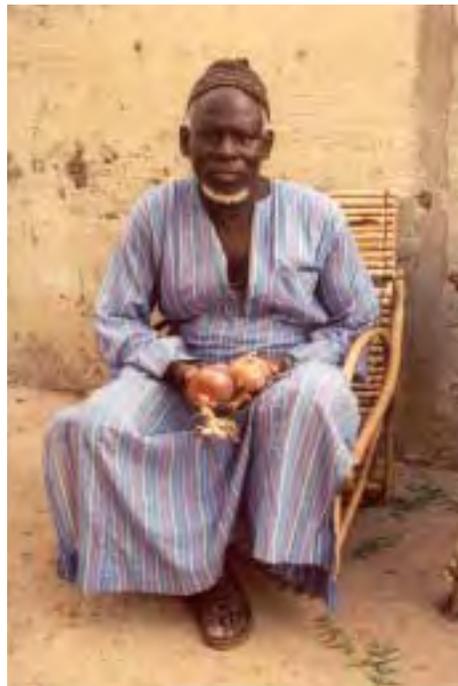




AN ASSESSMENT OF THE SOCIAL IMPACTS OF ENTERPRISEWORKS' INTERVENTIONS IN MALI



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I. Introduction

EnterpriseWorks Worldwide Inc., formerly Appropriate Technology International (ATI), is a private voluntary organization headquartered in Washington, D.C. with local affiliate offices in 15 countries worldwide. EnterpriseWorks' mission is to increase the incomes and improve the lives of small producers by helping them to add value to commodities, safeguard natural resources, and participate in profitable markets. EnterpriseWorks takes a commercial approach to development: identifying obstacles to increased production or value-added in key commodity areas, designing effective appropriate technology solutions, establishing profit-driven manufacturing and distribution systems in cooperation with local entrepreneur partners, and building markets for the new products through advertising campaigns.

EnterpriseWorks' program in Mali is implemented by its local country office, EnterpriseWorks/Mali (EW/Mali), and financed by a five-year Cooperative Agreement from USAID's Mali mission. EnterpriseWorks/Mali supports the mission's Sustainable Economic Growth objective through the establishment of commercially based production and distribution systems for several appropriate technologies. These technologies are specifically designed to produce concrete, monetary and non-monetary benefits for Malian farmers and households in three economic subsectors: small-scale irrigation, oilseed production, and household energy consumption. The small-scale irrigation project comprises treadle pump manufacture and usage and onion set production. The major oilseed production intervention is the promotion of sesame for export. Finally, the manufacture and use of ceramic-lined stoves is the focus of the household energy project.

II. Research Background

EnterpriseWorks places an emphasis on evaluating its programs based on concrete results, notably the numbers of beneficiaries and the increase in beneficiaries' incomes. EnterpriseWorks' Impact Tracking System (ITS) in Mali is based on data gathered from surveys of program beneficiaries, project records, and staff observations and allows accurate estimation of program results. This emphasis on evaluation and concrete results fits well with USAID/Mali's 'results-oriented' approach. It allows EW/Mali to calculate and report clear, scientific, and defensible information on how the interventions contribute to USAID/Mali's Sustainable Economic Growth Strategic Objective¹.

¹ See Appendix C for a more detailed description of the ITS.

The following summaries provide overall descriptions of project activities and data generated from surveys and the ITS.

Irrigation

The traditional method of lifting water for irrigation by means of a rope and bucket is labor-intensive and time consuming, presenting a major obstacle to possibilities of increased production. To address this constraint, EW/Mali promotes the commercial manufacture and sale of a foot-powered water pump, called a treadle pump. The project trains metal-working artisans to produce the pump using locally-available materials. The pumps are sold mainly to smallholder farmers who utilize the pumps for garden irrigation, although evidence shows that the pump has been utilized for a number of other purposes as well.

Through the end of 2001, nearly 1,800 standard treadle pumps (Ciwara I) were sold in Mali, at a price of 75,000 CFA (approximately \$105²). Almost 100% of the pump owners were men, reflecting the fact that in Mali, men generally have better access to irrigable land and capital to purchase the inputs for market gardening. According to a 1998 survey, Malian farmers using a treadle pump increased their crop sales by \$277 (median), from \$203 before pump use to \$480 after – a 136.4% growth in sales revenues. Furthermore, the study in Mali pointed out that the mean increase in cultivated area for the farmers surveyed was over 76 percent.³

The Ciwara II treadle pump is a deep-well pump (up to 20 meters); at a price of 135,000 CFA (approximately \$190), over 250 were sold through the end of 2001. A survey conducted in June 2001 found that clients used the pump for 3 main purposes: gardening (36.4%), watering animals (33.3%), and household needs (30.3%). Average plot size increased 101% with use of the Ciwara II, and when used for domestic purposes the pump resulted in a 50,537 CFA (approximately \$70) decrease in household water expenditures. Pumps used for watering animals also reportedly generated an average 101% increase in annual net incomes, although fluctuating sales prices during the period in question may have had a greater effect on incomes

² Costs in U.S. dollars are based on the exchange rates cited in previous survey reports. The currency has fluctuated within a general range of 550 to 750 CFA per U.S. dollar within the last few years. At the time of this report, the rate was 666 CFA per U.S. dollar. Costs in U.S. dollars, when not cited from earlier reports, are based on data from the Impact Tracking System or else conservatively estimated using an exchange rate of 700 CFA per U.S. dollar.

³ Hyman, Eric. *Findings of the Mali Treadle Pump Users Survey*. EnterpriseWorks Worldwide, Washington, D.C. 1998.

than pump usage. Taking this into account, the herders still increased their yearly incomes by 42,810 CFA (\$60) on average.⁴

Household energy

Mali's reliance on charcoal for cooking results in urban households spending a significant portion of their annual incomes on cooking fuel. EnterpriseWorks/Mali works in collaboration with local entrepreneur partners to produce and market an efficient ceramic-lined stove, also known as the SEWA. The various stove models sell in the local markets for between 1,500 CFA (\$2.12) and 6,000 CFA (\$8.47), providing a reliable source of income for metal artisans. Moreover, the improved stoves reduce charcoal consumption, resulting in significant consumer savings. Depending on the stove model, charcoal savings have been calculated between 11% and 57% compared to traditional metal stoves.

In 2001, over 14,000 improved charcoal stoves were manufactured and sold by 45 artisans and 105 resellers, mainly in Bamako. Two ceramics manufacturers produced all of the ceramic linings used to build the stoves. In total, over 45,000 stoves have been sold since 1997. EnterpriseWorks assumes that all of the stoves are purchased by women. An economic impact survey conducted in 1999 showed that consumers save an average of \$42.00 per year on charcoal expenditures.⁵

Sesame

Sesame has long been cultivated in Mali although production has been limited. Farmers have generally cultivated sesame in the traditional manner by broadcast sowing, or tossing handfuls of seeds to disperse them over the desired land area. Planted at the margins of dry season crop plots, sesame has not been a conventional staple in local diets, but used rather as a special offering for marriages or other important ceremonies, or as gifts to close family and neighbors.

Since 1997, EW/Mali has been working on a sesame promotion project to improve the production and commercialization of Malian sesame so that Mali will become a reliable source of quality sesame. Although the original objective of this project was to promote the ram press for small-scale sesame oil processing, field staff found that cottonseed oil remained more popular among

⁴ Diarra, Cheick. *Evaluation des impacts des pompes Ciwara II*. EnterpriseWorks/Mali, Bamako. 2001.

⁵ Diarra, Cheick. *Etude comparative des deux types de foyers améliorés avec les fourneaux à charbon normaux au Mali*. EnterpriseWorks/Mali, Bamako. 1999.

Malian consumers due to both its lower price and local cooking habits. The project focus shifted to improved seed production for sales to exporters as a more feasible means of generating increased income. EnterpriseWorks/Mali and its partners intervene at the sesame production stage through seed distribution to the producers, agricultural extension, and the formation of local market structures. Commercialization, the main obstacle in the subsector, is also taken into account. The project helps sesame producers to form sales groups, trains them in negotiation tactics, and organizes *bourses* (sesame markets) where economic operators and producers negotiate face-to-face.

At the end of 2001, EW/Mali was working with over 8,220 sesame producers. Approximately 29% of the farm owners were women. Together, during the 2001 season the participating farms produced 1,957 tons of sesame seed. According to a 1999 survey, between 1998 and 1999, the average sesame plot size cultivated due to project intervention increased from 0.626 ha to 1.497 hectares (139% growth).⁶

Onion sets

EnterpriseWorks/Mali field staff train project participants to cultivate and sell onion bulbs, called *Yiriwa Jaba* in the local language, to clients who can then grow and harvest full-grown onions about two months earlier than onions planted from seed. This allows the farmers to bring their crop to the market in December or January when prices are highest. Onion sets can also potentially increase the surface area under cultivation during a given gardening season by allowing producers to grow another crop on the same land before the onset of hot season.

A total of 56 onion set producers operated in 2001 with a client base of 584 onion farmers. From January to September 2001, the onion set producers increased their incomes by cultivating and selling a total of 817.5 kilograms of onion bulbs for 3,500 CFA (about \$5.00) each, or a net profit of 2,981 CFA (approximately \$4.25) per kilogram. Many onion set producers also replanted some of their bulb stock to produce full-grown onions that were also sold in local markets for a profit.

The clients who purchased the onion sets produced 83,115 kilograms of onions and sold them at prices between 275-400 CFA (approximately \$0.39 - \$0.57) per kilogram, compared to 125 CFA (approximately \$0.18) per kilogram for onions grown from seed. During 2002, EW/Mali is focusing on increasing production of *Yiriwa Jaba* to meet the great consumer demand.

⁶ Diarra, Cheick. *Impacts économiques de la cultivation de sésame dans les villages de San, Koro, et Koulikoro*. EnterpriseWorks/Mali, Bamako. 2000.

III. Purpose of the Evaluation

In June 2002, USAID commissioned EW/Mali to produce an assessment of the social impacts of project interventions to complement the existing economic data. The qualitative information captured in the study will provide a better understanding of socio-economic changes stemming from EW/Mali activities. The data will be used to improve program design and management and to provide data for future proposals and published documents. Above all, this will be an opportunity to focus on the specific observations of the program participants so that future activities will incorporate a better understanding of local contexts and perspectives.

Given the existing information and the needs of USAID/Mali and EW/Mali, the following research questions emerged as the focus of this evaluation:

1. What main social impacts emerge from the four major activities EnterpriseWorks has implemented in Mali?
2. How do these social impacts relate to the economic benefits of the projects?
3. Who benefits from these projects and how do they benefit?
4. How can EWW improve its program designs and strategy to better meet the needs of targeted clients?

IV. Methodology

In order to create research questions and interview guides, construct a sample, and capture appropriate qualitative data, the research team employed a participatory process involving EnterpriseWorks headquarters evaluation staff, EW/Mali field and marketing agents, and both American and Malian external consultants. Focus groups conducted in Bamako provided perspectives on participant characteristics and anticipated responses to interview questions, and also assisted in locating field sites.

To design appropriate samples for each activity, the researchers conducted an extensive stakeholder analysis, an examination of demographic factors, and focus group discussions with local staff. Due to the time constraints and the difficulty of travel in some regions, purposive sampling was employed in order to contact a large range of categories of participants while keeping the sample size relatively small. For some types of participants, one key informant was

included. The number of participants in the sample for each type of activity participation does not reflect the actual percentages of the total number of participants. Rather, the sample contains a wide variety of participant characteristics. Some participants were chosen to reflect gender, geographic location and productivity based on staff assumptions, and others were located using a snowballing technique through information provided by product manufacturers and resellers. Over the three-week evaluation period, the team conducted interviews with 49 project participants throughout the program target areas.

1. Small-scale irrigation
 - Pump owners: The sample consisted of eight pump owners ranging in the following characteristics: years of pump usage, low and high impact based on increased plot size, pump model, type of pump usage (animal watering, irrigation, etc.), gender, and geographic location.
 - Pump manufacturers: Three manufacturers were interviewed demonstrating differences in the number of years of participation, low and high productivity based on the numbers of pumps sold compared to other product sales, and geographic location.
2. Household energy
 - Stove owners: The sample included 13 stove owners. The owners were all women, and illustrated varying characteristics including stove model, household size, location (various neighborhoods in Bamako). One restaurant owner using the stoves for commercial purposes was also interviewed.
 - Stove manufacturers: Five stove manufacturers were interviewed to examine differences among the following: number of years of participation, low and high productivity based on the numbers of stoves sold, and whether or not the manufacturer sells directly to consumers or through a retailer.
 - Stove retailers: The sample consisted of one retailer.
 - Ceramicist: One ceramicist acted as the key informant for this category.
3. Sesame
 - Sesame producers: The sample consisted of five rural farmers producing sesame, and three women's groups. Various characteristics such as geographic location, number of years of participation, and gender were explored.
 - Sesame reseller: One sesame reseller provided information about the impacts of this business.
4. Onion sets
 - Onion set producers: Six onion set producers were interviewed varying in geographic location and gender.
 - Onion set clients: Two onion set clients were interviewed.
 - Onion set resellers: One reseller provided information about the impacts of this business.

To generate qualitative information capturing the views and perceptions of project participants, three main methods of data collection were employed in this study:

1. Observation – The researchers' observations provided insight into each participant's physical environment and socio-economic context.

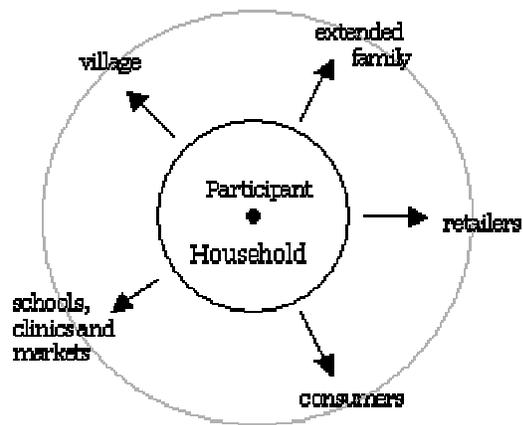
2. Interviews – The researchers employed the following interview tools:
 - Semi-structured interviews: The researchers followed open-ended interview guides tailored to each category of project participation. These interviews provided an outline of topics to cover and allowed both the researchers and participants to guide the conversations as appropriate to the context of the interview. Furthermore, the informal nature of these interviews generated anecdotal evidence to support claims of social, economic, and unintended impacts.
 - Focus groups: Focus groups were convened with three women's cooperatives participating in sesame production and processing. The stove manufacturers were also interviewed as two small groups.
3. Participatory Rural Appraisal (PRA) – PRA tools such as open-ended questions, comparison of personal experiences, visits to field sites, and use of local knowledge were used in order to confirm information and triangulate data from a variety of perspectives.

V. Data and Analysis

The following analysis is divided into two major sections: agricultural production and technology manufacture and usage. Because this study encompasses four projects with differing approaches, types of participants, and activities, a large variety of ways of segregating the data are possible.

The most obvious division between agriculture and technological production is the separation between rural and urban contexts. Information generated from the research showed that a main source of difference in benefits from project activities was the impact of increased incomes on these two categories of beneficiaries. While the livelihoods of urban participants are already integrated into the monetary economy, the rural participants revealed that the project interventions in fact supplied cash incomes that had not previously existed or had formerly been much more difficult to obtain. In fact, many of the rural participants described the impacts of project activities as life-changing, and the examples and anecdotal evidence gathered during the research supports this claim.

The analysis in each of the two sections attempts to depict the social impacts stemming from project activities as a chain of effects beginning as direct impacts to the participants that proceed to touch households and communities. In other words, the impacts can be imagined as emanating from a single point and radiating to wider circles of beneficiaries.



A. Urban Technology Manufacture

EnterpriseWorks/Mali has introduced and promoted the manufacture of two hard technologies: the ceramic-lined cookstove and the treadle pump. The stoves are manufactured exclusively in Bamako; the target consumers for this product are those urban households already using charcoal, rather than wood, gas, or other fuels as the main source of energy for cooking. Treadle pumps, on the other hand, are produced in 17 cities throughout the country in order to reach the rural client base and to tailor production to the specific demands of varying geographic environments and climates.⁷

At the end of 2001, a total of 62 small business owners (45 stove producers and 17 pump producers) were producing ceramic-lined stoves or treadle pumps for sale. Other project participants involved in technology production included a ceramicist and 8 workers, as well as 13 employees of the pump artisan workshops. In sum, approximately 159 people participated and earned income from manufacturing activities. However, the manufacturers account for less than 1% of the total number of participants in the two projects. The bulk of the beneficiaries for treadle pump and stove interventions are the product consumers. This percentage indicates that the overall economic and social impacts related directly to manufacturing activities are not as pervasive throughout the project regions as the impacts from product usage; nonetheless, the impacts of manufacturing the technologies at the personal, professional and even community levels are not insignificant. Moreover, the manufacturers are critical to providing the valuable

⁷ The treadle pump *manufacturers* will be included in the analysis of urban beneficiaries but the pump *users* will be incorporated into the rural agricultural production section.

products needed by charcoal consumers and agricultural producers. Successful, widespread dissemination of the technologies would not be possible without local production.

1. Production and sales

a. Household energy

The ceramic-lined stoves promoted by EW/Mali are produced in a series of steps. At the time of research, two trained ceramicists were producing ceramic linings from locally excavated clay. After firing and cooling, the liners are then sold to metal artisans in two locations in Bamako. The artisans fit the linings into metal casings and put finishing touches on the product, including a coat of black paint and a brand-name sticker. Finally, local resellers (both men and women) purchase the stoves to sell at a number of locations throughout Bamako.

The ceramicist interviewed stated that stove-liner production provided an important source of income; in fact, it is currently the only activity being undertaken at the workshop at this time. No problems have been encountered thus far with the demand for stove liners; sales remain consistent. In fact, new employees have been hired at the ceramics workshop to meet the large demand for the product; the business has grown and labor time has increased. The ceramicist employed 8 workers in 2001.

Metal artisans producing the stoves, who are predominately illiterate and do not keep sales records, expressed the perception that the activity generated much additional income. In 2001, 45 small-scale metal artisans were actively producing ceramic-lined stoves. Multiplying the estimates of net profits per stove (from a 1999 survey) by the numbers of stoves sold shows nearly 16,880,000 CFA (over \$24,100) earned from stove sales in 2001, or an average of approximately \$536 earned in net profits per stove artisan.⁸ It was noted that the stoves sold particularly well during the rainy season, although the stoves sold consistently throughout the year. Due to this economic benefit, the artisans have ceased to produce other kinds of improved charcoal stoves such as the “nafatiama”

“For many years we have been in the workshop, but the arrival of the Sewa was the high point. The gain surpasses by far that of other manufactured products; we have never made such large incomes.”

Bakary Dembele and Bourama Konate, stove manufacturers.

⁸ Diarra, Cheick. *Etude comparative des deux types de foyers améliorés avec les fourneaux à charbon normaux au Mali*. EnterpriseWorks/Mali, Bamako. 1999.

and “teliman” because they were not as profitable and consumer demand was not as high. The ceramic-lined stoves are sold either directly to customers at the metal workshops, or to resellers. Due to EW/Mali’s support in the form of demonstrations and advertisements, there is never a lack of clients. Production has continued to increase over time. One artisan expressed that he had been doing metalwork for many years, but the income from the SEWA stove surpasses by far the income from other metal products such as watering cans, oil lamps, and cooking utensils. “We have never made such large incomes,” was one statement made referring to the artisans as a group.

While stove resellers do not significantly increase their overall incomes from the stove sale profit margins, other benefits were cited. The stoves served as a way to diversify the stock available and therefore afforded the possibility of increasing the clientele. Moreover, clients purchasing stoves were likely to browse and perhaps buy other products from the particular shop or stand.

b. Small-scale irrigation

Metal-working entrepreneurs in 17 locations throughout Mali manufacture treadle pumps with marketing and quality-control support from the project. Using locally available materials, three models of pumps are currently being produced: Ciwara I (standard), Ciwara II (deep well), and the Ciwara Nogon (least expensive and lowest capacity). For this study, the Ciwara Nogon was excluded because it has been on the market for less than one year; information regarding the impacts of this product would therefore be fairly tenuous.

As in the case of the stoves, all of the artisans are men. The fact that 100% of the hard technology producers are men reflects the fact that in Malian society, women are almost never expected to provide a significant portion of household income nor are they encouraged to seek training in metal- or wood-working.

The three pump producers interviewed expressed a strong liking for treadle pump technology. They pointed out some of the advantages of pump production: 1) the pump is easy for the artisans’ apprentices to understand, 2) it is easy to manufacture in little time, and 3) it generally does not engender accidents in the workplace. Moreover, the cost of production is not too high and the materials are always available at local markets.

The demand for pumps is sometimes great, above all during the dry season when there is a greater need for ground water. However, according to the artisans, periods of higher pump

demand do not interfere with the manufacture of other products. With the help of EW/Mali, the technology is constantly being improved to better serve the clientele. Adjustments and reinforcements are made to different pump parts according to information and suggestions provided by manufacturers and clients. The Ciwara Nogon was specifically created so that a larger number of clients could afford the product.

Pump manufacturers confirmed that treadle pump production has increased the number of products offered and this in turn has allowed them to earn a greater income. Due to EW/Mali's promotion techniques such as television commercials and practical village-level demonstrations, many clients have been attracted to the pumps. What's more, the pump clients also buy other products from the workshops, such as windows, doors, and chairs, and this in turn has increased the amount of products manufactured for sale. Much of the increased revenue afforded by pump sales is reinvested into raw materials for all kinds of products in order to grow the businesses.

2. Impacts

An analysis of the responses from the two above-mentioned groups of participants showed that the pump and stove manufacturers experienced similar social impacts despite the differences in products and locations. The reason for these similarities stems from the comparable profiles of the majority of these artisans. All of the manufacturers and their workers are men living in urban or peri-urban areas. Although some may participate in agricultural activities to supplement family needs, the livelihoods of these producers and their households depends mainly on their manufacturing activities and are dependent on the monetary economy. Through the project the artisans benefit from technical training which improves personal confidence and professional competence and business skills. More importantly, the acquisition of new technologies and techniques allows access to a larger market for manufactured goods that meets increasing demand for higher-quality products.

Earning money from increased product sales allows the artisans to increase their consumer power. As in most societies, Malians living in cities spend money on goods and services to which their rural counterparts may not need or even have access. Urban life generally incurs repeating regular expenses on a daily, weekly or monthly basis; for example, monthly water or electricity bills, groceries, and fares or fuel for transportation. Furthermore, the cost of living in a city is typically much higher than in rural areas. All of these elements affect choices related to income expenditure and even the purchasing power of the consumer.

Another notable factor affecting spending habits is the regularity of the income. While technology sales may be heavier during certain seasons, manufactured products are sold throughout the year providing small increments of earnings on a somewhat regular basis. During the rainy season when pump sales are the slowest, the artisans may return to producing doors, windows, or furniture. Unlike pumps, stoves remain in demand throughout the year, with the heaviest sales during the rainy season. Therefore, the manufacturers earn consistent incomes. Depending on sales success, some of that income could be put aside as savings. However, it is more likely that the money earned would alleviate the costs of day-to-day household needs. The information gathered from the artisans points towards the latter option. In other words, the increased incomes of manufacturers in urban areas is generally spent on routine family expenses. According to the participants, the revenue earned that was not reinvested in business growth was used to pay for the following household needs: educational expenses such as school fees and supplies, health care including doctors' visits and medicine, food, clothing, motorcycles, and contributions to marriages, baptisms, and other ceremonies. The manufacturers interviewed provided these examples of how increased incomes were utilized, but the percentage of income spent on specific items was not available. Moreover, some manufacturers were reluctant to discuss the financial aspects of their participation in the project.

Significant social benefits result from increased and more secure incomes. Not only are the artisans empowered with a sense of financial security, they are also better able to assure food, health care, and education for their families, and to some extent to their apprentices and workers. Some of the financial gain is shared with more extended family members in the form of participation in ceremonies. The ability to more fully contribute to both personal and familial well-being motivates the artisans to continue developing their businesses, which in turn generates higher incomes along with other beneficial results. For example, the ceramicist interviewed has hired more workers and is able to ensure their salaries are paid. Furthermore, using income from ceramic-liner sales, the ceramicist's apprentices have received training in literacy skills. Such activities benefit the personal development of the apprentices and increase professional capacity in the workshop.

While the economic benefits of technology manufacturing have produced notable social impacts in the lives of participants, other important results emerge from the interventions upon closer examination. For example, the production and successful marketing of technologies promotes full employment of the participating artisans. Although the artisans were engaged in production prior to the project, the profit margins had generally been negligible and periods of little or no

sales would slow or even halt production. A substantial, continuous demand for new products such as stoves and pumps caused most artisans to scale-up their businesses; many manufacturers stated that periods of unemployment were rare or nonexistent due to the project.

Another impact resulting from participation is improved social standing of the manufacturers in both the business community and among family and friends. Through successful production and sales of a valued technology, the manufacturers earn respect from satisfied clients and counterparts in the manufacturing sector. Large purchases such as motorcycles demonstrate to others the secure financial situations of the participants and their households, and even enhances the image of the greater extended family. Finally, the ability to better contribute to social obligations such as contributions to the cost of marriages and funerals increases the dignity and esteem accorded to the manufacturer; the respected role of family provider is affirmed and enhanced by profitable employment.

In sum, the manufacturers benefit from project participation at several levels. At a personal level, they receive technical training to add value to their existing product line and earn increased profits as a result. The increased incomes empower the participants to grow their businesses and directly improve the welfare of their respective households. This second level, the household, is impacted by both the financial gain and the improved social standing of their main family provider. The project indirectly benefits the greater community through the distribution of wealth to the extended family system and stimulation of the local economy. Further research will help to measure the sustainability of manufacturing appropriate technologies as a successful approach to economic development in Mali.

B. Urban Technology Usage

Through EW/Mali marketing techniques such as demonstrations, television commercials, posters, stickers, and the public display of two giant stoves, the ceramic-lined stove technology has been successfully promoted in Bamako and sold to approximately 45,000 consumers since 1997. The improved stoves impact the population at a number of levels; first, as described above, profitable employment opportunities are created. Second, the stove consumers save money on charcoal and have found a number of other benefits, illustrated below, stemming from usage. Finally, the large-scale reduction in charcoal use over time will reduce the amount of carbon dioxide emissions polluting Bamako's environment and will potentially decrease the number of trees

felled for charcoal production. In essence, the production and use of stoves generates both socio-economic and environmental impacts.

1. Stove Usage

The majority of stove users are women, due to the fact that in Mali women are responsible for almost all aspects of family food consumption including shopping, buying charcoal, preparing meals, and maintaining the household kitchen area. All 13 of the consumers interviewed stated that the stoves were purchased and used for cooking purposes. Other possible uses may include heating water for bathing, or using the stove as a heat source in the home. However, due to the generally hot climate there is not a great need for heating devices and the bulk of household energy used is devoted to cooking.

According to the stove owners, the stove is easy to light and use. What's more, the stove noticeably reduces cooking time and does not necessitate constant monitoring. For example, the traditional metal stove must be fanned often to keep the charcoal lit; this task is eliminated with use of the ceramic-lined stove. The women interviewed unanimously stated that use of the stove had reduced charcoal consumption from one kilogram per day to approximately a half kilogram or even less per day. This confirms the statistical data generated from a 1999 survey which shows between 11% and 57% charcoal savings depending on the size of the stove;⁹ in 2001, 43.3% of the total stoves sold were the large model, with an average charcoal savings of 33 percent. The next most popular size was medium (20.5% of the total sales), with 27% average charcoal savings. The perceived 50% savings revealed in the current research may be compatible with this data when considering the following explanations:

- The ceramic-lined stove is shallower than the traditional stoves so that consequently a smaller quantity of charcoal is lit. Furthermore, the ceramic liner retains heat much more efficiently than the metal stoves and cooks food faster. Once the user becomes accustomed to the improved stove, she may further decrease the amount of charcoal used each time to maximize the stove's efficiency. This more exact quantity may take a few weeks or more to gauge.
- The stove users do not keep written records of charcoal consumption, so the stated 50% savings is a rough estimate.

⁹ Diarra, Cheick. *Etude comparative des deux types de foyers améliorés avec les fourneaux à charbon normaux au Mali*. EnterpriseWorks/Mali, Bamako. 1999.

The stove users mentioned that although the ceramic lining seems fragile, the stove is actually durable and works for a long time, especially when used as instructed. EnterpriseWorks/Mali has calculated that the average life of the stoves is about two and a half years, in comparison to the three- to six-month life of traditional metal stoves.

2. Impacts

The most evident impact of improved stove usage is the reduction of charcoal consumption and resulting decrease in household fuel expenses. This is the direct, tangible benefit of the technology and the reason that it has been successfully promoted. The product guarantees economic savings for urban charcoal consumers, explaining its popularity.

While the cumulative annual savings are appreciative (\$56.13 for the large model, \$29.35 for the medium model), the daily savings, while perceptible, are not large enough to cause significant changes in spending habits. The large stove model saves approximately \$0.15 per day, while the medium size stove saves about \$0.08 per day. The users all noticed spending less money on charcoal, but were unable to specify the direct impacts of the savings. One woman declared, "The SEWA stove lets me save charcoal and therefore money, but it is difficult to determine what happens to these savings because I don't think about it or calculate it."

Most of the women interviewed mentioned that the small daily savings were added to the money spent on ingredients for sauces or the price of general household expenses. Small purchases such as soap, children's pencils and pens, snacks, and aspirin are bought with the women's money. With the savings generated from reduced charcoal consumption, the users found it easier to cover these daily costs. In fact, some users revealed that this advantage made the home more "peaceful" in that there was less need to ask their husbands to cover small costs.

Because the stoves light quickly and do not need to be constantly tended to keep the fire lit, the women can spend the saved time doing other activities. The women said that they do other chores such as sweeping or cleaning while the food is cooking, or even take time to rest. Most Malian women, even in the urban setting, are engaged in many physically demanding tasks throughout the day in order to maintain their homes; the possibility of saving time or resting greatly reduces the stress of this burden and the fact was appreciated by many of the stove owners.

Another observation made by all of the consumers interviewed is that the ceramic-lined stove is much cleaner to use than the traditional stoves. The ashes from the burned charcoal fall into a contained space at the bottom of the stove, facilitating disposal. Moreover, the reduced quantity of charcoal and cooking time decreases the amount of smoke from charcoal combustion. One woman stated, "I can even cook in the living room with this stove, especially when it rains." The stove owners interviewed remarked that the ceramic-lined stoves produced less smoke and escaping heat and were thus less irritating to the eyes and body. Further study may reveal that the reduction of dust and emissions may have a positive impact on the health of women and children, who are most likely to spend considerable amounts of time in the kitchen area.

C. Rural Agricultural Production

EnterpriseWorks/Mali has launched three interventions targeting rural agricultural producers in order to increase productivity and to assist in the marketing and promotion of the production. The projects focus on onion set and sesame cultivation, and on increasing the irrigation capacity of smallholders through treadle pump usage. A range of participant ethnicities and farm locations across Mali are represented in the sample; however, the participants share a number of similar characteristics. Malian agricultural producers generally live in rural areas with little infrastructure such as paved roads and electrical connections, and they are often located at a significant distance from schools and health care facilities. According to World Bank statistics, the GNI per capita in Mali in 2001 was \$210. Although this figure is not disaggregated between rural and urban populations, the data still points to the fact that most Malians are living on less than \$1.00 per day and the average is likely to be lower in rural areas. In rural zones, such low incomes impede access to goods, services, and markets, thereby slowing the development of these communities.

The rural producers interviewed for this research unanimously stated that they have diversified their productions and increased their annual incomes. Many confirmed that the techniques and technologies introduced by EW/Mali have eased the tasks of agricultural labor. The impacts of these changes are presented in this section following a description of project activities from the perception of the participants.

1. Cultivation and Production Usage

In Mali, nearly all crops produced are cultivated with manual labor. According to the season, rainy or dry, a variety of plants are prepared, planted, irrigated, maintained, and harvested by hand; these tasks are physically demanding and take a major portion of the day to perform. Rigorous upkeep of the fields must be undertaken daily for successful crop production in the Sahelian environment. EnterpriseWorks/Mali has introduced a number of technologies aimed at reducing the difficulty, increasing productivity, and increasing the profits of agricultural production.

a. Onion sets

Before EW/Mali initiated the promotion of onion sets (known as *Yiriwa Jaba* in Bambara), most of the participants were producing other market vegetables. The process of onion set production is comprised of two main steps: the cultivation of onion bulbs and the use of onion bulbs to produce full-grown onions. The project provides training in onion set production and also provides marketing support in the form of demonstrations, radio spots, and advertisements through stickers and signs. This activity has generated much interest among rural producers and those who have adopted the technology have found it to be very profitable. In 2001, 56 onion set producers received training and support from EW/Mali; these participants supplied onion bulbs to 584 retail clients, who then resold or replanted the bulbs. A survey conducted in April 2001¹⁰ found that one kilogram of onion bulbs sold for a little less than \$5.00, and the average amount of bulbs produced per participant was approximately 29 kilograms.

After planting the onion seeds, the producers grow the bulbs for about four to five months. The bulbs are then harvested and packaged for sale at local shops and markets. The participants interviewed appreciated the fertility of the onion seeds promoted by EW/Mali, stating that the nurseries produced well and grew to term in the desired timeframe. Conversations with the onion set producers also revealed almost complete satisfaction with the bulbs produced following the advice of the project agents. Some of these participants retained a portion of their bulb production in order to replant and cultivate full-grown onions. Those who had carried out the second stage of the onion set production were pleased with the large size of the onions.

¹⁰ Diarra, Cheick. *Evaluation des impacts de la production de Yiriwa Jaba*. EnterpriseWorks/ Mali, Bamako. 2001.

Generally, EW/Mali determines the best timeframe for onion bulb replanting. The key to the success of the intervention is related to when the onions planted from these bulbs mature and can be sold to consumers. Normally, due to the timing of other agricultural activities, large onions are scarce in local markets in the period from December to the end of January. Therefore, producers receive much higher prices for onions during this time than later in the year when the market is saturated; one kilogram of onions during the latter period sells for about 70 CFA (less than \$0.10) compared to 260 CFA (about \$0.35) per kilogram when the onion shortage occurs. Onions grown from bulbs mature during the most profitable timeframe. Moreover, because the onion cultivation period is shorter, another set of crops can be planted on the plot once the onions have been harvested, providing another possibility for increased income. Finally, women in the participants' households often sell onions and also onion leaves from their homes and at small village markets. This provides a small source of income for women to spend on food and other purchases for their families.

Not only do households use the onions for commercial purposes, they also consume a quantity of the onions produced and many participants confirmed that the leaves are often used in sauces. Household consumption of the production saves money and offers nutritional benefits.

b. Small-scale irrigation

In 2001, approximately 2000 treadle pumps were in operation throughout Mali, except in the northern Sahara region. The treadle pumps were originally designed to facilitate small-scale garden irrigation but some owners have employed the technology for other purposes such as animal watering and household provision. Nonetheless, the majority of pumps are still reserved for irrigation use and are mainly purchased by male smallholders, although a small percentage of the owners are women. Although many women participate in agricultural activities in Mali, it is customarily the men who control access to irrigable land and have the necessary capital needed to purchase farm implements and inputs.

Owners of the Ciwara I and II treadle pumps found that the technology is easy to use, demanding physical force rather than economic expenditure to operate. At first the pedaling motion can be tiring, but as the users become accustomed to the movement, they generally find it to be easy and even fun. According to the owners, men, women, children, and even the elderly can operate the pumps.

The technology can be adapted to different physical environments, as long as the water table does not surpass the required depth for the pump to function. In general, the pumps are used intensively during the dry season and somewhat more infrequently during the rest of the year; some pumps may be stored during rainy months. The simple design allows the owners to maintain and repair the technology using materials available in local markets. The pumps may also be returned to the manufacturers for repairs such as welding that the owners cannot perform themselves.

In general, the participants expressed that the pumps assured that water needs would be met. Use of the pump greatly reduces the amount of time spent on lifting water compared to the traditional method employing a rope and bucket. One participant affirmed that his irrigation time had decreased from five hours to one and a half hours with use of the pump, leaving more time for other garden tasks; another remarked that filling his cement water basins took only five to ten minutes compared to three hours pulling water by hand. All of the pump owners interviewed affirmed they had increased their plot sizes. The woman owner interviewed stated that before purchasing the pump, she was obligated to water her garden twice a day to be able to cover all the plants; she now has doubled the size of her plot and waters only once daily in the morning. The possibility of increasing plot sizes affords a major economic benefit to the participants in that they can produce more crops either to sell or consume in the household. Many owners chose to diversify their crops. What's more, the producers found that by using the pumps, they were able to better irrigate the plots so that the plants' growth was assured and sometimes even accelerated. Crops cultivated using the technology matured well and produced high-quality final products. One participant claimed that the flavor of his vegetables had improved; this is probably due to the improved level of maturation reached prior to harvesting.

Treadle Pump Benefits
according to the users

- Easy to use and maintain
- Reduces time related to irrigation tasks, allowing owners to increase plot sizes
- Facilitates animal watering
- Provides cleaner water than many traditional wells
- Facilitates access to water for household needs such as cooking, bathing, and washing
- Can be used for mud brick construction
- Reduces monthly water bill

Herders who use the pumps for watering animals such as cows, goats, sheep and fowl also expressed an appreciation of the technology's utility. The participants interviewed affirmed that using the pumps ensured more water for the animals' consumption in contrast to the limited amounts from the traditional method of lifting water in buckets or leading animals to watering holes. One participant remarked

that before purchasing the pump, he had employed two boys to water his animals once a day. With the pump, he does not need to spend money to hire labor and because of the rapidity of the task can water the animals twice or more every day, even during the dry season. It was also noted that the animals were stronger and in better health, with many fewer illnesses and deficiencies related to insufficient or low-quality water consumption. One owner claimed that the occurrence of false births among his female animals had disappeared. This owner also stated that he had diversified his stock with the purchase of a "Dutch" cow which requires a significant amount of water.

Another notable use of the treadle pump mentioned by participants was collecting water for household needs. One smallholder had installed the pump in a garden close to approximately ten households; the women from these neighboring homes came to use the pump rather than the wells in their compounds. The participant explained that the water in the other wells is not as clean and tends to dry up quickly during the dry season. Using the pump, the women have had easier access to water for tasks such as cleaning and cooking. Both women and children use the pump water for bathing; other people in the area use the pump to water animals and in the construction of mud bricks. Another owner interviewed in a small city had purchased a pump specifically for household needs, in order to lower the cost of his monthly water bill. However, this participant claimed that the pump was difficult to operate and tiring. This criticism may owe to the fact that people living in more urban areas may not be habituated to the same level of physical labor as their rural counterparts, so that pedaling for the small amounts of water needed for cooking and washing may seem cumbersome or possibly even undignified. On the other hand, this particular participant did state that the treadle pump was more efficient than pulling water in the traditional fashion.

c. Sesame production

The information generated during this study verified that sesame is much easier to cultivate than other cash crops. Planting, weeding, harvesting, and threshing require comparatively little labor time and energy; the participants stated that sesame necessitated approximately half the labor time of other crops. This is due to both the variety of sesame seed promoted through the project, which needs less water and grows under difficult conditions, and improved planting techniques. Furthermore, the producers stated that sesame cultivation does not encroach on other agricultural activities and the ease of cultivation allows women to become more active in sesame production. Some producers have chosen to replace groundnuts with sesame because of these advantages.

Certain producers remarked that sesame cultivation is often affected by insufficient rainfall and pests, although all the producers confirmed satisfaction with the size of their harvests.

Producers use sesame in the traditional manner as gifts to friends and family, and many also mentioned using seeds as an ingredient for sauces. The seeds are also used to produce oil on a small scale for family needs. One producer reported using sesame straw as feed for cattle. The two women's cooperatives stated that they had benefited from their partnership with EW/Mali in learning to process sesame for making soap used for washing dishes and clothes, skin lotion, and sesame seed bars and cakes. Interestingly, two producers in the region of Koro stated that sesame was used as a traditional medicine to relieve coughs and symptoms of asthma.

**“He that sows
sesame harvests
money.”**

*Koro sesame
producer citing a
Dogon saying.*

Working with EW/Mali, the producers have been able to identify a number of markets suitable for sesame commercialization. One of the principal activities of the project is to organize *bourses* during which producers and economic operators meet to negotiate buying and selling sesame seed in a mutually profitable manner. In this way, links are forged to form a chain where producers can sell on a local market to operators who then sell to wholesale exporters. With support from EW/Mali, the seed is easily and quickly sold for cash. One producer near Koro quoted a Dogon saying: “He that sows sesame harvests money.”

Discussions with participants also established that two avenues of commercialization are available: sale of the seeds, and sale of the products from sesame transformation. The latter option is above all practiced by the women's cooperatives; they sell both unprocessed and processed sesame. Using traditional methods or the ram press, the women produce soap, lotion, and oil, as well as sesame bars and cakes for resale. The by-product from oil extraction is also sold as animal feed.

Sesame is victim to fluctuating world prices and this constituted a major factor of stress and discontent for the sesame producers, who hope for stable prices and need a reliable cash flow. Many of the producers interviewed cited low prices as a major concern.

2. Impacts

Although targeted to different participants, the three types of interventions described above, onion set cultivation, small-scale irrigation and sesame production, engender a number of very similar impacts. These rural agricultural producers earn cash incomes from productions that are subject to weather, the limits of human labor, and difficult access to inputs and markets. One of the main benefits of these projects, and indeed a major goal of the entire program in Mali, is the increased income generated through project participation. This extra income is used for a variety of purchases and investments that directly impact the livelihoods of the producers and their households. Other benefits from project participation include improved farming techniques and access to appropriate technologies, contributions to food security and better nutrition from improved local agricultural production, promotion of social cohesion through building local business partnerships and cooperatives, empowerment of families to secure needed provisions, and the creation of sustainable employment opportunities.

a. Benefits from increased incomes

Previous economic research has shown that through EW/Mali's interventions, participants increase their annual incomes earned from the sale of agricultural productions. During this study, the researchers did not attempt to collect additional specific economic data; rather, the participants were asked if any difference in income had been noticed and how that difference had impacted their households. The responses fell into the following categories:

Re-investment in agriculture and business activities: A majority of the producers described spending a portion of their profits on agricultural inputs including seeds, fertilizers, pesticides, plows, draft animals, carts, and motorized irrigation pumps. One participant had used a part of his income to buy additional agricultural plots. The female pump owner interviewed mentioned paying for the salary and food for a hired laborer; another used some of the income to build a fence around his garden. Other producers spent money on business investments other than agriculture; these expenditures included the purchase of fishing line for commercial purposes, seed money for small commerce, and even a sewing machine.

One producer who had replanted onion bulbs and sold full-grown onions had used most of the income generated from that activity to contribute to the purchase of a motorized mill. This mill was installed in a building connected to the household compound and was operated by the

producer's family. For a small price, women in the neighborhood may bring produce such as shea nuts and millet to the mill for processing. The onion producer and women present during the interview stated that the mill has greatly eased the arduous tasks of making shea butter and pounding millet; typically these tasks are relegated to women and are physically demanding and time consuming if done using traditional tools such as a mortar and pestle. Not only does the mill decrease women's labor, it also provides a steady source of income for the household operating the machine.

Using the income generated from sesame production, a women's cooperative has set up a credit fund so that members may borrow money to start small businesses such as knitting, clothing sales, and food preparation and sales. Once a member has presented valid reasons to receive a loan and has borrowed the specified amount, it must be repaid after six months with an interest rate of five percent so that the fund slowly increases. Additional profits from other crops, such as peanuts, are also added to the fund.

Reinvestment in agriculture and business allows more possibilities for income generation and also permits the purchase of better quality and greater numbers of inputs for increased production. The decision to reinvest also demonstrates interest in the activities and a desire to achieve greater economic returns. Economic growth at the household and community level is thus stimulated and continuously sustained.

Education: Nearly all of the participants interviewed stated that revenues earned from project activities contributed to or paid entirely for the cost of children's education. Such educational expenses include school supplies such as pens, notebooks, text books, and clothing. The public school system in Mali requires families to pay annual fees for children to be enrolled. Often, these fees are due at a time when cash assets are low or even nonexistent. One onion set producer recounted that previously he had been forced to sell a cow in order to afford school payments, but because of successful onion bulb sales he can now easily pay for the fees. Many producers expressed that former concerns and worries regarding educational costs no longer existed.

A few participants mentioned having purchased bicycles for their children so they could go to schools, some located far from their respective villages. One sesame producer's son now rides ten kilometers to the nearest school; without the bicycle this would not be possible. Others paid for private school fees and one market gardener stated that he had hired a private tutor to provide supplementary lessons to the children in his household. Not only does the increased

income secure the possibility of providing an education, it also may be used to improve the quality of the instruction.

On top of children's education, adult education was also supported by income earned from project activities. Very notable is the case of a women's cooperative interviewed who had used income from sesame production to contribute to the construction of a one-room training center in the community, financed in part by another international organization. Village meetings and training sessions take place in this building to educate and strengthen social structure in the surrounding communities. This cooperative also affirmed that they had purchased textbooks so that members can study reading and writing.

From the testimonies of the project participants, it is evident that education and the associated costs are major considerations in rural households. The few participants who did not specify educational costs in the expenditure of increased income either were not sending their children to school at all, were not in charge of managing money for education (so did not know if money from the activity had entered into that category), or had older children no longer attending school.

Health: All of the onion set and sesame producers and all but one pump owner affirmed that income from production sales was spent on family health care. Interestingly, most participants described costs related to children's and women's health, mainly for medicine and doctors' consultations. Many of the participants stated that they had spent money on malaria treatment both for their children and other family members including themselves. Generally, the increase in income provided a better cushion for all types of health care costs that had previously caused anxiety, especially in emergency situations.

"The motor pump and onion cultivation have decreased my worries about difficult situations like health and education. There has really been peace and an easing of burdens."

Moussa Coulibaly, onion set producer.

"Women in my family no longer worry about affording maternity visits because they know I am selling many onions."

Ali Kamia, onion set producer.

One producer explained that because of the cash income earned from sesame, he had been able to pay for his uncle's surgery; a pump owner recalled the time he had sold a portion of his pepper production to buy medicine for his grandchild's illness. Members of the women's cooperatives interviewed and women in participants' households use portions of increased revenues to pay for pre- and post-natal care.

Without more in-depth research of the health impacts of EW/Mali interventions, it cannot be assumed that the health of the participants and families has indeed improved because of the activities. However, in general, increased cash earnings seem to increase the likelihood that illnesses and other health care needs will not go untreated; in other words, income from project activities provides better insurance that money is available for health care. When health needs arise, the participants are less likely to be forced to use cash normally allocated to other expenses, borrow from another person, or even sell a valuable asset to afford the medicine or treatment necessary.

Another health benefit stemming from increased incomes is the consumption of a larger quantity of higher-quality foods. Again, until more detailed data on the nutritional value of foods consumed before and after project participation becomes available, it cannot be stated with accuracy that nutrition has improved among participants and their families. On the other hand,

The experience of Mariam Segnou, treadle pump owner.

“The Ciwara pump helped me to double the size of my plot of 70 planted beds. I’m now at 140 beds. Despite that, the watering time has really decreased compared to before, when I took the whole day to water the 70 beds.

“Part of the produce is for familial consumption and in this way I help my husband support the family. For example, last year I produced 30 beds of potatoes and all of it was for my family. Other produce such as lettuce, cabbage and onions are consumed by my family or are used to buy other staple grains.

“The profit from the produce sales allow me to pay for costs related to health care and education. With the income, I took care of the cost of my daughter’s marriage and I help pay for baptisms and marriages of close family members. I decided to open a savings account in the village credit union and deposit 100% of the profits if there is nothing urgent to buy. There has been a great change in the life of my household; I have work and garden produce all the time, my children don’t need to leave this rural area, and I no longer worry about day-to-day expenses. The Ciwara pump brings me joy. Everything that is mine comes from the garden.”

most of the participants interviewed said that they spent a portion of their incomes on food; a bigger variety of ingredients for sauces, children’s snacks, and staple cereal crops were all mentioned. One sesame producer had bought 700 kilograms of millet the previous year to replace crops lost in a poor harvest. What’s more, pump owners explained that their families consumed part of the vegetables produced and many of the sesame producers confirmed preparing the seeds in sauces and producing small quantities of oil for family consumption. The woman pump owner interviewed stated that she had planted 30 *planches* (raised garden beds) of potatoes expressly for family use.

Social obligations: More than half of the rural producers interviewed affirmed that part of the earnings from their productions was used to contribute to the costs of marriages, baptisms, funerals, and costs related to annual holidays. One sesame producer mentioned using money from and part of the sesame production as a dowry; other producers paid for or contributed to marriages in their immediate or extended families. For holidays such as Ramadan and Tabaski, participants purchased new clothing for their families and one producer stated that he used the money to buy animals, such as sheep or goats, which are offered as a sacrifice on these occasions.

The impact of being better able to afford the expenses of such social obligations is the empowerment of the producer and his or her family to share increased wealth with the rest of the community. What's more, in most African societies the sharing of wealth is a cultural norm that acts as a type of social insurance. People's ability to meet social obligations means they are likely to be able to call on others in their social network during times of crisis, thereby promoting self-sufficiency for communities. The ability to share or even cover the costs of ceremonies like baptisms, marriages, and funerals engenders a sense of pride and even benevolence that is impossible without sufficient resources for these expenses. The social standing of the producer and his or her family is affirmed and possibly even heightened in such circumstances, in turn earning him or her more respect in the community and opening doors for future personal or business opportunities and partnerships.

Material goods and other investments: The acquisition of consumer goods for the participants' households was supported through the generation of increased incomes. Many of these purchases, such as bicycles, carts, animals, and motorcycles facilitated the transportation of people and goods. Some animals were bought as capital that could later be consumed or sold; these included turkeys, chickens, donkeys, and cows. One onion set producer had invested in the construction of a house; another had bought a television set for her family. These purchases have the added benefit of stimulating the economy.

While many of the material goods purchased were for functional purposes, many also served to improve the quality of life of the producers and their families. More efficient means of transportation facilitates travel to workplaces, markets, and other communities and can also greatly decrease the labor of transporting goods. Radios and televisions provide a form of recreation and even education in that users receive information about current events. The television owner remarked that her family members now enjoy staying at home together rather than going to neighboring households or other establishments for entertainment.

Four participants affirmed that they had put part of their income into some kind of savings account either at the rural credit union or kept personally. These savings were used for emergency situations and also as a base for other small business affairs. Putting a percentage of profits into a savings account reduces or eliminates the exorbitant debt service fees required by money lenders. One woman stated that because she had created such a savings account, she no longer needed credit from local lenders to fund her and her family members' small business costs.

b. Use of improved agricultural techniques and technologies

Participants in EW/Mali projects receive training in a variety of aspects of agricultural production; these include field preparation and planting techniques, crop maintenance, advice on fertilizer and pesticide use, and proper use of the promoted technologies. Furthermore, the project provides access to improved varieties of seeds, links to local and regional markets, and information on product pricing. All of these interventions empower rural producers to make informed decisions regarding the production and sales of their crops. With better knowledge and access to the modern techniques and technologies available, the producers improve the quality and quantity of their productions, thereby cementing their self-sufficiency and securing incomes and assets for their households.

Introduction of new techniques and use of agricultural technology also causes a shift in labor, easing physical hardship while increasing productivity, and even augmenting the period of time that farmers can actively produce by increasing access to a deep water table during dry months.

c. Employment creation

The participants unanimously expressed that because of the project interventions, the usual periods of unemployment had significantly decreased. For example, at a point each year during the dry season, many market gardeners are forced to curtail their activities because the wells run dry and not enough water can be accessed for irrigation. With the use of the treadle pumps, especially the deep-well model, water is more easily accessed and cultivation may continue.

Sesame and onion set producers both remarked that young men were more likely to remain in their respective villages to practice agriculture rather than leave to seek outside sources of income because of the successful techniques promoted by EW/Mali. The reliable income

generated from cash crop production creates a profitable means of employment at the village level. Migration to larger cities for work opportunities has also been linked to higher rates of AIDS infections; young people move to urban areas where the risk is increased and carry the virus to rural populations when they return to their villages. An onion set producer and a sesame producer both mentioned that compared to before the project intervention, more young men in their respective villages had decided to stay and cultivate their own crops rather than leave the community to seek employment elsewhere. In other words, assured income from crop cultivation contributes to a diminishing rural exodus and increases the number of active producers.¹¹

d. Contribution to food security

"My household has become a place of rest for my married children and their children. There is always something to eat. . . because the garden is productive."

*Abdrahamane
Taboura, treadle
pump owner.*

Project interventions aimed at agricultural production contribute to local and regional food security in Mali in a variety of ways. The first and most evident is the increased production of a number of crops including sesame, onions, tomatoes, cabbage, carrots, and peppers, along with other market vegetables. The increased production affects local and regional markets; more produce is available to consumers. In the case of onions grown from bulbs, some of the production is even exported across the border into Senegal. What's more, participant families benefit from the consumption of their own productions. Sesame contains nutrients including vitamin E, vitamin B, amino and fatty acids, calcium, potassium, phosphorus, and iron; all of the producers mentioned giving sesame seed bars and oil to children. The onions and leaves produced from the onion sets are cooked in sauces; these contain dietary fiber, potassium, vitamin C and iron. Vegetables from market gardens provide a variety of vitamins and nutrients and diversify the number of foods consumed in participant households.

Four out of eight sesame producers interviewed pointed out that because of the income earned from sesame production, they no longer needed to sell a portion of their subsistence crops for cash. Not only does this secure the household's self-produced food supply, it also allows the purchase of more staple crops if the harvest was poor. Furthermore, because the production of sesame is fairly simple, it does not negatively affect the amount of other crops the participants

¹¹ As HIV and AIDS continue to spread throughout Africa, more research will help to better understand how migration to and from urban areas links to infection rates, and how slowing the rural exodus may impact such trends. See <http://www.fao.org/Focus/E/aids/aids1-e.htm> for more information.

choose to produce unless they decrease those other crops specifically because sesame has proven more valuable.

Finally, the increased income generated from project activities was used in part to purchase food for daily family meals and also for holidays and ceremonies. Many participants mentioned buying animals; meat is usually the most expensive food consumed and animals slaughtered for ceremonies and holidays can provide an important source of iron and protein that in many households is foregone the rest of the time. In general, it was the participants' perception that they were able to buy (and therefore consume) more food. The women in the cooperatives explicitly stated that their activities provided extra cash to buy snacks and food for their children and families.

e. Strengthening social cohesion

Many of EW/Mali's project activities involve forging relationships among and between people in a variety of social contexts. For example, sesame producers receive training in negotiation skills in order to meet face-to-face with economic operators during a sesame *bourse*. This interaction forms a link, formerly nonexistent, between often marginalized rural smallholders and urban businessmen. Other relationships develop among producers and resellers, and can also reach to clients. Women's cooperatives offer another example of team-building and task-sharing that enhance the skills and knowledge of the members involved. The interactions between these different actors tend to build trust and solidify professional, and sometimes personal connections. In other words, relationships stemming from project activities strengthen social cohesion.

Women from both of the sesame cooperatives interviewed pointed out that earning money empowered and instilled confidence in the members. Furthermore, they also discussed the importance of the activities in reinforcing cohesion among women, especially as work was carried out in common areas. By working towards a common goal, an enjoyable ambience was created and the resulting profits were then shared among all members of the group. Such an association falls into the category of components necessary to the building and strengthening of civil society in Mali.

Social cohesion and civil-society building are important elements in the development of democratic societies. Divided and unequal societies tend to be more unjust and engender instability; sharing of common values and rights and a sense of solidarity motivate citizens to play active roles in the economic and social progress of their communities. Empowering individuals

and groups in impoverished rural areas discourages feelings of exclusion or isolation from the larger context of Malian society. What's more, associations among and between actors in various economic and social roles can fulfill a number of needs and respond to concerns that may otherwise be neglected by state agencies. In this way, Malians can mobilize themselves, communicate new ideas, learn skills, and build the economy even at the most basic village level.

VI. Conclusion

EnterpriseWorks/Mali has implemented four major projects to support USAID/Mali's Sustainable Economic Growth objective. The main purpose of these activities is to commercialize production and distribution of the following products: an improved variety of sesame, fast-maturing onion bulbs, treadle pumps, and ceramic-lined charcoal stoves. Through its two-pronged approach, the interventions target both small-scale artisans and agricultural producers; the manufacturers benefit from the sales of technologies and the consumers benefit from increased efficiency and productivity. Moreover, the activities are aimed at both urban and rural populations and reach not just Bamako, but towns and villages throughout most of the populated regions of Mali. In 2001, this widespread outreach included 52,293 participants, not including family or other household members.

The goal of this study was to evaluate the impacts of the projects using the insights and perceptions of the participants themselves. Not only were the researchers interested in the direct economic benefits of the activities, but the social impacts stemming from the economic benefits as well as other effects related to participation. In addition, this research was an attempt to gain a better understanding of who these impacts reach, apart from the official activity participants.

The categorization of urban and rural participants emerged as a main indicator of differences in the degree of impacts resulting from the activities. Urban manufacturers, constituting the smallest percentage of the total number of project participants, revealed that the production of these technologies was beneficial to them and their families in that it provided an important source of income, added to their respective product lines, and increased their clientele. This in turn engendered financial security and full employment opportunities, as well as improved social standing. Another group of urban beneficiaries, and the largest percentage of overall participants (69% in 2001), were the owners of the ceramic-lined stoves. Many owners mentioned that the small daily or weekly amounts of money saved from reduced charcoal expenditures were used to contribute to household needs, especially food. While this group found difficulty articulating the

specific impacts of charcoal savings, they did name a number of advantages of owning the stoves including facility of use and maintenance, shorter cooking time which allows time for other chores or rest, comparative cleanliness from decreased charcoal ashes and emissions, and the durability of the product. These advantages also benefit the families, especially the children, of the stove owners.

Analysis of the interview responses revealed that rural agricultural producers experienced the most dramatic impacts. The significant increases, and sometimes creation of, cash incomes allowed participants to make a number of beneficial changes in the lives of their families. Using profits from crop sales, the agricultural producers were better able to afford expenses related to education, health, social events and family obligations, and household needs including food; the previous stress of affording such costs with very little annual income was relieved. Further research will help to better understand how families with low cash incomes cope with these costs before participating in an EW/Mali activity, so that the breadth of the impacts attributed to the interventions may be more fully revealed. Food security has also been impacted in a number of ways by the increase in crop production: first, more local produce is available to consumers and second, the producers often use part of their profits to buy staple foods to supplement their harvests. Moreover, many sesame producers stated that rather than selling their staple crops, sesame sales now generate needed cash incomes. Similar to the impacts in the lives of manufacturers, the agricultural producers affirmed that participation in the projects encouraged full employment by decreasing the periods when profitable work was not possible or available. Finally, the links forged among and between producers, resellers, and consumers built professional and personal relationships that in turn promote social cohesion and development.

The impacts of EW/Mali's interventions have far-reaching implications. The commercial approach of the projects ensures that success is market-driven; the investments of the participants sustain the activities and dictate the demand for the production of the technologies. Without the contributions of the participants, the projects would no longer function. The result of the interventions is an example of participatory development that points to future sustainability. The projects benefit not only the immediate participants, but their households, extended families, and communities, building a grassroots network to support future business and social development, increased food and commodity production, and ultimately economic growth.

Most importantly, the participants interviewed for this research all expressed great satisfaction with their production or use of the introduced technologies; many described sentiments of joy and happiness related to what they had been able to accomplish with support from EW/Mali.

The participants took pride in displaying the fields they had cultivated or the products they had manufactured and describing the results of their efforts. Perhaps the most meaningful social impact engendered by any of the activities was the feeling of empowerment, motivation, and hope instilled in the current participants.

VII. Recommendations

One of the main purposes of this evaluation was to discover ways that EW/Mali may improve its program designs and strategies to better meet the needs of the targeted clients. From the information the participants provided during interviews and site visits, some general suggestions and concerns were revealed. Further observations and conclusions from an analysis of the preceding sections also informed these recommendations. The following are presented not as resolutions to immediate problems, but as possible considerations for future activity planning and implementation.

Sesame producers should be aware that sale prices reflect the fluctuating world sesame market. The sesame producer participants expressed concern regarding the low producer price they had received during the last season. The producers had expected a profit almost twice as much as what was actually paid to them, and they found this very discouraging. While it is not entirely clear where the original assumption of sesame prices had originated, it may be linked to previous years' sales. The producers generally believed that the local economic operators had not offered fair prices. However, because of the low international prices, the local operators could not have offered higher prices without a loss. In the future, sesame producers should receive some form of training to better understand their role in the international sesame market and how and why prices may greatly fluctuate from season to season. In other words, they should be more aware of the risk so that they may plan their productions accordingly.

New technologies must be thoroughly tested and proven before introduction to the market. The owners of Ciwara II pumps all mentioned that they had needed to repair their pumps within the first year of use because the *crepine*, or metal filtering cage, had broken. One owner postulated that this piece tends to break because the water pressure is too great for the metal to withstand. Before the pump is sold to consumers, it should be thoroughly tested so as to ensure the highest possible quality so that owners are not burdened with repair costs. Moreover, the pump owners' activities are hindered while the pumps are in disuse or not working properly.

Treadle pump manufacturers and resellers should be compensated to regularly monitor pumps sold, in order to ensure correct installation and usage. Some pumps are installed in remote locations, where it is difficult for manufacturers or resellers to conduct follow-up visits with the owners. While site visits build a link between consumers and providers, and

can be an effective way to support customers, it is difficult to sustain such activities when the reseller or manufacturer is not compensated for the time and energy expended to visit pump sites. If the cost of these visits is not covered in the price of the pumps, then the people responsible for monitoring are not likely to be motivated to do so.

Further research will be required to provide more comprehensive data on the projects' effects on family health, education, and social standing. Baseline data and repeated visits to participants' families over an extended period of time will allow EW/Mali to collect quantitative data to better understand the effects of increased incomes in social contexts. For example, research may focus on health impacts from ceramic-lined stove usage, or how the numbers and genders of children sent to school differs before and after project participation. Verified trends may be useful in future program design and proposals for funding. Other research topics may include sustainability, women's developing role in agriculture, and an in-depth analysis of the environmental impacts of the interventions.

Continue to implement programs based on a private sector approach that incorporate sound project design. This approach includes preliminary feasibility studies, product testing, and financial analysis before implementation of any new activities. The success of the present interventions is derived from meticulous planning and a comprehension of the consumer context. Consumption of the introduced technologies drives the growth and development of the activities, and indicates the likelihood of future sustainability.