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TEM Lab Indonesia: Kopernik & ExxonMobil

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Executive Summary

Thunderbird students traveled to Bojonegoro in East Java, Indonesia, to monitor and evaluate the impact of the Kopernik-sponsored technologies (cook stoves and water purifiers) and distribution model on women and their communities. Kopernik asked TEM Lab to determine whether or not these two technologies have the potential to further the economic empowerment of women, and should that be possible, they wanted to understand how best to scale up access to the technologies in East Java and other Kopernik regions of action.

These two technologies had been determined by a local NGO (or "technology seeker") to be of interest to potential Base of Pyramid (BoP) adopters (end users) in Bojonegoro. The local NGO partner – Farabi, in this case – then disseminates the technology to the end users at subsidized prices using a microfinance structure. The sales revenues are subsequently ploughed back into the project or sent back to Kopernik for use in other projects elsewhere.

The overall scope of technologies that Kopernik offers has the potential to impact women on a social and economic level. Many of their technologies provide monetary and/or time savings by, for example, reducing fuel consumption or time spent on household chores. Many of their technologies (stoves and filters included) also provide significant health benefits, by reducing the amount of smoke inhaled while cooking or boiling water and by improving access to purified drinking water. In addition there are other technologies like the hearing aid, solar lamps and digital devices, which help improve education. However, any technologies apart from the Bening One water filter and the Kompor Biomass stove were not a part of the TEM Lab scope of work and we therefore cannot comment on their overall impact.

In general, our findings showed that in most households the Bening One has replaced more time-consuming and expensive methods of obtaining purified drinking

water, such as boiling or purchasing bottled water, and enjoys a broad appeal for both small business owners and household users. On the other hand, despite a number of dissatisfied users, the Kompor Biomass cook stove has been successful for only certain segments of the market. Its benefits are most pronounced in certain small business and domestic market segments that value the stove's portability and fuel efficiency, and in which the small size does not pose an inconvenience. Those users who purchased their fuels (wood, LPG and kerosene) rather than collected them for free (wood, crop residues) are now able to realize monetary savings as a result of the stove's efficient use of fuel.

The distribution model involves a local woman, the coordinator, who serves as the community's point of contact with Farabi, communicating product orders, collecting payments and distributing the product. This role has, in effect, created an added opportunity for women to earn income and improve their entrepreneurship skills. It is too soon to determine if these savings and new skills will result in any discernible ways to gauge women's economic empowerment.

Additional project elements included organizational analyses of the Kopernik business model and operations. The team gave the organization feedback on how to identify the right target market for their products, improve consumer education, tighten communication protocols and ensure future organizational growth. They outlined ways for Kopernik to identify strategic partners, increase sources for revenue, measure the impact of the technology and find ways to make the technology affordable on a wider scale.

Technology Assessment

Introduction and Methodology

The assessment of the technology was the foundation piece of this project and needed to be accomplished through field interviews with end users of the water purifier and the cook stoves. The team started with dedicating a week to local protocols starting with meeting Kopernik's co-founder, Toshi Nakamura; members of the local NGO, Farabi; local police, village chiefs and other authorities as appropriate. As a result the team had a more complete concept of the environment they would be operating in for the next five weeks and which helped shape the interview structure and questionnaire.

In developing the questionnaire, the team attempted to capture as many elements of the project as possible including questions around general demographics, spending habits/economic status, technology questions (processes, problems and advantages), distribution/training and competitor products.

The scope of time allowed for a sample of 40 women, who were chosen by the local NGO (Farabi) and comprised of 20 cook stove users and 23 water purifier users, with some overlap by the women who have both technologies. In addition to assessing the technologies, the interviews were intended to prescreen six women to be filmed by APCO Worldwide for the upcoming Clinton Global Initiative Conference. The data from the interviews was analyzed and interpreted via a framework created by the TEM Lab. This gave the team significant insight on how the technologies were being adopted and their impacts on the households and businesses.

It is important to note that considering the small sample size, the lack of a control group, the non-random sample selection, the absence of a corresponding baseline survey and the brief period that had elapsed since project implementation, the survey was intended to provide qualitative rather than quantitative data. Additionally, because few (if any) of our respondents were in the habit of keeping budgets or tracking

time spent on various activities, the quantifiable data we did gather must be taken with a grain of salt. It would be difficult or even misleading to extrapolate too many generalizations based on averages or percentages of survey variables; much of the team's analysis is therefore based at least in part on case studies and anecdotal experiences.

Technology Distribution Model

Approximately twelve weeks prior to the writing of this report, the NGO Farabi, Kopernik's local implementing partner, began distributing the Bening Satu water purifier and Kompor Biomass cook stove in seven villages within the Bojonegoro region. The technologies were disseminated via the following process:

- In March 2011, Farabi held a meeting, "Socialization," in each of the target villages and invited village residents to attend. This was an information session where the manufacturers and/or inventors of a number of selected technologies performed live demonstrations of the products for the villagers. Dedy Haning from Kopernik also attended these meetings.
- After the Socialization, Farabi arranged several Focus Group Discussions (FGDs) and invited the women who had attended the Socialization. Some of the larger villages held more than one FGD. At each FGD, attendees were asked which of the technologies that had been presented would be most valuable to them (i.e. which ones would they be interested in purchasing.) Based on their interests, the individuals were placed into groups of ten.
- Becoming a member of the group is conditional upon signing a contract[1]. This contract specifies that there needs to be a Coordinator and a Treasurer for each group. Farabi asked the groups to elect these positions themselves. The contract also spreads liability for non-payment across the group. If a given member is having difficulty making her payments, it is up to the group to resolve the problem amongst themselves.

[1] See Appendix for Contract and Responsibilities Outlined.

- Every group has a Coordinator (point of contact with Farabi) and a Treasurer (responsible for collecting payment). The other members of the group (known as a*nggota*) are allowed to promote and sell the technologies to other women within the village for a commission. It is a model that leverages the social ties and influence that the women have within their communities.
- For the water purifier (not the stove), there is an incentive scheme to encourage sales and repayment. For every product sold, 5,000 IDR ($0.58)[2] is either given to the Coordinator or deposited into a community fund, according to the group's discretion. Farabi suggests that the money should go to the Coordinators in compensation for all the work that they do and expenses they incur (e.g., phone charges). Additionally, 10,000 IDR ($1.16) of the revenue from every product sold at 110,000 IDR ($12.77) is supposed to go to the woman that sold it. Theoretically, any woman in the group should be able to earn this commission if she directly sells the product to a non-member.
- The Coordinator is responsible for communicating all orders to Farabi, who in turn sends the order to Kopernik. Kopernik then places the order with the supplier.
- The supplier ships the technology to Farabi's offices; Farabi then delivers the technology to the Coordinators' homes in the villages. From there, the products are typically picked up by the individual customers.
- The Coordinator will often order more products than necessary in the hope that they will sell more once the initial products are introduced and word of mouth spreads. Farabi keeps an inventory record in their office. The villagers typically pay for the products on a three-month installment plan, usually at 35%, 35% & 30% (although the terms can vary according to each group).

[2] The average exchange rate between March and July, 2011, is 8,617 IDR per 1 USD (source: www.oanda.com)

The Incentives Scheme Explained

Every group has a Coordinator (point of contact with Farabi) and a Treasurer (responsible for collecting payment). The other members of the group are known as Anggota and are also allowed to promote and sell the technologies to other women within the village. However, because of the social dynamics of the village, a number of women that did not originally express interest in the products wanted to buy the technologies. They have been allowed to purchase the products (at 110,000 IDR), but were not allowed to sell them and are known as Pembeli. However in one particular village, Mojodelik, there was not much initial interest in selling or promoting the products, so Farabi allowed Pembeli to actively promote and sell the products as well.[3] Since the beginning of July, Pembeli in all the other villages have been given the all clear to sell the products. It is a model that is dependent on the social ties and influence that the women have within their communities.

The incentives scheme works as follows. For every product that gets sold 5,000 IDR is given to either the Coordinator or a community fund. This varies according to each village as Farabi asked each group to decide where this money would go. However, Farabi suggested that the money should go to the Coordinators for all the work that they do. Additionally for every product that is sold at the 110,000 IDR, 10,000 IDR is supposed to go to the woman that sold it. Theoretically this should mean that any woman, be she Pembeli, Anggota, Treasurer or Coordinator, would be able to earn this commission if they directly sell the product to an end-user. However, in practice it seems that most Anggota and Pembeli just recommend the products to other women in the village, the Coordinator makes the sale and the Coordinator pockets the 10,000 IDR. Even though every woman can now technically sell the products, a general observation during our survey was that the majority of women was unaware of this and thought that

[3] NB Mojodelik is the most affluent village as this is the land that Exxon is actively drilling. Consequently there are a lot of *nouveaux riches* in the village, who have no real investment in improving the rest of the community. Their participation in Farabi's projects is rather limited.

only the Coordinator could do so. Their understanding of the incentives scheme was also extremely limited outside of the Coordinators and Treasurers.

The efficacy of the incentives scheme is also difficult to assess because the commissions will not be paid out until payment of the final installment has been made. None of the Coordinators interviewed could say with any great deal of certainty as to how much they would personally receive from it. The value of the commission (10,000 IDR) may be too little to incentivize the dissemination of the technologies into other villages due to the cost of transportation (fuel costs 5,000 IDR per liter). It might also be too small to significantly incentivize additional sales. One Coordinator, Ibu Betty, has been extremely successful selling the Bening One water filters[4] and is looking to raise working capital to set up her own cake-selling business. However, she revealed to us that to raise this from commissions alone, she would need to sell over 250 units.

NB According to the Group Contract, the Coordinator is also supposed to receive an additional 50,000 IDR from Farabi at the end of the third installment period. However, no one we interviewed appeared to be aware of this.

Bening One Water Purifier

Overview

The Bening One is the cheapest water purification system produced by Indonesian manufacturer Nazava Jalan Kartini. All units are manufactured and assembled in Banda Aceh (on the northwest tip of Sumatra) and then distributed by boat and train. Instruction manuals are provided with each unit.

[4] Over 30 sold at the time of writing.

The unit has two plastic water containers (both 13.5 liters) made of food-grade plastic that does not affect the taste or odor of the water. Gravity pulls the water through a single filter candle in the middle as it filters. The ceramic candle is fine enough to remove most impurities: bacteria, cysts, parasites, fungi, sand, clay and other particles greater than 0.4 micron. The filtered water it produces is, according to WHO standards, safe enough to drink. The filter is effective in making yellowish or whitish water clear and can easily purify tap, well and river water. Murky and muddy water can be filtered but the speed of filtration will be slower. The filter will not remove chemical contaminants or salt.

The manufacturer claims that one candle can filter 7,000 liters of water before it needs to be replaced, which equals about three years of drinking water for an average household. Based on this calculation, the company estimates that the purifier is six to nine times more economical than boiling or buying water. The Bening One can filter 2 liters of water in one hour. Consequently, the end user does not experience time savings in terms of processing time (as a larger amount of water can be boiled in less time). However, unlike the boiling process, the Bening One requires no supervision while it produces purified water, freeing up time for the end user to perform other tasks. Therefore, in addition to the cost savings on bottled refillable water and on fuel for the boiling process, the end user can also benefit from time savings to a certain degree. Additionally, users who used to boil their water on traditional wood stoves no longer have to spend as much time gathering wood fuel.

Prior methods

The women in the communities we surveyed sometimes used to walk over 2 kilometers to pump water from wells to meet their daily needs. However, after the Farabi water tower implementation, the villages in which we conducted our survey all had access to running water.

In order to purify their water, the women primarily used to boil it using a traditional or LPG stove. Households relying on this method to provide their drinking water typically spent about 30 minutes per day, depending on their level of consumption. In some villages, the available water contains a great deal of chalk, which is not removed through boiling. Due to the variability of these factors the women found it challenging to ensure the purity of the water.

Households and businesses often supplemented their purified water refill water which they could have conveniently delivered to their homes by sending a quick text message. However, a refill water jug costs somewhere in the range of IDR 5,000 ($0.58)[5] and consumption varies according to household and business.

Typical Household & Business Users

This product has very broad appeal. In the surveyed households, the product was used almost exclusively to produce drinking water, though on rare occasions we found that people also used it to wash their hands. In businesses, it was used to make ice, iced drinks, popsicles ("*ruja*"), noodles, coffee and other water-based products. There have been instances where the women were selling certain products in their kiosks as a result of having convenient and quick access to purified water. This demonstrates the opportunities created by a Bening One water filter.

Pros

Overall, the Bening One water filter has a strong demand and has seen a high adoption rate within the Bojonegoro region. One reason for this was the respondents' prior awareness of the importance of sanitization and access to purified water. Understanding the benefits of the technology plays a major role in its adoption rate. Since the community already had a sense of the benefits that purified water has to offer, the Bening One simply had to demonstrate that it was functional product in order

[5] The average exchange rate between March and July, 2011, is 8,617 IDR per 1 USD (source: www.oanda.com).

to be accepted as a good fit for the household or business. There were other factors that also contributed to its mass appeal.

Visibility of benefits

One of the most common reasons respondents purchased the Bening One was the visible transformation of the brown water into purified water at the demonstrations. The end users were immediately able to identify its benefits and factored that into their purchasing decision.

Health

The health benefits associated with purified water are commonly understood by the respondents the team interviewed. The users make it a priority to drink purified water and have cited this as a major factor for using this technology. 100% of the respondents mentioned that they refrain from drinking unfiltered water and that they had experienced health-related issues in the past as when they did.

Prior methods of boiling water would leave traces of chalk and bacteria, which led to frequent coughing and dysentery. One of the respondents mentioned that she wanted to provide the children of her neighborhood with products made with purified water in place of less healthy alternatives. As a result she uses the Bening One to make popsicles for the children and makes sure the parents are aware that it is made with purified water.

Time

The Bening One does not require any supervision during the filtering process and this in turn frees up time for the women to do additional chores in the house. In some cases it affords extra time to rest or spend time with family. Although the processing time of two liters per hour is slower than boiling, the time saved (typically about 30 minutes per day) from lack of need to supervise the process is essentially a luxury the Bening offers.

Additionally, many Bening One users used to boil their water using wood (or other biomass) fuel that they spent time collecting on a regular basis. Because these households no longer need to boil water and now consume less fuel, they presumably realize some time savings here, as well. However, most respondents were unable to reliably quantify the amount of time saved; it was not something that was typically tracked and time spent collecting wood would vary according to fuel usage patterns and the ease of access to locally available fuel.

Money

Some users formerly boiled water using fuel that had to be purchased, such as LPG or wood (when not available for free). As a result of the Bening One, the users fuel are purchasing less fuel. However, in the absence of a baseline survey quantifying an average amount of fuel used prior to the introduction of the Bening One, these monetary savings are difficult to quantify. A lot of the households also supplemented their purified water needs by buying refill water, which costs between IDR 3,000 ($0.35) and 13,000 ($1.51) per jug. . The Bening One has proven to be a replacement technology and accounted for significant savings for households and businesses that relied on refill water.

In all, about half of the interviewees reported that they were saving any money at all as a result of adopting the Bening Satu. Typical household savings ranged between IDR 5,000 ($0.58) and 10,000 ($1.16) per week.

Easy to use

The Bening One is very simple to use and does not require significant training. In many cases the instruction leaflet proved to be sufficient and few people reported any ongoing issues with using the technology itself. The only step involved is filling the top container and this convenience also translates into time saving as mentioned above.

Safety

The technology is operable by individuals of all ages and this aspect was given high consideration by several interviewees. As a result of our survey, we found that children not only used the filter but also often times were the ones who refilled it. Previously, the children would have to wait till their mother could be available to boil water for them and in some cases had to drink non-purified water.

Appeal

Given the widely recognized importance of access to purified water for households as well as business, the Bening One has very broad appeal. In households it is used primarily for drinking water, however in businesses it is used to make multiple products such as ice, popsicles, beverages and baked goods. These products have proven to be significant sources of revenue for the businesses we interviewed.

Cons

While over 60% of interviewees asserted that they had "no complaints" regarding the Bening One water filter, some of our respondents indicated that there were some areas for possible improvement.

Aesthetics

Twelve percent of respondents indicated that they would have preferred a more aesthetically pleasing model; some respondents specifically mentioned a premium-priced Unilever filter that they had seen on television. Respondents did not like the transparency of the Bening, comparing it unfavorably to the containers commonly used to store rice crackers. The option of having the product available in a variety of different colors was also suggested as a possible improvement. This feedback is worth bearing in mind if the product is targeted at high income buyers.

Size

Around 8% of interviewees identified the size and capacity of the Bening One as potential areas for improvement. In some cases, the unit was deemed to be too small to satisfy the needs of the household. However, this was generally when the household was using the unit to try to fulfill the demands of a business in addition to the needs of the residing family. Other users complained that the Bening One's height makes it top-heavy at the beginning of the filtration process when the upper bucket is full, making it unstable. Several respondents expressed concern that the unit might topple over and had taken measures to stabilize it.

A further insight from our interviews was that farmers in the region do not always have access to clean drinking water when they are out in the fields. Although they take bottled water with them, they can only carry so much and when it runs out they often resort to drinking unfiltered water. The Bening One is of course too large to be portable. This, coupled with its slow filtration rate renders it unsuitable for this application. However, there is a potential market opportunity for a smaller, more portable model with a faster filtration rate, such as the LifeStraw featured on the Kopernik website.

Filtration Rate

The current model takes one hour to filter two liters of water. This means it will take just under seven hours to filter a full batch of water, based on the unit's capacity. While many households have circumvented this problem by filling up the unit overnight, it can still become an issue if the water supply is used up during the day. This was an issue identified by 4% of our survey sample.

Training Issues

The Bening One is relatively simple to assemble and to operate. However, Nazava recommends throwing out the first batch of filtered water as it will have an

unpleasant taste and smell. During the course of our research, it emerged that many users had followed this course of action, indicating that the training was insufficient.

Maintenance & Repair/Returns Policy

The filter candle needs to be cleaned whenever the flow of water slows down. Regularity of maintenance will vary according to the type of water used. However, an area of concern was that there were knowledge gaps among end users (including one coordinator) regarding the process for repairing/returning a product.

Overall Recommendations

Although the Bening One does not appear to be competing with any other locally-available water purification technologies in the Bojonegoro region, it is worth noting that prior methods are still a source of competition.

All of the women surveyed mentioned that they no longer continued to boil their water after the introduction of the Bening One, although refill and bottled water remain a supplementary source of drinking water for some households and businesses. This is mainly due to the fact that the Bening One requires a significantly longer time to replenish and when large amounts of water are required frequently, the product cannot keep up with demand.

There was some awareness in the villages about competitor filters offered by other companies, most notably Unilever which advertises on television. However, there was no evidence to suggest that these products were being used in households or businesses in the area surveyed. This can be attributed to the Bening One being more competitive in terms of pricing and a lack of local availability of competing products.

Kompor Biomass

Overview

The Kompor Biomass was invented by Dr. Nurhuda through a program in Indonesia supporting the development of technologies designed to benefit developing communities. The stoves are manufactured in the region of Malang, East Java. According to the inventor, these stoves are 80% more fuel efficient than traditional stoves. They can also use a wider variety of fuel sources, such as trash, biomass briquettes and food waste. In addition, because of the design of the combustion process, it emits less smoke than a traditional stove. The stove's small size makes it portable, unlike traditional stoves and large LPG models.

The fuel is placed in the core of the stove and lit using kerosene, twigs, leaves, or other kindling. Two versions of the stove were introduced into the villages surrounding Bojonegoro: one with a round top and the other with a square top. Both styles of stove have a small lever at the bottom that is used to control the flue, which in turn controls how much air feeds the fire. A major difference between the two stoves is that the round stove has a small hole on the side which allows the user to add small pieces of fuel while cooking. This was not included in the design of the square stove; in order to add fuel to that stove, the user must remove the cooking pot in order to access the main fuel chamber.

Ideally, this stove provides numerous benefits: reduced smoke inhalation, money and time savings through fuel efficiency, and portability. Through our research, however, we have found that although these benefits are possible, few our respondents actually recognized these as benefits of owning the stove. Our overall finding is that for this technology, the correct target market is extremely important to the adoption in the community and continued usage.

Previous Methods

Traditional Javanese stoves are brick structures shaped like an open box with one side missing. Across the top are sometimes iron bars to set the pot or pan depending on the size. A fire is built using large pieces of wood that stick out the open side. As it burns down, the wood is pushed into the center of the stove.

The TEM Lab team learned that there was a government initiative in 2009 to provide homes with LPG (gas) stoves in place of kerosene stoves, which the government had decided to cease subsidizing. Kerosene stoves were also considered dangerous and unhealthy. However, public perception of this product was unfavorable due to widely circulated stories of fires and explosions caused by leaky gas cylinders. Most people sold their government-sponsored stoves to local shops and reverted to using traditional stoves.

Because the villages we visited were all electrified, many households also had electric rice cookers. The advantages of the rice cooker are that it can be left on all day to keep the rice warm and it is relatively cheap compared to operate. Its narrow functionality (it only cooks rice) is made up for by the fact that rice is such a staple food.

Of these methods, the Kompor Biomass was intended to replace either entirely or in large part the traditional, kerosene and LPG stoves.

Current Business & Household Users

As mentioned, the Kompor Biomass was introduced into seven farming villages in the region of Bojonegoro, known for its teak plantations. Most of the local villages have easy access to biomass fuel sources such as wood and crop residues such as corn cobs. In general, people can go into their yard and collect enough wood for the day. It is also easy and fairly inexpensive to buy wood or charcoal at the local markets.

For most of the biomass stove users in these villages, the technology has become a supplement to their traditional stove, rather than a replacement. In some cases, the

stove is used primarily in the family business, while the traditional stove is used to cook family meals.

Our surveys showed us that the majority of the women purchased the Kompor Biomass without having ever used it themselves. When asked, they often said they purchased it because their neighbor had it or because they had heard it was supposed to be good. Having no actual experience with the stove, it is not surprising that many women had trouble operating it and a few even ended up not using it at all.

Pros

The Kompor Biomass was well received by certain families within the community. There were very specific instances wherein the stove satisfied a need not being met by the previous methods of using traditional and LPG stoves.

Monetary Benefits

In some of the villages where the fuel is not easily sourced, the women are able to save money by limiting their fuel consumption. Wood is the most common and preferred fuel since its easily sourced in most villages and is used as the primary fuel for the traditional stove. Other fuels, such as kerosene and LPG, are considerably more expensive. The Kompor Biomass, being a more efficient wood-burning stove than the traditional brick stove, affords the family some fuel savings, which are realized through less frequent fuel purchases.

Size

The stove is considered convenient due to its size, which allows for it to fit in the compact kitchens of the village households. Some of its other benefits such as fuel usage and portability are also tied to its size.

Health and safety

By virtue of its design, the Kompor Biomass emits less smoke than a crude

traditional stove. Although few women using the stoves recognized this health benefit of the technology, it is nonetheless a merit. Anecdotally, some of the women did cite that they have not gone to the health center with complains of itchy throats and heavy coughing, which they attribute partially to the fuel-efficient stove.

In addition, the stove is considered safer than the LPG stove, which is considered to be dangerous due to its potential for explosion. The LPG stoves, although available at a subsidy, were not widely accepted and in most cases sold back to the storeowners.

Business owners

This technology has been an especially valuable fit for business owners who require a portable stove. It enables businesses that are mobile in nature to have the stove with them as they move around. It was recognized as a substitute product for kerosene stoves, which are portable but not nearly as cost efficient as the Kompor Biomass.

Some women who have kiosks selling toiletries, household sundries and snacks, have expressed an interest in selling hot appetizers using the stove. Some of the items they plan to incorporate would include tempe (soybean cakes) and fried tofu.

Fuel availability

The stove is able to burn a variety of fuels that are readily available to some households and businesses and that are relatively cheap compared to alternatives like LPG, kerosene or electricity. Apart from small pieces of wood, corn cobs, coconut husks, charcoal and biomass briquettes also make convenient fuel sources.

Cons

Despite its advantages, the Kompor Biomass had a low adoption rate throughout the seven villages participating in the project, and in most of the households surveyed that did adopt the technology, it usually did not fully replace the prior methods of

cooking. The following feedback relates to the actual functionality of the stove as well as the methods employed to distribute and educate the end user on the technology.

Product design

The stove is not a self-explanatory or intuitive product and therefore many users did not understand how to use it and wound up simply storing it in a corner of their kitchen. The concept of a flue, a component that is not featured on most stoves familiar to the local market, was difficult to grasp for many users. The users need more one-on-one training, which would be time-consuming for the NGO or the coordinators in charge of distributing the technology. In addition, the square stove does not allow for fuel to be easily added once the user starts to cook, which led to several cases of half cooked or uncooked rice and noodles and very frustrated users.

Size

For users who found little interest in the stove's portability, the stove's small size became a disadvantage. Most of the women prefer to cook large quantities once a day, but due to its size, large quantities cook much slower on the Kompor Biomass than on stoves that can accommodate larger flames and larger cookware. This has caused the stove to be only a supplementary burner and not a replacement technology in the majority (about two thirds) of the households we surveyed.

Fuel processing

Some of the respondents claimed that they did not use the stove because the fuel had to be chopped into smaller pieces in order to fit into the refueling hole on the side. In many areas, the only widely available fuel is large wooden logs; households in these areas thus find the stove difficult to use. These women prefer to use the traditional stove which can accommodate the large logs. Before launching this product within a given community, it is important to consider the locally available fuel types.

Value recognition

Although the stove has health benefits resulting from lower smoke emissions, this benefit did not resonate with the majority of the end users. Most of the women who used traditional cook stoves did not cite the fumes as an inconvenience; therefore the Kompor Biomass's reduced smoke emissions are not necessarily associated with as a benefit. When the end user does not understand a benefit, this will inevitably impact the technology adoption.

Impulse purchase

Apart from the functionality of the stove itself, there were some drawbacks to the way the stove was introduced and marketed. Although some of the users went to the demonstration events and purchased the product with some awareness, there was a significant number of women who had never even seen the stove prior to their purchase.

It was found that many of the dissatisfied stove users had never seen it or had never been shown how to use it. Their reasons associated with buying the stove were tied to the fact that their neighbors had it and they wanted to try it also. In some cases, the coordinators (who hold significant influence in their communities) convinced the women to buy the technology but did not sufficiently train them on how to use it. As a result, the stove became a technology that was difficult to use, virtually unused in many cases, and the negative experience left the community with a sour impression of the project overall.

Complex to market

This technology is deceptively complex and there are many factors to consider when introducing it to a market:

- What is being cooked and how often?
- To what degree is portability an issue? How many mobile businesses are

in the area?

- To what degree is the local population already aware of and concerned with the negative health effects of smoke inhalation?
- What types of fuel are people most commonly using, and how much time and money do they spend acquiring it?
- What is the availability and cost of the appropriate types of fuel for the Kompor Biomass?

The answers to these questions, which we recommend form the basis of any future marketing surveys, will impact the level of adoption of the technology.

Overall recommendations

In the case of the Kompor Biomass, only about half of the users we interviewed reported having experienced no problems with it at all. Many of them comfortably switched back to using the traditional stove, since they already buy or source wood as their fuel. Only about one third of those surveyed claimed that the Kompor Biomass had become their primary stove. Some people still use the LPG as a supplementary technology; however the overall preferred stove is still the traditional stove.

From the Kompor Biomass analysis, it was discovered that most of the problems associated with its adoption were a result of lack of consumer education on how to use the stove. This can be addressed by providing more hands-on consumer training at the demonstrations and even at the point of sale, preferably in small groups or one-on-one. This may require further training of coordinators as salespeople and a review of the coordinators' incentive scheme in light of any new demands placed upon their time. Some users were unpleasantly surprised to discover only after their purchase that the Kompor Biomass requires access to small pieces of fuel. Given that, it is highly recommended that coordinators, members and anyone who sells the stove be trained to manage customer expectations prior to any sales transaction.

Recommended Business & Household Users

Based on the low adoption rate of the Kompor Biomass in the villages and on a number of our own observations outlined above, it seems this technology is only likely to achieve its full potential under a relatively narrow range of circumstances. This underlines the importance of identifying and targeting the right market for the sale of these stoves. In the future, a more in-depth community needs assessment would allow for all the factors to be considered when marketing a stove, which will address the stove's adoption rate and determine if it is a good fit for the targeted community.

Many of the problems people had with the stove boiled down to difficulty of use: some people had trouble adding fuel (especially with the square model); some complained about the need to chop their wood into small bits; others appeared to have trouble operating the flue. Some of the feedback that we received also focused on the size of the stove: compared to the traditional stove, it is smaller and cannot cook as much food. A positive response was the portability of the stove. Because it is not fixed to the ground like the traditional stove and doesn't have a large attachment for fuel, like an LPG stove, it is easy to store out of the way or use in a mobile business.

Our recommendation is to focus the sale of the stove to low-income, small families or individuals who may not have a lot of space and who do not have easy or cheap access to traditional fuel sources. The small size and fuel economy will be a great selling point for these people. The stove's positive impact will be significantly diminished in areas where fuel can be easily gathered at no cost, especially if it is fuel that must be further chopped into bits. Another target market is mobile businesses. A common sight in the villages was a motorcycle with wooden saddle-boxes on the back. These motorcycles are traveling food stands and the Kompor Biomass is perfectly sized to fit inside and keep the food warm while using less fuel than a kerosene burner.

Conclusion

In testament to the products utility and appeal, the Bening One Water Filters are now being distributed beyond the original seven villages as a result of their success; they are being introduced into two more villages: Beged and Cengungklung. Apparently villagers in the original seven villages have been buying some of the products for relatives living in these other villages.

The stove, however, has received mixed reviews, partly because one of the two models that were distributed had some design issues. The biomass stove did not become a replacement technology in the villages, but more often a complement to existing stoves in village kitchens. In other cases, the stoves fell into utter disuse. Most of the negative feedback the TEM Lab team heard revolved around the difficulty of using the stove and although the inventor made a visit to the villages in an attempt to alleviate concerns. However, the impact of the inventor's visit was diminished by the prolonged negative experiences of the community. It is our opinion that most of these problems can be avoided in future cook stove projects by more thoroughly assessing market needs and by addressing critical consumer education issues.

Kopernik Analysis & Recommendations

Introduction

Kopernik is an international NGO founded in 2010 with a mission to provide BoP customers in developing countries with affordable access to innovative, life-changing technologies. The organization manages approximately 30 projects in ten different countries, employing a number of short-term fellows and volunteers who manage the bulk of the workload. The company has an international advisory board and relies largely on personal relationships for partnership development.

The spectrum of technology that Kopernik sponsors is very diverse, addressing areas such as agriculture, education, energy, environment, health, water and sanitization. Kopernik's target markets are primarily women and children at the base of the pyramid; they aim to provide efficient and economical technologies. Examples of some of their projects include providing solar lights in Papua and Nigeria, distributing technologies that facilitate the transportation and storage of water for household use in Kenya, improving computer skills in Uganda and distributing solar-powered hearing aids in Vietnam. Kopernik is a strong supporter of emerging and innovative technologies, working closely with inventors until their products reach a final distribution stage. Some examples of the more innovative designs include the sOccket (a soccer ball which accumulates energy during play and can be used for lighting) and the hydroelectric barrel (a low cost, rugged, flexible hydroelectric generator).

The TEM Lab team's findings and recommendations, based on their experiences with the cook stove and water purifier project in Bojonegoro, Indonesia, are intended to inform Kopernik's future projects, such as one in Lombok, Indonesia, where a community has requested a distribution of the biomass stove. The team's recommendations revolve around the assessment of community needs, alignment of

strategies for improving product affordability, possible avenues for revenue generation, strengthening the organization's network, measuring project impact and connecting technology seekers and providers.

Responding to Community Needs

Observations

The Kopernik model laudably aims to improve the efficacy of development work by implementing a bottom-up approach that responds directly to needs that its beneficiaries themselves identify through the intermediary of local NGO partners. Kopernik relies upon its local NGO partners to correctly identify and prioritize those needs; its model is only as strong as its partners' ability to do so. Furthermore, the local NGOs rely upon their good relationships and reputations within their respective communities in order to function; this is indeed their greatest asset.

The results of the TEM Lab survey of Biomass stove users in Bojonegoro Regency indicate that residents in at least some of the seven communities did not in fact recognize a particular need for such a product. Despite some notable exceptions, most of the stove users (over 75%) did not realize any monetary savings as a result of their adoption of the technology, as the local teak wood industry assures a bountiful supply of freely available fuel in most of the communities. Although such users may not save any money, the stove's fuel efficiency may yet provide a certain amount of savings in terms of time spent collecting fuel. However, for users who only have access to large chunks of wood or other types of fuel that still required additional processing due to the stove's small size, those time savings were often cancelled out. Furthermore, fewer than a quarter of the users recognized health or safety issues to be a factor in their decision to purchase the stove, despite this having been one of the stove's main selling points. These observations, combined with the stove's relatively low adoption rate (even among those who purchased the item, several abandoned its use), seem to indicate that this particular technology does not respond to an important community need. The stove appears to have been a poor match for this particular market.

In theory, the Kopernik model is designed so as to ensure that development solutions are adopted only by those who want or need them – it is demand-driven. In practice, however, the TEM Lab team observed that this is not always the case[6]. Distribution of a maladapted product not only diverts valuable resources from more effective uses, but in severe instances can even go so far as to damage the reputations of the local NGO and Kopernik and/or their relationships with the communities. Drawing again from the example of the Biomass stove (which also suffered from problems beyond those related to its market mismatch), frustrated users were so disenchanted by their experience that they often wanted nothing more to do with any "Farabi" products. This sort of outcome could threaten the effectiveness of future efforts by either partner in these communities.

Recommendations:

In order to mitigate such eventualities in future projects, there are a number of things that Kopernik can do during the NGO vetting process.

First, Kopernik should encourage its technology seekers to support their applications with more rigorous, quantitative needs assessments of their communities. This should certainly not be a requirement, as many local NGOs may lack the administrative or technical capacity to do so, and in many cases a community's needs may be obvious enough without such a formal assessment. Nevertheless, as Kopernik grows, it will undoubtedly continue to face situations in which applications from technology seekers will outstrip available funding; quantitative needs assessments could become an additional tool for applicants to improve the competitiveness of their proposals while improving the likelihood that Kopernik will select projects with potential for success. A simple way to implement this recommendation would be to provide guidelines to this effect on their website. Additionally, Kopernik could build the capacity of existing NGO partners who show promise for future collaborations by providing either informal advice or formal training on how to improve the rigor of their

[6] See the *Kompor Biomass* recommendations, above.

community needs assessments. Ideally, such needs assessments would use quantifiable, survey-based metrics that indicate the relative importance of an identified community need.

According to the TEM Lab team's observations of the Bojonegoro project, it also appears as though the technology fairs and focus groups that Kopernik currently implements as part of its technology vetting process may not be sufficient to identify the most appropriate solutions for a given community. In order to make this process more robust and reliable, we recommend that Kopernik or its partner NGO implement more thorough field testing of the technologies it distributes before engaging in sales. Specifically, this testing could involve a trial period during which a few select users be allowed to use the product risk-free in return for providing product feedback. The ultimate goal here is not only to receive feedback on the functionality of the product itself, but just as importantly to assess the technology's appropriateness for a specific context.

This recommendation is particularly relevant for technologies which have been newly added to Kopernik's portfolio or which have a more complex set of factors that may impact its success in a particular market. Again, the biomass stove provides an example here, as its success depends upon a number of different local factors: the types of food cooked, the local cooking style, the types of fuel available locally, the cost of fuel in terms of time and money, etc.

Potentially, Kopernik could even go one step further and work more closely with technology developers to ensure a better supply of appropriate technologies. The TEM Lab team's experience with the biomass stove (the square model, in particular) led us to believe that the design approach at least in that case was perhaps focused more on the designer's need to repurpose old equipment rather than on the users' needs and experiences. Consequently, a number of design flaws resulted in a souring of certain users' attitudes towards not only the stove, but to the people and organizations responsible for distributing it. Products developed through a more "user-centered" or

"human-centered" design approach[7] are far less likely to encounter such problems after entering the market. We therefore recommend that Kopernik advocate a more "human-centered" design approach among the technology developers with whom it partners.

This advocacy could be enacted in a number of ways. Kopernik could compile and disseminate resources to educate technology developers about the human-centered design approach. The materials could be distributed through email, through Kopernik's website or perhaps in hard copy. More ambitiously, Kopernik could seek to establish a formal relationship with organizations like IDEO.org who might be able to offer consulting or training services to technology developers with whom Kopernik partners. Kopernik's role might simply be to facilitate an introduction between the two parties, and then benefit indirectly through access to a selection of better-designed products.

Affordability

Observations

There are basically two ways to improve the affordability of technologies for customers in developing countries: either you reduce the total price of the technology for the end user, or you provide financing options for buyers and reduce the size of individual installments over an extended period of time. Currently, the Kopernik model employs both of these strategies: Kopernik subsidizes the selling price of the technologies while its local NGO partners often act as *de facto* microfinance organizations.

While this dual strategy helps maximize the technology's affordability to the end user, it does however raise some dilemmas in light of Kopernik's mission and values. Kopernik sprang from the desire to create an "ecosystem of ideas for development,"

[7] IDEO has published a Human Centered Design Toolkit, downloadable for free at www.ideo.com/work/human-centered-design-toolkit/

wherein the most appropriate and effective ideas self-propagate and flourish while the less effective ones fade away. But subsidies – especially price subsidies – can have a distorting effect on the mechanics of such an "ecosystem", or marketplace, by creating an artificial incentive for people to adopt a given idea (or technology, in this case). It is possible that at some future time and place, a Kopernik-sponsored technology may find itself competing against another technology that is somehow superior but does not benefit from subsidized pricing. Should this superior product flounder as a result of Kopernik's subsidies to its competitor, Kopernik's mission to create a marketplace of ideas and to would be compromised.

That said, the TEM Lab team did not witness such a situation on the ground in Bojonegoro – insofar as we are aware, it remains a purely hypothetical and theoretical dilemma. However, the team did encounter instances of a similar type of inconsistency between mission and strategy. Among the forty Kopernik beneficiaries we interviewed, two came from households reporting annual incomes of over 25,000 USD, well outside the typical range of 1,000 and 2,000 USD per year[8]. Because our survey sample was not randomly selected, it is impossible to say how often Kopernik subsidies benefit those who don't necessarily need them, but it can be said that for better or for worse, it does happen.

A third observation worth mentioning at this point is that Kopernik relies upon its local NGO partners to implement microfinance schemes, even when microfinance is not necessarily one of the NGO's core competencies. These organizations are often small, project-based generalists whose greatest value lies in their close ties to their communities rather than specific technical capacity.

Recommendations

Given a choice between the two strategies for achieving affordability, namely the subsidization of the price or of the financing, we recommend that Kopernik favor

[8] As a point of reference, the CIA World Factbook puts Indonesia's annual per capita GDP at $4,200.

the latter as a general rule of thumb. Subsidized financing is, at least in principle, less disruptive to natural market forces than subsidized pricing, because competing products then wouldn't be entirely undercut by Kopernik-sponsored technologies perhaps being sold below cost. An exclusively finance-oriented subsidy would also prevent valuable donor funding from being diverted to benefit wealthy consumers who could afford to purchase the product at full price. If a customer has the means to pay full price in one lump sum, they are less likely to take advantage of an installment plan with subsidized interest; as a result, more of the donor-funded subsidies would be available to benefit needier consumers.

Given that microfinance is a fairly specialized industry, is an industry where economies of scale can play an important role, and is already a major component of Kopernik's operations, we also recommend that Kopernik examine the possibility of partnering with a larger and more specialized microfinance organization. Relative to small, local NGOs, such an organization would be less susceptible to cash flow related issues and would be able to distribute risk across a more diversified portfolio. Furthermore, such an organization would more likely to have the technical and administrative capacities to better implement programs, or depending upon the nature of any eventual partnership, to provide training to local NGO partners to implement them on their behalf.

As we make this recommendation, however, the team understands very well that on a given project, a microfinance program may not always be the optimal solution; some projects are likely to be most successful if they also rely upon price subsidies either in whole or in part. This is particularly true of communities that are both especially poor and remote: where competing technologies are less likely to have a presence, where the level of poverty ensures that every beneficiary is likely to be needful, and where the logistics of managing a microfinance scheme are particularly challenging.

Revenue

Observations

The Kopernik model currently has two primary sources of revenue. Individual contributions make up the vast majority of the donations. These are done mainly via the company website. Individual donors are able to donate in relatively small increments and specify which the project they would like to fund. Corporate partnerships, such as the one with ExxonMobil, have allowed Kopernik to secure sizable amounts with the possibility of follow-up grants. These donations generate a revenue stream of 10% from all the contributions.

Secondary funding sources are also being tapped. Kopernik's team leverages their experience to offer consulting services to companies interested in penetrating emerging markets. The opportunities that companies can take advantage of range from capturing a brand new market with existing products or in some cases customize the offering to the market for meeting an existing need and maximizing returns. Furthermore, the high adoption rate for certain technologies (such as the D-Light and other solar technologies) has inspired demand for these products in the developed world. Kopernik is considering selling these products in the wealthier countries at premium prices in order to add to their revenue stream.

Recommendations

All the revenue methods being currently employed by Kopernik appear to be working well and it is recommended that they be maintained. However, as the organization grows, TEM Lab recommends increasing the spectrum for revenue generation. Some of our observations are in line with areas already being explored by the Kopernik team but are nonetheless mentioned here in order to emphasize their potential to impact revenue.

The TEM Lab team sees substantial value in approaching potential partners who might find mutual benefit in developing markets at the BoP (base of the pyramid).

Currently Kopernik's corporate partnership with ExxonMobil is limited to the Bojonegoro region. ExxonMobil's economic interests in the community require that the company maintain good relations; therefore it is in the interest of ExxonMobil to be actively involved in that region and be a part of developing and improving the quality of life for the residents of these relatively poor farming communities. Similarly, identifying other companies who may have a mutual interest in the dissemination of certain Kopernik-sponsored technologies is a way for Kopernik to obtain other strategic corporate partnerships.

This concept has been successfully implemented by IDEO.org in many countries. One of their recent efforts enabled the company to partner with Unilever doing a collaborative R&D effort for a portable toilet and collection service for low-income families in Kumasi, Ghana.

"Unilever, which is a household name in many corners of the world, sells health and well-being products in more than 180 countries; more than 50 percent of its business comes from emerging markets. The company was looking to develop a suitable toilet/collection service to provide a complete in-home sanitation solution. Sanitation is an area of interest because there is tremendous need and the company sees healthier, happier people as more likely to buy its other products"[9].

To bring this idea home to Kopernik, we can take the example of the Bening Satu which is used in several small businesses to produce drinks from powdered mixes. Producers of such mixes, for example, have an interest in ensuring that more consumers have access to purified water. If the end consumers have access to purified water, they are more likely to buy powdered drinks as a choice of beverage. Some companies to potentially target for sponsoring a Bening One campaign for a widespread campaign within Indonesia can be Marimas and Nutri-C. The hot beverage market is also one to consider (e.g., Chivet Luwak coffee) and even the international Nescafe brand, which has a large presence in many of the where Kopernik operates, is worth considering.

[9] www.ideo.com/work/in-home-sanitation-solutions/

Similarly since noodles are a staple diet in many of the villages, the Indomie or Maggi instant noodles brand could be partnered with to sponsor the Kompor biomass. To look beyond the lens of the technologies that TEM Lab assessed, this approach can be replicated throughout the technology portfolio of Kopernik by identifying companies who produce complimentary products to Kopernik technologies and seeking partnerships with them.

Some examples could be partnering with Johnson & Johnson for the "Infant Warmer" and Monsanto for the agricultural products. A FMCG company like Unilever, whose products are sold at the local kiosks, would benefit by sponsoring solar lighting campaigns that benefit storeowners. This will allow the owners to extend their store hours and in turn sell more Unilever products. There are multiple ways to identify these strategic partners and find common interests. This will widen the scope of corporate partnerships wherein they have incentives for long-term gains and create sustainable revenue streams for Kopernik.

Tied to this, another recommendation would be to formalize Kopernik's consulting service offerings and target potential corporate partners who could benefit from BoP sales opportunities (like the ones mentioned in previous paragraphs). This would eliminate the need to approach companies with open palms to asking for a flat-out donation towards a campaign. Rather, Kopernik could offer its consulting services at discounted rates in return for sponsorship of a campaign to distribute a complementary technology. Such campaigns could be valuable marketing tools for many companies: for example, a trial version of a company's product could be distributed at Kopernik technology fairs or as a complimentary item when the technology is purchased to allow the consumers to sample it. The consulting chapter would essentially become Kopernik's for-profit wing that funds the non-profit wing.

In addition, selling the high-end products within wealthier countries is something Kopernik is already considering. We recommended that Kopernik examine TOMS

shoes[10] as a possible model for accomplishing this. Essentially, products would be marketed in such a way so as to let consumers in wealthier countries know that the purchase of one technology will directly benefit a BoP consumer with access to the same technology in emerging markets.

When it comes to "green" technologies, such as fuel-efficient stoves and solar lighting, there is a carbon credit financing possibility that is being pursued by a number of cook stove developers elsewhere. The Gyapa[11] and the Toyola[12] stoves in Ghana are two examples of such technologies; Goldman Sachs and JP Morgan are (or at least have been) involved in purchasing cook stove carbon credits. Similar schemes may be possible for solar lighting projects. The sale of carbon credits generated from the distribution of qualified technologies would provide an additional revenue stream to either Kopernik or the technology provider, depending on the arrangement. Either way, these credits would offset both technology production and distribution costs, allowing Kopernik to stretch its resources that much further.

Strengthen Your Network

Observations

The Kopernik team has strong personal relationships, which has played a significant role in the company's rapid growth. The founding members started out by creating awareness of their mission by utilizing these relationships and by actively pursuing in speaking engagements to build partnerships early on. As a result of Kopernik receiving media attention, the technology providers and technology seekers solicited them actively on their own. This has proven successful for the company thus far; however, based on our limited interaction with Kopernik, the TEM Lab team did not observe any formalized systems to sustain this growth in the future.

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[10] www.toms.com

[11] Gyapa stove: http://www.google.com/url?sa=t&source=web&cd=5&ved=0CDcQFjAE&url=https%3A%2F%2Fgs1.apx.com%2Fmymodule%2FProjectDoc%2FProject_ViewFile.asp%3FFileID%3D4260%26IDKEY%3Dfiofj09234rm9oq4jndsma80vcalksdjf98cxkjaf90823nmq3n5874540&rct=j&q=gyapa%20stove%20cabon%20credits&ei=1b5WTt69FcLSiAKXmtGhCQ&usg=AFQjCNGAsGraHpyFyDmiqZ0s7Y3b-Lg0BQ

[12] Toyola stove: http://news.nationalgeographic.com/news/energy/2011/02/110215-cookstoves-sustainable-development-ghana/

Recommendations

In some cases, the relationships that Kopernik has are quite structured, but in other cases they appear to be rather informal in nature. Our recommendations on this issue are possibly more feasible to implement in the long term. As the company continues to grow, they need to prepare to start formalizing their relationships with strategic partners and build institutions out of personal relationships. TEM Lab does recognize that as of now, the Kopernik team is already working at full capacity and that informal networks may be reliable enough under present circumstances. However, Kopernik needs to start looking for ways to structure relationships to facilitate future growth, wherein technology seekers and providers have an organized medium to connect with the solution facilitator.

We can draw from some examples observed in the medical tourism industry and the roles played by medical facilitators. These companies facilitate patient/physician relationships by matching them according to what the patient seeks and what the physician has to offer. A similar model can be implemented in the non-profit world wherein upon meeting certain criteria, the facilitating organization would recommend Kopernik to partner with. This will allow technology providers and seekers who have not been exposed to Kopernik to have a systematic channel for reaching them.

Finally, having a website in the languages of the countries where Kopernik operates, with low-bandwidth browsing options for countries with limited internet access, will increase their reach in their targeted areas.

Measuring Your Impact

Observations

At the time of this report, the oldest Kopernik project is still within one year of its implementation. Although this time period can be too brief to measure any discernable social and economic impact, our discussions with Kopernik's leadership surfaced the need to create methods to do so. The organization realizes the urgency around creating standardized methods, however with an array of different technologies being distributed in a multitude of diverse regions, this process is innately complex. This complexity provides all the more reason to expedite the start of this long process. As the company continues to be a recipient of grants and

international attention, this process needs to be accelerated in the interest of transparency, maintaining credibility and attracting future funding.

It has proven to be challenging however to assess this impact in an environment where the concept of financial and time budgeting is foreign. Whether a technology has the potential to save time or money, there is no discernable way right now to attribute how those savings are being utilized. There is potential for these savings to be put towards a small business or children's education, but due to a lack of budgeting practices, this project benefit is difficult to capture in monitoring and evaluation exercises.

Recommendations

The overarching recommendation here is to develop, as soon as possible, a standardized benchmarking process for assessing a project's impact on a set of key indicators. This can be done by creating metrics that can are easy to observe or extrapolate from the users. Furthermore, we recommend using control groups as a way to gauge the social impact. Often times the users cannot verbalize what benefits they are realizing. By establishing control groups in areas of project implementation, Kopernik can observe, for example, changes in spending patterns and time spent on activities to reach tangible conclusions regarding social impact.

A final recommendation in this area would be to leverage relationships with local NGOs with overlapping mandates for knowledge sharing. This may pose logistical challenges, to be sure, however its potential benefits are worth mentioning. For example, we were made aware of many micro finance institutions and NGO's focused on developing vocational and entrepreneurial skills in the region of Bojonegoro. We suggest that it may be worthwhile for Kopernik to connect with such organizations and share information that may be useful for identifying local trends that may be related to key project indicators. Furthermore, this could result in a network of mutually beneficial relationships.

This concept is similar to targeting corporate partners that have a mutual benefit in the project's success. An NGO that focuses on skills development might work with the users of a Kopernik-sponsored technology and identify whether there is a time saving that can be allocated towards learning a new skill and provide income opportunities. Similarly, a microfinance institution (MFI) could work with Kopernik beneficiaries to build budgeting

techniques that will allow them to realize their savings and set up a business using the services of the MFI. As a result, the social impact measurement will address some of the constraints around budgeting that exist and be a more organized community effort.

Connecting Technology Seekers and Providers

Observations

In the Bojonegoro project, the TEM Lab team observed that Farabi had early on forged a relationship with the technology provider. This seems to have been largely as a result of an initiative on the part of Farabi itself rather than a something more systematic. However, when issues with the technology arose, the technology seeker and provider had already established a solid relationship that enabled them to reach out to each other as necessary.

Recommendations

We recognized this early forging of a direct relationship between the technology seeker and supplier as a best practice that should be systematized, if it is not already. The current technology feedback systems that Kopernik already has should be maintained; however, we also saw value in ensuring direct tech seeker & supplier relationships early on in all projects. This may become challenging as some of the technology providers inevitably will be in different countries, therefore an Internet platform or an informal introduction should initiate the foundation for the relationship. This is a best practice that we recommend be replicated in all Kopernik projects.

Conclusions

The overall scope of technologies that Kopernik offers has potential to impact women and their families on both a social and economic level. Many of their technologies provide monetary and/or time savings by, for example, reducing fuel consumption or time spent on household chores. Many of their technologies (stoves and filters included) also provide significant health benefits, by reducing the amount of smoke inhaled while cooking or boiling water and by improving access to purified drinking water. In addition there are other technologies like the hearing aid, solar lamps and digital devices which help improve education. However, any technologies apart

from the Bening Satu water filter and the Kompor Biomass stove were not a part of the TEM Lab scope of work and our recommendations are largely based upon our observations from the Bojonegoro project.

The distribution model involves a local coordinator, a woman, who serves as the community's point of contact with Farabi, communicating product orders, collecting payments and distributing the product. This role has in effect created an added opportunity for women to earn income and improve their entrepreneurship skills. Therefore it is too soon to determine if these savings and new skills will result in any discernible ways to gauge women's economic empowerment.

Market Survey: Competitive Analysis and Employment Opportunities

Overview:

In addition to our main project focused on interviewing women using Kopernik's Kompor Biomass Cooking Stove and Bening Satu Water Filter, a market survey was conducted. The objective of this survey was to conduct a competitive analysis of the two technologies, as well as to make an assessment of the area's economic landscape and employment opportunities.

Location

This market survey focused on the area of the seven villages covered within the project. This area corresponded with the regencies of Blora, in Central Java, and Bojonegoro, in East Java. While the base of operations and Cepu market were both located in Blora, most of the markets and employers visited, as well as all of the original survey villages were located in Bojonegoro. These villages were Mojodelik, Brabowan, Begadon, Bonorego, Gayam, Ringintunggal, and Katur.

All seven villages were located along two side roads perpendicular to the main road connecting the area with Cepu and Central Java to the west, and Bojonegoro and Eastern Java to the east. Ultimately connecting to Jakarta in the west and Surabaya in the east, this unevenly-maintained two-lane paved road represented the lifeline connecting the villagers to the primary markets and employment centers of the region. The main markets visited were in Purosarwi, Kalitidu, Malo, Padangan, Cepu, Bojonegoro, and Gayam. The top employers in the area were two cigarette factories, located in Padangan and Kalitidu, along with MCL, employing a large yet unidentified number of people across functions in close proximity to the area of the seven villages.

Methodology

Constrained by time the market analysis remained flexible, growing organically with information discovered one day often generating interview questions for the next day. Although most of the survey questions were qualitative in nature, anecdotal evidence was tested and triangulated through asking the same questions from diverse sources a variety of times. In total, seven towns and markets were visited and 47 interviews were conducted. The interviewees ranged from small food stall merchants in Gayam, to government employees working for the national rice harvesting organization (BULOG) in the city of Bojonegoro. Additionally, any area establishment employing over 20 people was investigated to see if it hired local villagers, with a special emphasis placed on the hiring of female villagers, given the nature of the primary project.

Several limitations impacted both the quality and quantity of the data collected through the survey. Limitations included but were not limited to: the organic nature of the survey questions themselves; the inconsistent ability to collect responses from those interviewed; the diversity of types of establishments and employees interviewed; the low sample size for each of these types; and the inherent risk of interviewees telling the team what we wanted to hear. Observed across the entire project, some villagers had a general assumption that any foreigner asking livelihood-related questions was sent by MCL to help improve their living circumstances. The collected data, despite the anecdotal nature, represented the words of the various consumers, merchants, and employers who make up the economic heart of the area surveyed.

Competitive Analysis

A critical way to triangulate the value of the primary project was to learn more about competing products in the area. Included in the market survey, this competitive analysis focused on discovering if competing cooking stove or water filtration products existed, and if so, what specific advantages and disadvantages they had with respect to the Kopernik technology products.

Kompor Biomass Cook Stove

The Kompor Biomass Cooking Stove found a direct competitor in the widespread one- and two-burner LPG stove units available for sale in every market visited during the course of the survey. Competitively-priced (50,000 to 250,000 IDR) when excluding the substantial cost of LPG fuel (14,000 per month), the LPG stoves advertised their ease of use and cooking speed. The high cost of fuel as well as a rumored risk of explosion limited their popularity. This later point was especially interesting as it was discovered that many villagers had sold their free, government-subsidized LPG stoves to stores. With this revelation, the entire question of the competitive value of the LPG stoves was called into question.

In addition to the presence of LPG stoves, the Kompor Biomass Cooking Stove was subject to less direct competition by the widespread sale of rice cookers. Although limited to cooking rice, rice cookers nonetheless championed the same cooking speed and ease of use advertised by LPG stoves, but without any downside risk of explosion. The price for rice cookers ranged from 110,000 IDR to 315,000 IDR.

Bening Satu Water Purifier

While the Kompor Biomass Cooking Stove found potential competition in LPG stoves and to a lesser extent in rice cookers, the Bening Satu Water Purifier saw no direct competitors in the markets surveyed. While responses from several villagers mentioned a water filter seen on television, no water filters were to be found in the shops and markets surrounding the villages. The nearest comparable substitute was found in the form of ‘refill water’; the multiple-gallon plastic jugs which sat on top of dispenser units and could be refilled at local purified water refill stations. Different brands of water cost different amounts, ranging from generic at approximately 3,000 IDR to the well-known Aqua brand costing approximately 12,000 IDR for a refill.

Employment Opportunities

Often put forward as one of the most pressing problems facing the village communities, the issue of unemployment was incorporated as one of the key components of the market survey. As a result, in between visits to various shops and markets, the survey involved stopping in at local businesses and factories, targeting any establishment with more than 20 people, and emphasizing the hiring of women workers during each site interview. While non-agricultural employment in the area remains low (reported as only 10% in one case), these jobs are generally prized, as they offer a decent wage and, moreover, their payment cycle is independent of the growing season. This point was of considerable importance as most of the unemployment witnessed in the villages was seasonal, with most men taking construction jobs in the off-season, and the status of women largely unknown. Given that the project placed such a high importance on the economic livelihood of women, special effort was made to identify employment opportunities for women in particular.

The top employer in the area of the seven villages was a cigarette manufacturer. Operating two plants located in Padangan and Kalitidu (founded in 1991 and 1999, respectfully), this manufacturer was not just the largest non-agricultural employer close to the villages, but it was also the largest employer of women, as its workforce was composed nearly entirely of women. A considerable boom to women's economic opportunity in the area, these factories together employed approximately 900 women from the seven villages, a third of the factories' total workforce. They offered wages slightly higher than the national minimum requirement, and had very low educational requirements—a major obstacle to work for many village women—of their workers. Women typically started work out of high school and worked approximately 7 years on average before resigning.

While an inability to gather specific figures from MCL precluded the possibility of their recognition as the top employer in the area, they nonetheless garnered the #2 spot through market survey observations alone. Data was collected from visits to both "The

Residence" (a housing compound for expat MCL workers) and interviews with various "Flag Men" (traffic directing crews located along the side roads connecting the main road to the Banyu Urip oil well). While the staff of The Residence was largely from outside the village area, the security guards (mostly male) were from the local villages.

That said, the Flag Men represented the only other visible impact, with approximately 100 villagers employed, with nearly 15 of them women, since MCL recently decided to hire women for those road positions located near schools during school hours. While a small number, these positions were highly prized, once again for their high wage and low education requirements.

Other general observations from the employment survey further elaborate on some of the structural issues at the heart of unemployment in the area. Traditionally farmers, when the villagers sold their land to the government for MCL's ultimate usage, they lost the very land which gave them job security. As a result, those that were able became tenant farmers on nearby land, and those that were unable--or were previously tenant farmers themselves, and thus never received any money for selling land—became perpetually jobless.

While some of them and the younger generation have been reported to leave the area in search of work elsewhere, most of those now unemployed do not seem to have the means to travel very far for work opportunities. With many new MCL-derived jobs having educational requirements high above that which the unemployed have obtained, there are few opportunities for these villagers, and when there are, it is most likely to be seasonal (i.e. rice hauling work at the government run BULOG during harvesting season) or contract-style maintenance work on infrastructure projects seen quite frequently in the area of the villages.

An additional obstacle to employment is found in local-hire laws exacerbated by the location of the seven villages on the border not only of two regencies (Blora and Bojonegoro) but also of two provinces (Central and East Java). MCL's commitment to

'growing with the community' can be potentially weakened through this border-dynamic, as seen in the case of a Cepu-based supermarket being restricted from hiring workers born just across the river in Padangan, as they were from a different regency and province. A final potential disconnect with the hiring of local villagers can be observed in MCL's reliance on contract labor (for large construction projects) selected in conjunction with the input of BP Migas, rather than through local hiring exclusively.

Conclusion

As indicated above, while the Kompor Biomass Cooking Stove had a direct competitor in LPG stoves and a partial competitor in rice cookers, the Bening Satu Water Filter found only a substitute product in the form of refill water. The LPG stoves and rice cookers provided ease of use and cooking speed, but required high fuel/electric costs in the long run. This is contrast to the Kopernik stove or the traditional stove, both of which used wood, which was often cited as being freely sourced by villagers.

The water filter appeared to suffer from a lack of recognition or familiarity with the product concept. There were simply no water filters, nor awareness about such technology, amongst the merchants interviewed. The TV commercial aside, it seems that the marketed solution for water problems is primarily found in the form of refill water jugs, with a rather visible distribution system in place for refilled jugs, as well independent refill shops, for individuals who did not wish to pay an outside service to refill their jugs. Moreover, the presence of various price points and brands for refill water spoke to the high level of development of this water solution concept in the area. While a more detailed and extensive survey might contradict these findings, these conclusions represent the words of the villagers and the impressions gained through the survey as of this time, and given the aforementioned context and limitations of the survey.

While subject to various constraints and limitations, the market survey nonetheless provided key insights into the competing products and a general

illumination on the employment opportunities—especially for women--in the area. As well, this additional perspective was invaluable in the process of corroborating or contradicting the information reported by the villagers themselves through the main project interviews.

Exhibits

The following charts represent data pulled from the surveys and analyzed to show quantifiable basis for recommendations.

Chart 1

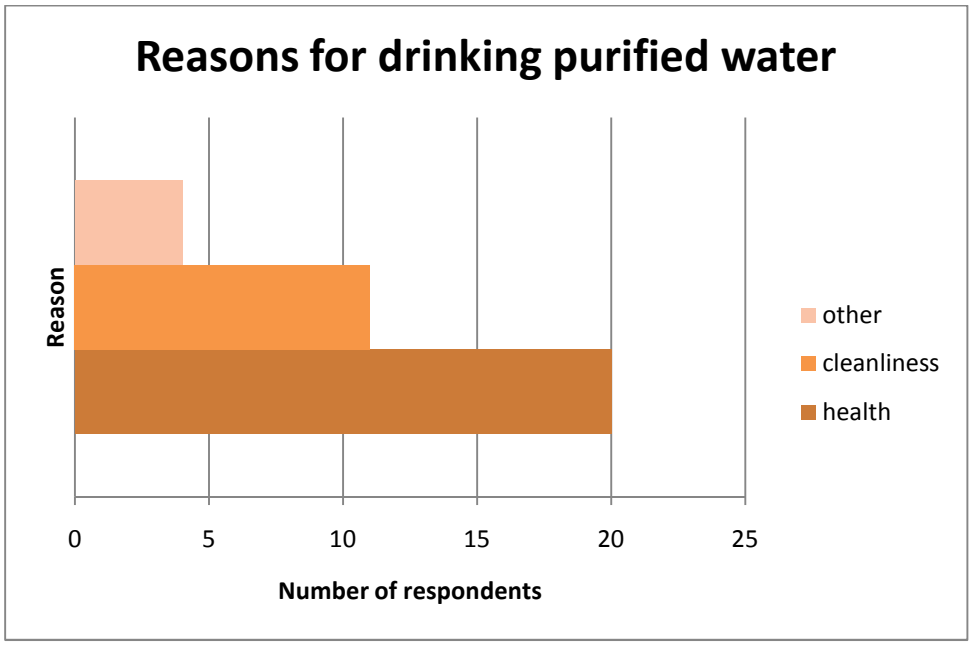


Chart 2

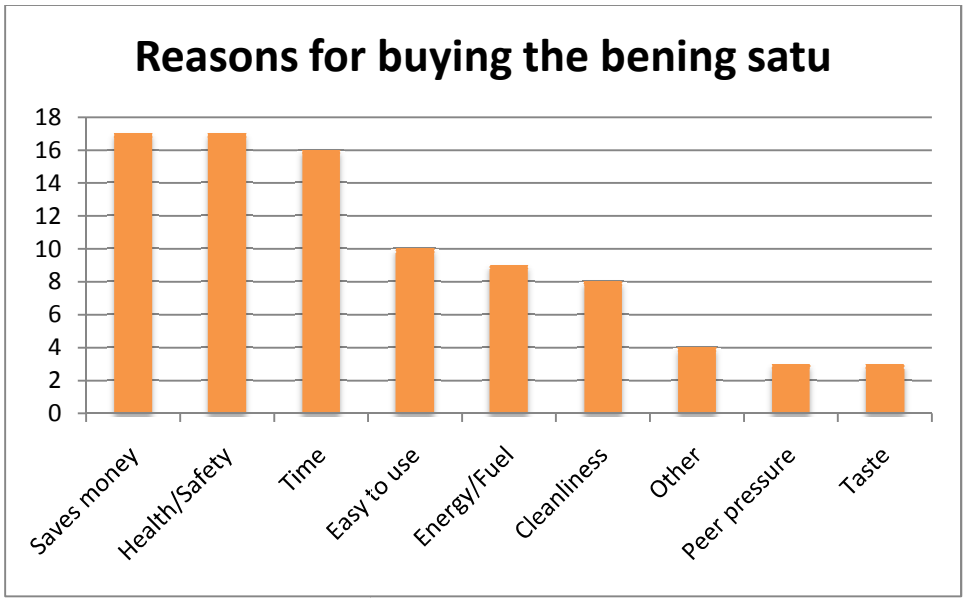
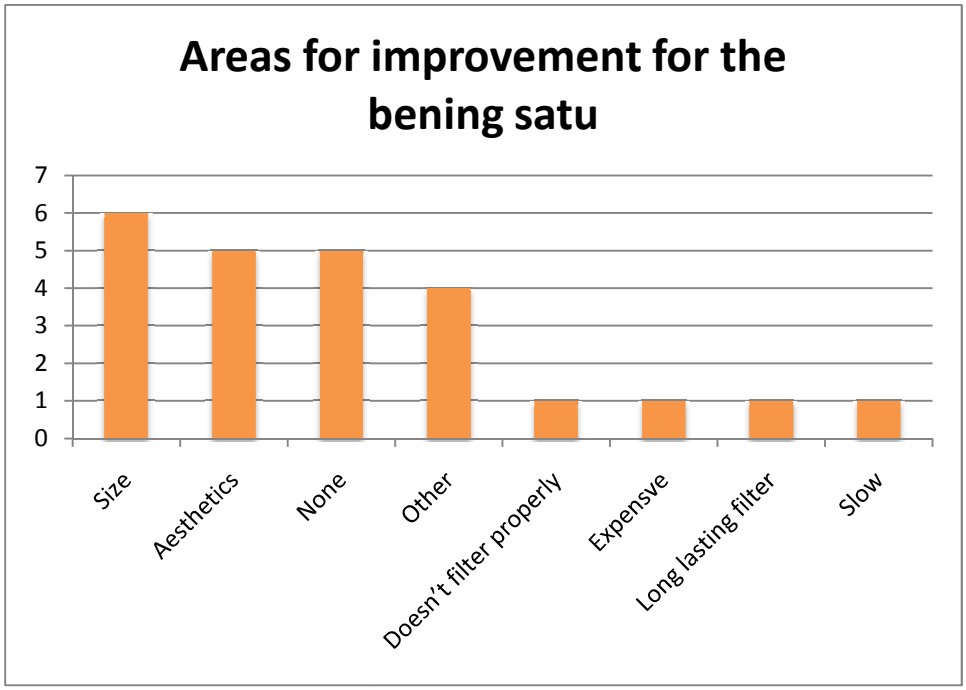


Chart 3



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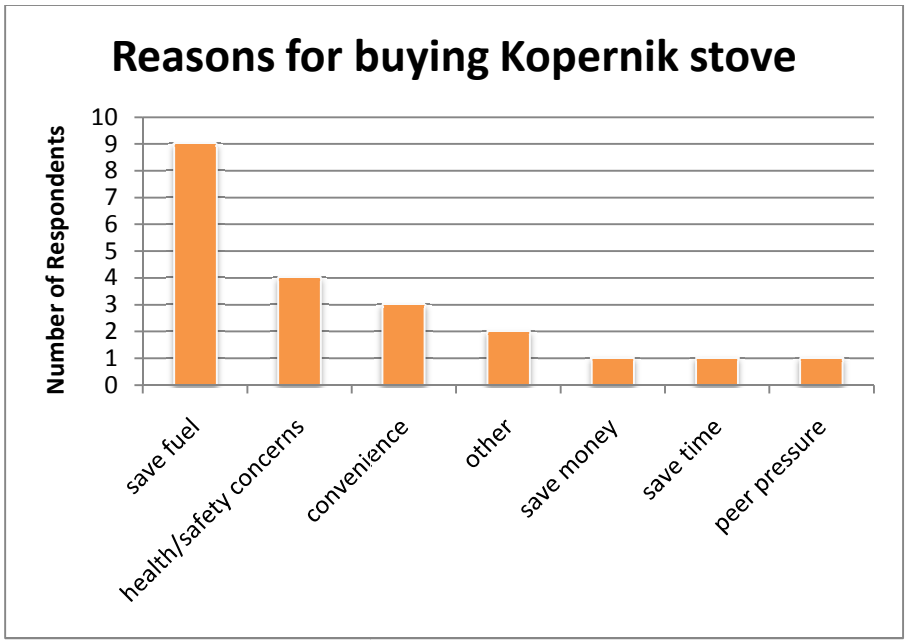


Chart 5

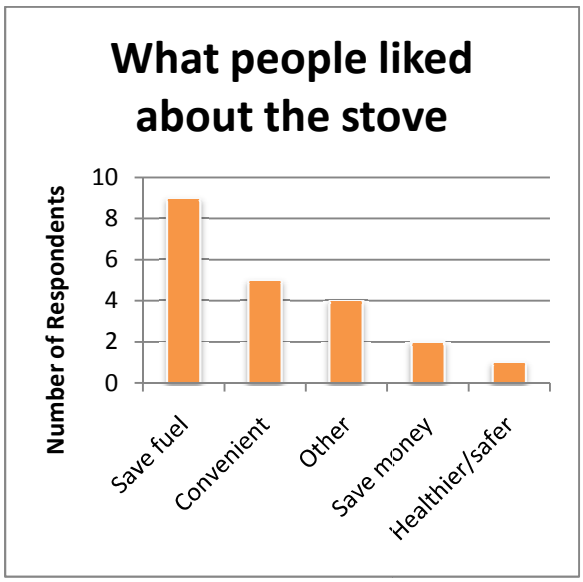


Chart 6

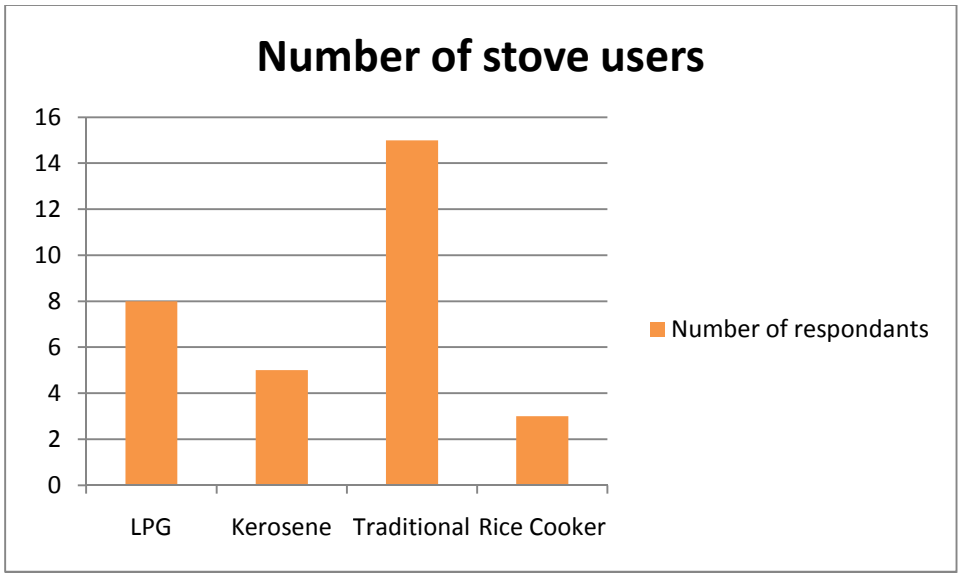


Chart 7

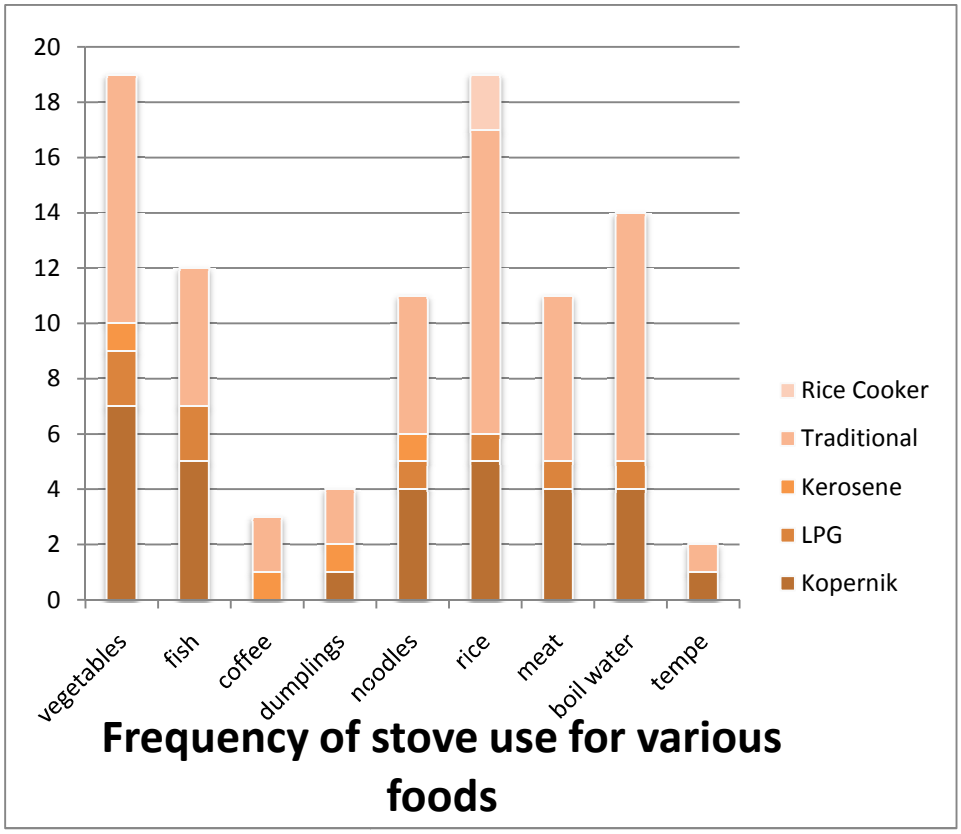
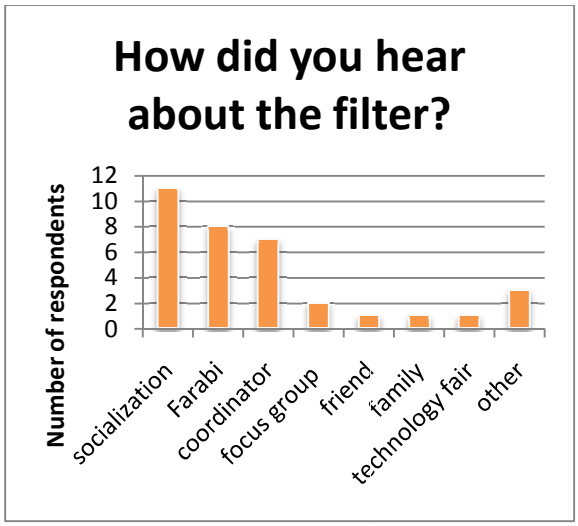


Chart 8



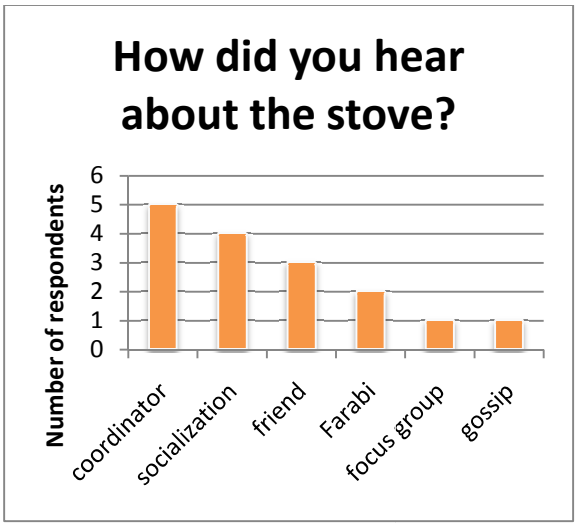
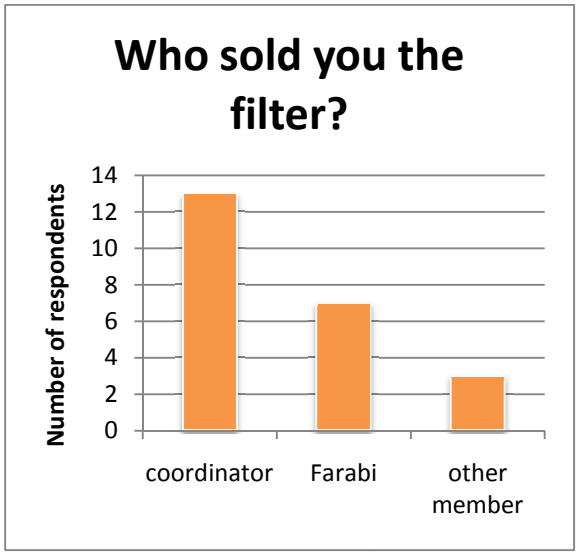


Chart 9



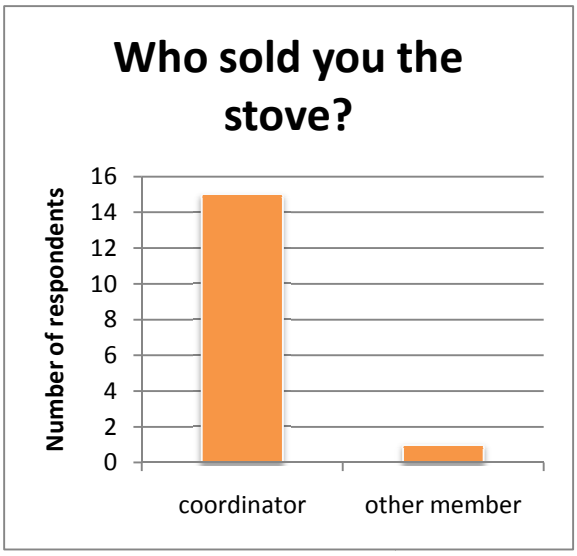
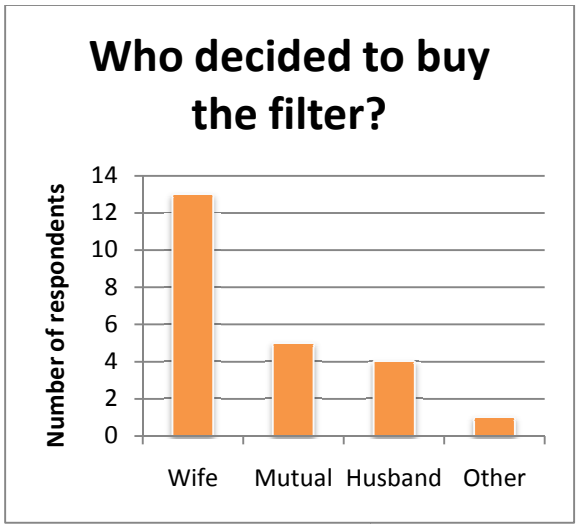


Chart 10



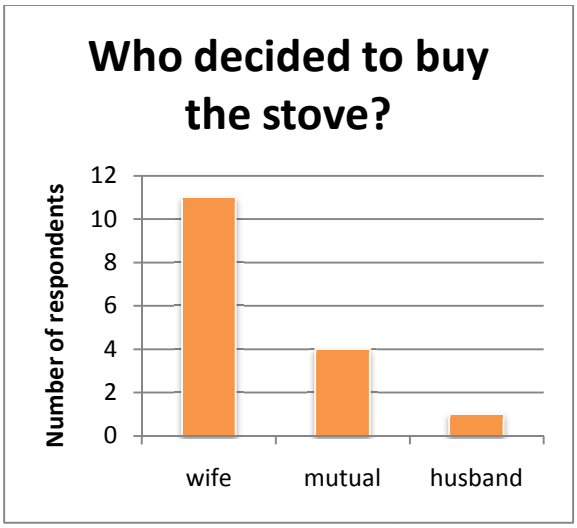


Chart 11