

## **UNDP / GEF East African Cross Borders Biodiversity Project**

### **Chome Ward Fuel Efficient Stove Survey Follow-up**

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#### **Background**

Chome Forest Reserve in Same District is the focal forest for the Cross Borders Biodiversity Project in the South Pare Mountains. The 14,023-hectare forest, gazetted in 1951, is the most species rich forest in the Pare Mountains and is the most important catchment forest in Same District. Chome Forest Reserve is important worldwide for its endemic species, and valuable locally for its water catchment services. Through the completion of a Values and Threats Analysis during the project start-up period, CBBP identified fuelwood collection in Chome FR to be one of the major threats to biodiversity in the reserve. Fuelwood is used by all households in the villages adjacent to Chome FR for cooking, heating, and lighting. Village demand for fuelwood resources puts considerable stress on Chome FR, particularly in recently burned areas of the forest where fire-damaged trees of all sizes are typically harvested for fuelwood after a burn<sup>1</sup>.

Activities aimed at reducing household dependency on fuelwood among forest-adjacent communities therefore play an important role in reducing the biodiversity loss of Chome FR. CBBP initiated a program in collaboration with the Same–Mwanga Environment Conservation Advisory Organization (SMECAO) in 5 communities adjacent to Chome Forest Reserve in September 2000 to promote the use of fuel-efficient cook stoves. The five pilot villages were chosen because of their close proximity to the reserve and the documented demand for fuelwood resources from the forest (as opposed to woodlots outside the reserve) in these villages.

Prior to CBBP intervention in communities adjacent to Chome Forest Reserve, the most common method of cooking in each of the target villages was with an earlier prototype of the fuel-efficient stove, known locally as the Usambara stove. The Usambara stove was introduced to the area in the 1980's by a now-completed development project, and is similar in form to the SAMECAO stove in that it is an enclosed stove that conserves heat. It differs from the SAMECAO stove in that it lacks specific dimensions, has only one opening for a pot, and does not have a chimney to channel smoke out of the cooking hut. Households which do not have Usambara or SAMECAO stove employ a traditional 3 stone hearth for cooking, in which pots are balanced on 3 large stones over an open fire.

The improved stoves promoted by CBBP are stated to be more fuel-efficient than three stone hearths, and to decrease cooking time and reduce the amount of smoke released into the cooking area. Their design allows the wood to burn slower and increases the amount of heat trapped to reduce cooking time. The chimney leading to the outside or roof of the kitchen allows for a majority of the smoke to leave the kitchen, creating a less smoky cooking environment. All of the materials needed to build the stoves (gravel or small stones, clay soil or cement, and a stove mould) are locally available to villagers. Use of the fuel-efficient cookstove has been surmised to reduce household fuel-wood consumption by up to 50%. As part of its long term monitoring strategy, CBBP has completed 2 follow-up visits to pilot villages in order to quantify the actual reduction in fuelwood consumption by households using the SAMECAO stoves.

#### **Monitoring of the Fuel Efficient Stove Program**

In November 2001, closed-end surveys were administered in 4 of the villages adjacent to Chome Forest Reserve in order to ascertain whether the improved stoves do indeed reduce the amount of

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<sup>1</sup> While links between burning in the forest and fuelwood collection are documented, it is not known to what extent (if at all) intentional burning in the forest may be driven by fuelwood demands.

fuelwood consumed per household (compared to traditional “open” three stone hearths), and to provide monitoring and evaluation feedback on the CBBP stove implementation program. The surveys were administered to a total of 73 households using improved stoves or traditional three-stone hearths in order to compare patterns of fuelwood collection and consumption between the two groups. The surveys were intended to gather both quantitative and qualitative data regarding the efficiency of the respective cooking methods, by asking questions targeted at villager experiences with the two cooking methods, and by measuring the volume of a typical bundle of fuelwood, which was used to derive an estimate of the volume of fuelwood collected per week. In addition, some of the survey questions focused on issues of stove use, wider uptake among households and awareness of the link between the improved cook stoves and forest conservation. These questions were designed to provide feedback on how CBBP can improve on and expand its stove program in villages adjacent to Chome Forest Reserve.

The survey attempted to collect hard quantitative data on fuelwood use, in order to substantiate villagers indications that the improved stoves use less fuelwood than 3 stone hearths. The volume of fuelwood bundles were assessed and frequency of collection recorded in households using both 3 stone hearths and improved cookstoves. Qualitative results suggested that improved stoves require much less fuelwood per week than 3 stone hearths: 88% of improved stove users agreed that their stoves required less wood for cooking than traditional three stone hearths. These results do suggest that increased use of improved stoves by villagers living adjacent to Chome Forest Reserve would decrease the amount of fuelwood consumption, thus reducing pressure in Chome Forest Reserve. However, while qualitative data strongly supported the assumption that improved cook stove users collect and use much less fuelwood on average than three stone hearth users, statistical analysis showed no significant difference in the volume of fuelwood collected per week by the two groups. Responses to questions regarding villager perceptions about stove use, maintenance, and construction were also reviewed to make suggestions about how CBBP can increase the use of the improved stoves in the future and make stronger links between conservation and development in the communities adjacent to Chome FR.

The survey results highlighted a need for increased technical advice to villagers on stove building and maintenance, as well as greater awareness of the link between the conservation of Chome FR and the use of improved cook stoves. The survey results also drew attention to the difficulties in accurately calculating quantitative data related to fuelwood collection and consumption. It was recommended that future surveys evaluating the CBBP improved cook stoves program also address cost issues related stove building in order to identify financial barriers to wide uptake of the stoves.

This first survey was also intended to provide monitoring and evaluation feedback to CBBP regarding the effectiveness of the improved stove program in Chome, and to help identify barriers to wider uptake of the new stoves in communities adjacent to Chome Forest Reserve. Respondents’ answers to questions regarding how they had heard about the stoves, why they did or did not want one, and problems they may have encountered with the stoves was targeted to help CBBP identify and prioritise activities that would overcome these barriers and achieve greater impact. Information pertaining to how people learned about the improved stoves indicates that of those participants who already have improved stoves, 70% learned about the stoves from the UNDP-GEF CBBP while 18% learned about the stoves from their neighbors.

Of the participants who have three stone hearths, 24% heard about improved stoves from neighbors, 7% heard about improved stoves from the UNDP CBBP, while 19% hadn’t heard about the improved stoves at all. This indicates that the dissemination of information from the UNDP-GEF CBBP about improved stoves is not wide spread beyond those villagers who already have stoves. Word of mouth via neighbors appears to be the most effective means of spreading information about the improved stoves. Data pertaining to community members' attitudes about the stove suggest that there has been a positive reception for the stoves in each of the villages, though it is then unclear why more villagers have not adopted the new technology. It must be noted here that the survey questionnaire did not provide an opportunity to discuss financial issues related to building an improved cook stove. It may

be that building costs are prohibitive to villagers, and this was recommended as a point for further study. The majority of community members who have improved stoves indicate that they haven't had any problems with their stove, that their stoves require less wood for cooking than traditional methods, and that they would recommend improved stoves to other villagers. A majority of people who use three stone hearths reported that people that they know who have improved stoves like their stoves and don't have problems with them. These results suggest that the stoves work well, and that participants with improved stoves desire to keep and maintain their stoves. Of those respondents who currently have three-stone hearths, most have heard primarily positive things about the improved stoves and desire to have one. However, many (35%) of these respondents expressed uncertainty about who to talk to get an improved cook stove.

### **Second Follow-Up Survey Results**

10 households in Chome Ward were visited during a second follow-up survey, on August 13, 2002. The objective of this brief set of household visits was to fill in some of the information gaps uncovered by the more comprehensive survey on household fuelwood consumption conducted in November 2001. While the November 2001 surveys attempted to quantify the volume of fuelwood collection and consumption for both 3 stone hearths and fuel efficient stoves, the August 2002 follow-up focused on gaining additional qualitative information about fuelwood collection and consumption, how the stoves were working and whether the number of stoves in the villages was increasing.

Further information was particularly sought for the following:

1. To determine whether fuelwood is collected for other purposes in addition to cooking with the fuel efficient stoves (e.g. fires at night, etc.)
2. To estimate the amount of fuelwood consumed by SAMECAO fuel efficient stoves compared to the Usambara fuel efficient stoves introduced to Chome in the early 1990s.

The follow-up was conducted in Gwanga'a and Mhero Villages in Chome Ward, as they represent the villages farthest (Gwanga'a) and nearest to Chome FR (Mhero). Rather than administering formal questionnaires, information was gathered through informal conversation with household members who use the SAMECAO stoves (all women). A brief introduction was made at each household, explaining that I had come to check on how the stoves are working and to learn about any positives or negatives that have been brought to the household by the stoves. In addition, questions were welcomed about the stove introduction project and the Biodiversity Project in general.

The conversations generally began with the stoveowner expressing enthusiastic satisfaction with her SAMECAO cookstove. This provided an entry point to ask questions about fuelwood collection and use, since the reduced amount of wood needed for cooking with was frequently cited as one of the main benefits of the stove. The following questions were woven into each conversation:

1. When was your stove built?
2. Have you had any problems with your stove? If yes, what are they and have you been able to fix the problem?
3. Have you seen any benefits to having this stove? (This question was generally not necessary as villagers almost always began the conversation by extolling all of the wonderful benefits the stove has brought their household.)
4. What kind of stove did you cook with before building this new stove?
5. How often do you collect fuelwood for this stove?
6. How often did you collect fuelwood with your old stove?
7. From where do you collect fuelwood?
8. Do you use or collect fuelwood for any other purposes in addition to your stove?

### **I. Gwanga'a Village Observations:**

The Gwanga'a follow up was carried out together with five members of the Gwanga'a kikunde kwa majiko sanifu, and the village Mwenyekiti. Five households using SAMECAO fuel efficient cook stoves were visited in Gwanga'a, in addition to one household using an Usambara stove. The village

majiko sanifu group members are trained in building the improved stoves and making repairs. The group has built 46 stoves in Gwanga'a, and says that requests are still being made for them to build additional stoves. The group members are not paid for building the stoves<sup>2</sup>, and villagers supply their own building materials. The majiko sanifu group has made some modifications to the original stove design, which have minimized the need for repairs later on. The group also teach new stoveowners how to make minor repairs themselves<sup>3</sup>. Modifications include lining the mouth of the stove with an iron arch to keep the fuelwood from rubbing against the entrance and causing cracks in the stove exterior, adding a third burner to the stove, and adding a ledge onto the end of the stove to chop vegetables and store cookware. The stoves can be built from bricks, mud or cement, and can be built in 3 hours by 2-4 people. The size and style of each stove is tailored for the cooking hut size and layout.

Stoveowners cited a number of varied environmental, health and livelihood based benefits that they have experienced as a result of using the SAMECAO fuel efficient cookstoves. These benefits include the following:

- Smoke free cooking environment.
- Option to dry maize inside the cooking hut by channelling the smoke from the chimney into the hut ceiling<sup>4</sup>.
- Reduced time spent on collecting fuelwood each week.
- Meals cooked much faster.
- Heats the room sufficiently for family and friends to sit in the cooking hut for warmth during cold days, and at night<sup>5</sup>.
- Reduced risk of children being burned by open fires.
- Improved hygiene – family members bathe more frequently because extra burners and fast cooking time allow for bathing water to be heated for the entire family on a daily basis.

### **Fuelwood collection**

It was noted in Gwanga'a that most fuelwood is collected from open areas within the village or from trees growing on personal farms, rather than from Chome FR. This is mainly because the Forest Reserve is quite far from the village, and fuelwood trees are available in the village. Fuelwood from personal farms is sold at Tsh. 2,000 per small tree (6-8m tall), and some villagers do buy fuelwood from farms if extra wood is needed. Fuelwood is collected from Chome FR when special occasions are planned which require large amounts of wood, such as weddings and village celebrations. Some households collect fuelwood in bundles on a weekly basis, but many others stockpile large amount of wood all at once and then do not collect again for a month or longer.

### **Fuelwood consumption**

Each of the five stoveowners visited were emphatic in their statements that the SAMECAO stove consumes much less fuelwood than both the Usambara stove and the 3 stone hearth. One woman who had previously cooked over a 3 stone hearth stated that she now collects fuelwood once per week, compared with every day in the past. Three of the five households visited had cooked with an Usambara stove before building the SAMECAO fuel efficient stove. Each of these stoveowners independently estimated that the SAMECAO stoves use roughly 1/3 less fuelwood than the Usambara stoves. The fifth household visited were newcomers to the village who buy fuelwood because they do not have a farm on which to grow trees. This family buys fuelwood once every 3-4 weeks, and says that this is a very large reduction in the amount of fuelwood they used formerly with their 3 stone

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<sup>2</sup> Many communities in the Pare Mountains have a strong tradition of community-wide effort to help one another with labor-intensive tasks. Stove building in Gwanga'a is seen as one such activity, not requiring cash payment.

<sup>3</sup> Minor repairs generally include small cracks in the stove exterior, and chips or cracks in the burner rim.

<sup>4</sup> This is a much faster way to dry maize than the traditional method of hanging the maize in trees outside, and also keeps the maize free of insects during the drying process.

<sup>5</sup> Use of the cooking hut as a gathering area was evidenced by the many stools and chairs arranged around the stove in each of the huts that were visited.

hearth. Most people do not use fuelwood for any other purpose besides cooking, except for open fires during special occasions. However, a small number of villagers also use fuelwood to burn bricks.

## II. Mhero Village Observations:

The Mhero follow up was carried out with a member of the CBBP established Village Environmental Committee. Five households using SAMECAO fuel efficient cook stoves were visited. The pattern of stove building and observed benefits to the SAMECAO stoves in Mhero village was much the same as that observed in Gwanga'a, although a single group of people does not build all of the stoves for the village. Many villagers in Mhero were trained in stove building, and some villagers have built stoves for their friends or neighbors as well. Stove modifications are also present in Mhero, though they do not follow a set standard.

### Fuelwood collection

Fuelwood appears to be collected from Chome FR more frequently in Mhero village than in Gwang'a, though fuelwood is also collected from open areas outside the Reserve boundary. More frequent collection from Chome FR is likely to be because Mhero is adjacent to the village and therefore easily accessed. Fuelwood is not stockpiled to the same extent as that seen in Gwanga'a – villagers appear to collect more on a regularly weekly basis. Fuelwood for sale is also more expensive in Mhero than in Gwanga'a, at Tsh. 3,000 for 1m<sup>3</sup>.

### Fuelwood consumption

Three of the stoveowners visited had used an Usambara stove prior to building the SAMECAO stove, and two of the women estimated that they use 1/3 less wood with the SAMECAO stove. Two of the stoveowners visited had cooked over a 3 stone hearth before building the SAMECAO stove, and also stated that they cook with much less wood now. As in Gwanga'a, most people do not use fuelwood for any other purpose besides cooking, except for open fires during special occasions. A small number of individuals also use fuelwood to burn bricks.

**Table 1. Stoveowner estimations of fuelwood collected per week for the SAMECAO stove and the previous cooking method.**

Household	Village	Previous stove	SAMECAO stove fuelwood collection	Previous stove fuelwood collection
1	Mhero	Usambara	--	--
2	Mhero	3 stone hearth	2 times / wk	7 times / wk
3	Mhero	Usambara	2 times / wk	3-4 times / wk
4	Mhero	Usambara	1 time / wk	3 times / wk
5	Mhero	3 stone hearth	2 times / wk	7 times / wk
1	Gwang'a	Usambara	--	--
2	Gwang'a	3 stone hearth	1 time / wk	7 times / wk
3	Gwang'a	Usambara	--	--
4	Gwang'a	Usambara	--	--
5	Gwang'a	3 stone hearth	--	--

\*Households with no information stem from difficulties in estimating fuelwood collection on a weekly basis, due to wood stockpiling rather than regular weekly collections.

These surveys suggest that improved cook stoves introduced by CBBP are beneficial to the user in three main ways: they most likely reduce the amount of fuelwood the user has to collect each week, they reduce the amount of smoke in the kitchen, and they reduce cooking time. Overall, villagers impressions of the stove are positive and the use of the stoves could potentially spread as more people are made aware of how to build the improved stoves, and recognise the benefits of using an improved stove. As more and more villagers in Mhero, Gwan'ga, Marieni, and Mvaa start using improved stoves, the amount of fuelwood consumption is likely to decrease, thus reducing the pressure on Chome Forest Reserve.