic of the smallholder farmers: The timely supply of suitable firewood from ever further distant sources has become more and more a logistical challenge in terms of transport capacity and management.
4. For the contract relationship between smallholder and tobacco industry: Increasing firewood costs are reducing the profit margin of the smallholder tobacco growers as this factor is not (fully) accommodated in the development of the selling price of the crop. The farmers are dissatisfied with the selling price partially due to this increase in production cost.
5. For the relation to government institutions: The Malawian Government is more and more concerned about the impact of deforestation on the environmental and economic development of Malawi. Legislative initiative is in preparation to increase its commitment to biomass efficiency and tree replanting.

The majority of smallholder flue cure tobacco growers in Malawi are operating under contract with one of the two major tobacco companies (Alliance One or Limbe Leaf). Using various systems, the industry is supporting these smallholders by supplying different services:

- inputs on loan;
- firewood on loan;
- extension services / advice;
- others

Due to the close relationship between smallholder flue cure tobacco growers and the tobacco industry, the companies expressed their interest to cooperate with ProBEC in the attempt to make tobacco curing more firewood efficient.

The vision

The Programme for Biomass Energy Conservation (ProBEC/GTZ) and the two major tobacco companies operation in Malawi, Limbe Leaf and Alliance One, agreed to work jointly towards improving the problem outlined above. The parties agreed that it will take many years from the introduction to the widespread use of efficient curing technologies. The targeted improvements are as follows:

- Development of a curing technology that increases fuel wood efficiency by more than 60% for new barns and 50% for modified existing barns.
- Setting up a barn supply structure to ensure that the new technology reaches the smallholder farmers
- Close Cooperation with The Agriculture Research and Extension Trust (ARET) in Malawi in order to support their role and function for the smallholder tobacco farmers. In their regional capacity, they can support the sharing of information in a regional African context.

Achieved results

ProBEC's consultant Peter Scott from Aprovecho Institute/USA designed, in close cooperation with Limbe Leaf, several prototypes of improved tobacco curing barns. These ROCKET BARNS differ slightly in design and size. The term ROCKET BARN was chosen as the combustion chambers of the modified and new barns are based on the Rocket Stove principle of Dr. Larry Winiarski (Aprovecho Institute/USA). After the first curing season, three designs seem to be the most promising and will be tested during the next season in a bigger sample size.

Currently the smallholder farmers use a curing barn with a V-slot combustion chamber and a simple system of one flue per barn. Poor combustion efficiencies are one negative aspect of that flames may, in some instances, touch the thin metal sheets that separate hot flue gases and the inside of the barn causing the thin metal sheets' destruction. The result is common barn fires. On average, a smallholder farmer with this technology needs 10.5kg of firewood to cure 1kg of tobacco. Each season, a farmer will cure 8 to 9 barns of tobacco. As the investment costs for his production (firewood, fuel to get firewood, fertilizer) are quite high, the profit of a farmer sometimes comes only from curing the barn number 8 and 9. Frequent barn fires occur at the end of the curing season caused by the poor heat exchange system in the traditional barns. As a result, many farmers lose their profit.



Picture: Traditional barn with V-Slot Combustion Chamber

- Modified traditional barn:
In the structure of an existing barn a ROCKET combustion chamber is built. The heat transfer system in the barn is improved. Due to that the risk of a barn fire is minimized, too. The chimney of the old barns is replaced with a double chimney. The hot flue gases exit through the inner chimney while the outer chimney is the way out for the moist air from inside the barn. First test with these modified barns have shown that the wood to tobacco ratio can be reduced to 3.5 : 1.



Picture: modified traditional barn



Picture: Rocket Barn 250

- ROCKET BARN 250:
The ROCKET BARN 250 is build for small holder farmers with about 1 hectare of tobacco. In the self feeding ROCKET combustion chamber, the wood is burnt. Inside the barns, an improved heat transfer system ensures equal heat distribution and minimised risk of barn fires. Similar to the modified traditional barn, a double chimney for the exit gases is build. The major difference to the modified traditional barn is the outer dimensions of the ROCKET BARN 250. It is longer than and not as wide as the tradition barn. However, the same volume is kept which results in improvements in the air flow. This will increase the quality of the tobacco. The wood to tobacco ratio with the ROCKET BARN 250 was tested to be at 3 : 1.

- ROCKET BARN 500:
The ROCKET BARN 500 is a longer version of the ROCKET BARN 250. All design criteria are similar, only the length of the barn is doubled. This bigger volume makes the barn to be the correct size for a smallholder farmer with 2 hectares of tobacco. A wood to tobacco ratio of 1 : 2.3 was achieved during the first tests.



Picture: Rocket Barn 500

Way forward

Until the next harvesting season, a number of the above mentioned new barns will be built within Malawi and Tanzania. A close cooperation between ProBEC and the tobacco industry (Limbe Leaf and Alliance One) is the basis for this development. Besides fine tuning the design of the barns, we intend to prove that a farmer can achieve the above mentioned savings using the rocket barn without supervision.

Report by Peter Scott

A report with more details will be produced by the designer Peter Scott in July 2006.