Enhancing Effectiveness of Extension Efforts: A Case Study of Malian Shea Butter Producers

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Abstract
The researchers conducted an ethnographic case study in three villages in Mali (West Africa) to ascertain shea butter producers’ perceptions toward technologies that improve the efficiency of shea butter production. The study revealed that the appropriateness of time and labor saving technologies for Malian women who produce shea butter depended on: 1) the relative cost of the technologies; 2) the accessibility of information on new technologies; 3) the arduousness of the work avoided; 4) the economic status of the households and of the women’s associations; and 5) the productivity of the participants in other economic activities. The study confirmed the conclusions of previous researchers who noted that external technical assistance from developed countries played a vital catalytic role in upgrading traditional technologies. Top-down technical assistance was not the best dissemination means. Participants preferred producer-led training along with visual aids. New shea butter processing technologies were requested by participants, and an understanding of the local context for technology application as well as a strong field presence of trainers during designing and testing was important for dissemination.

Keywords: Extension Education, Technology Adoption, Diffusion, Shea Butter
Introduction

In September 2008, the Population Reference Bureau reported that during the 20th century, almost 90% of the population growth took place in countries classified as less developed by the United Nations. Additionally, it was estimated that virtually all of the world’s population growth between 2008 and 2050 will occur in these less developed countries, which includes every country of Africa (Population Reference Bureau, 2008b). In Mali, one of the Western African nations, the 2008 population estimate was 12.7 million while the projected 2050 population was 34.2 million, an increase of 169%. Over 48% of the Malian population was under the age of 15, 29% of the population was undernourished, and the per capita income was $1040, based on 2007 U.S. dollars (Population Reference Bureau, 2008a). The nations of Africa may never see the economic prosperity of European or North American nations, Japan or Korea. However, it should be possible for Africa to ensure for its peoples a real improvement in their lives and a greater harmony between their physical resources, cultural traditions, natural environment, and material expectations. According to the World Bank’s Robert Calderisi, (2006) the nations of Africa need to be allowed to develop in their own way and not be told what to do. Despite their much-documented poverty, the African nations have enormous resources upon which to build a better life.

Historically, shea butter has been economically important to Malian rural women. These women were able to assist in the financial support of their families through the income generated from shea butter production. According to Botang (1992), over two million women in 13 African countries produced shea butter for cash and consumption. Shea butter was a high-value export to European countries and the United States, where it was considered a luxury product. It was often used as a substitute for cocoa butter in the chocolate and confectionary industries because it was sweet and oily (Food and Agricultural Organization, 1991). It also was used in the cosmetic industry for its high cleansing power (Food and Agricultural Organization, 1991). However, the inefficiency of the production process lowered productivity, and therefore profits for the rural women of Mali. Lilja, Sanders, Durham, De Groote, and Dembele (1996) suggested that technological change supported the empowerment of Malian women and that providing additional extension services, inputs or land would increase the women’s income.

Shea nut processing in Mali was the cultural domain of women. After collecting the nuts, women cleaned, shelled, and roasted the nuts, ground them into a paste, then kneaded the paste to separate the solids and oils. The production process involved 14 individual steps. Traditional production methods were physically demanding and inefficient, and the product lacked quality. For example, kneading by hand required an average of three hours (University of Saint Thomas, 2005). To help African women improve the quality of the product and the efficiency of production, a fair-trade, non-profit organization, Shea Yeleen International, was founded in 2004 (R. Wright, personal communication, March 2004). This organization, in collaboration with faculty and students at the University of Saint Thomas (UST) in St. Paul, Minnesota, designed a mixer to knead shea paste, thus reducing the physical labor and time required to separate the solids from the oils. Ultimately, the goal of this project was to improve women’s lives in Mali by providing them with access to new and culturally appropriate technology, which then expanded the women’s economic opportunities.

Effective distribution of this technology held the possibility to reduce poverty in Mali by potentially increasing the
income of women. Toward that means, it was necessary to determine the extent to which Malian women involved in shea butter production were willing and able to adopt relevant technological innovations and diffuse them using a producer-led approach.

Despite the potential of shea butter as a good source of export earnings, the traditional method of processing provided a poor-quality product with a low fat yield of about 15 percent (Fleury, 1981). This limited the product’s utilization both locally and internationally. To improve the yield and quality it was necessary to develop improved methods for processing shea butter (Olajide, Ade-Omowaye, and Otunola, 2000). Without standard operating procedures or guidelines, the process was difficult to replicate. To improve shea butter production, the Food Technology Laboratory (LTA) at Institut d’Économie Rurale (IER), the main government-funded research institute in Mali, reviewed the traditional processing of shea nuts and developed improved processing techniques (LTA, 2004). These techniques were introduced through an adult training program with an instructional poster series on shea butter quality management (Kante, 2004).

However, getting a new idea adopted even when it had obvious advantages was often difficult. A lengthy introductory period was often required before the innovation was widely adopted. Often this resulted in research results remaining unused (Riesenberg and Gor, 1989). Therefore, there was a need to study factors affecting the adoption rate of technological innovations for efficient shea butter production processing methods in Mali and to develop appropriate outreach strategies for the diffusion of those innovations.

Theoretical Framework

Progress in agriculture was achieved through extension workers who transferred the results of scientific research to producers (Macadam, 2000). Despite the efforts of extension personnel and researchers, the developed technologies took time to reach the targeted populations. Therefore, it was essential to understand outreach strategies and individuals’ perceptions towards innovations in order to eliminate barriers to technology transfer in rural areas. Various extension models were used around the world, including linear “top-down” transfer of technology; participatory “bottom-up” approaches; one-to-one advice or information exchange; and formal or structured education and training. Besides more traditional extension approaches, the use of the producer-led method of introducing new technologies and practices and consulting with other farmers held promise for the transfer of scientific research and technology to rural areas (Lopez & Bruening, 2002). According to Black (2000), no single model or strategy was likely to be sufficient on its own.

The aim for introducing new technologies in rural settings was to have populations apply them as their own practices. Lionberger and Gwin (1991) noted the factors that seemed to affect the motivation of farmers to use new practices were functions of a dynamic network of institutional, situational, and personal components. These factors were in a constant state of interaction, combining in unique ways to direct the decision-making process of individuals considering alternative courses of action. Düvel and Abate (2004) noted implications for extension efforts were contingent on media contact, while education had significant impact on adoption behavior. Further, Lionberger and Gwin, (1991) stated:

In agriculture, technical information, supplies, credit, attitude changes, and changes in present farming methods have to come between awareness and use of an innovation. You have to examine all the variables in a local situation and make as many of those variables as
possible helpful or at least not an obstacle to adoption. We can influence change… But don’t expect to achieve instant agricultural development with a magic gadget (p. 15).

Inaizumi, Singh, Sanginga, Manyong, Adesina, and Tarawali (1999) concluded that when a technology was appropriate, it stimulated a process of autodiffusion, through a dynamic farmer-to-farmer horizontal spread. Rapid adoption of agriculture technologies by resource-poor farmers would require farmers’ increased participation in the technology development and evaluation process in order to ensure that the technology would be appropriate for their needs.

In Ghana, Effa and Herring (2005) found that rural women who participated in educational seminars adopted agricultural innovations at a significantly higher rate than non-participants. Hyman (1991) noted initial decisions for participation to test the technologies were based on politics and family ties. Although the technology was generally accepted, in a few cases women especially were reluctant. Hyman also noted the main reasons for the reluctance were a) the process did not correspond to the traditional steps of shea butter production; b) higher labor intensity was required, or c) lower shea butter yields resulted. Hyman further noted the following issues regarding the adopting of shea butter processing equipment:

The experience with shea butter processing equipment illustrates some common lessons in the introduction of new technologies like (a) providing training for proper operation, (b) establishing a sustainable system for maintenance and replacement parts, (c) criteria to help ensure an equitable distribution of costs and benefits, and (d) incorporating the preferences of users in the design (p. 1265).

Understanding the local context was necessary for successful application of the diffusion and adoption process. In-depth interaction was essential at all stages, from designing and testing through dissemination. A strategy for disseminating technology must be based on a clear identification of the target beneficiaries and their resources and constraints (Hyman, Stifetel, Moreau, and Nichols, 1988). Further, according to Hyman (1991), the main benefit of upgraded technologies for shea butter production was that reducing the amount of labor involved allowed women to conduct other income generating activities. In rural Malian societies, women had few opportunities for individual wage employment due to socio-cultural barriers.

**Purpose and Objectives**

The purpose of this research project was to ascertain the factors affecting adoption and diffusion of technological innovations by female shea butter producers in Mali.

The study’s specific objectives were:

1. Identify barriers to the adoption of new shea butter processing technologies;
2. Identify the information channels used by selected Malian shea butter producers to receive production processing practices information; and
3. Identify the types of training preferred by selected Malian shea butter producers.

**Methods**

This case study research utilized purposefully selected sites and individuals to focus on Malian village women involved in shea butter production who were
considering adoption or had recently adopted new shea butter production technology. Because of unique differences in infrastructure, business organization, and production practices at the village level, three distinctly different villages were selected. Dio Gare was located 45 kilometers west of Bamako, the capital city of Mali. The women in this village had recently worked with the University of St. Thomas in testing a manually operated churn. Zantiebougou was located 200 kilometers southeast of Bamako and had an organized shea butter marketing cooperative. Doila was 180 kilometers south of Bamako; the women there had a loosely organized producer’s association and had mechanized shea butter processing. The illiteracy rate among adults in these areas was approximately 80 percent (Oxfam America, 2006). The workforce was largely informal or engaged in subsistence agriculture. The population spoke Bambara, the most commonly spoken local language in Mali.

The interview protocol included topics related to processing methods, technology adoption, product quality, and marketing. An open interview process was used due to the differences between the experiences of the women in the three communities (Merriam, 1988). As a native Malian, the researcher used the participant-observer approach and relied on verbal and non-verbal cues from participants as questioning prompts. The researcher stayed seven days in each village to become acquainted with the study participants, gain their confidence, observe their practices, and conduct interviews.

In June 2007, the researcher visited each community and was introduced either directly to the village residents or to a village chief. The researcher shared the study purpose and background information with the village chief, who then directed the researcher to appropriate participants.

The interviews were conducted at two levels: individuals and focus groups. Individual interviews were conducted with youth and adult shea producers, and with shea butter users in each village. After the individual interviews and observations, the researcher brought together focus groups of 6-10 producers to gain further insight regarding social implications for adopting and diffusing the new technology.

Though the interview protocol served as a guide to the interviews, the questions were often followed by probing remarks which allowed the researcher to gather more in-depth information regarding the perceptions of participants. The villagers were encouraged to tell their stories about the introduction of technological innovations. The guidelines of Gay, Mills, and Airasian (2006) were used for constructing the interview protocol. All interviews were audio taped and video recorded, with the consent of the participants. The researcher kept field notes and transcribed the interview tapes following each round of data collection. As a triangulation measure, the researcher observed shea butter processing and recorded the essential aspects of the process.

**Results**

The content of the transcripts from the recordings was organized into themes according to the responses to the questions. Outlines were formulated according to participants’ main thoughts, ideas, and perceptions regarding each question or group of questions. Based on the outlines, four main themes were identified: 1) formal and informal organization of processing methods; 2) factors supporting the new technology; 3) barriers for adoption/diffusion of the new shea butter technologies, and; 4) comparison of shea butter quality between the traditional and new processing methods.

**Formal and Informal Organization of Processing Methods**

In some villages, women filled three to four 200-liter tanks with the collected
Shea nuts. Little by little, they processed the
shea nuts and sold their final product. In Dio
Gare the biggest market for shea butter was
located in Kayes, one of the administrative
regions in Mali. Traders came from Kayes
and bought the butter.

Participants in Zantiebougou noted
there had been a big change in shea butter
processing. Women in the villages recently
had been advised to give up the underground
storage of the nuts. One of the participants
reported:

The shea nuts are boiled now
before storage and extraction
of the oil. When the new
processing method is applied,
the shea butter has better
taste, flavor, and color, and
consequently a better price
even at local market: 350
FCFA (€ 0.53) per kilogram
instead of 150 FCFA (€ 0.23)
per kilogram.

In attempts to improve quality, new
processing technologies had been
introduced. These included triage (removing
germinated, shrunken, and insect damaged
kernels), a machine grinder, and the hand-
powered mixer. However, women reported
they preferred the manual churning to the
mechanical method, because it yielded
higher extraction rates and higher quality
butter even though it was time and energy
consuming.

The shea butter cooperative was
producing two grades sold at different prices
and different places. Grade 1 was sold to a
Canadian buyer for 3500 FCFA (€ 5.34) per
kilogram. Total annual sale was 70
kilograms. Grade 2 was sold in Bamako for
1000 FCFA (€ 1.52) per kilogram.

Factors Supporting the New
TechnologyWomen’s Initiative. Women
were free to introduce any kind of
technology related to their income
generating activities. Men encouraged
women to improve their economic situation.

In their social system, women were well
invested in the decision-making process and
were independent. Men were not seen as
more influential in decisions regarding shea
butter production. Within each village, men,
women, and the elderly were exposed to the
issues and made decisions collectively.
Culturally, women were respected and their
decisions and needs were given priority by
local government administrators. From the
point of view of the participants, women
played an important role in their society.

The idea of introducing the shea
butter mixer was initiated by University of
Saint Thomas and not by women, but the
women in Dio Gare indicated they saw the
opportunity for increased employment and
enhanced economy. Additionally, through
focus groups, they reported a lack of
teamwork and financial support to
effectively institute new initiatives.

Education and Training. A male interviewee
stated the education of women was
beneficial for the village, and opportunities
within government had been given to well-
educated women because of their unique
capabilities. The researcher observed that
both men and women were involved in
organizing training sessions for shea butter
processing. In terms of the participants’
choice for the training setting and styles,
participants reported preferring face-to-face
training with visual aids like video or film.
One of the participants said, “For adult
learners, explaining and presenting an image
is more beneficial for learning.” Participants
in Doila preferred to have books, images,
and face-to-face exchanges as training
techniques. In terms of training needs,
cooperative management was a primary
concern. The participants relied on their
ability to master innovations, and age did
not play a role in who was trained. Overall,
the women had a preference for farmer-to-
farmer transmission of information with
visual aids.
Shared Responsibility for Shea Trees.
Participants reported plans to cultivate shea trees for increased productivity. They also noted planting and growing the trees would require the help of men. One respondent stated,

> If you consider the whole process of shea butter production, women can prepare shea butter; however, they cannot take care of the shea trees. Therefore, there is a gap between growing shea trees and making a profit from the butter. If we can have men in the village take care of the shea trees, this will be a good thing. We should share roles between individuals or groups of men to take care of the plots of shea trees. Within three to four years this will be a high-quality project for all those involved with the shea butter process, including those who now cut the trees down.

Information Channels. The main information channel was through the women’s association weekly meeting. A participant reported, “The information is given to the president of the women’s association, who, in turn informs all the women in the village at a meeting.” The meeting date, time, topic and location were provided in advance. Another information channel was the village chief. One participant stated, “Information is not easily available, Internet is not accessible, and information sources are not diversified.”

Participants’ View of Innovations. Participation of beneficiaries was important and necessary for the success of the project. When a new technology was introduced, few people were willing to adopt it until they saw the benefit. From earlier experiences, a male participant reported,

> “Most people want to wait and see how it will work. If the experience doesn’t work, they won’t approach.” Participants reported they were always interested in ways to improve product quality because of the price benefit, even on the local market. One participant reported, “We always test and adapt new technologies to line up with our state of production.”

Other Current Issues in the Village. A crucial problem was the lack of an external market for shea butter. The aim of the villagers was to meet outside market requirements using their own tools. One interviewee stated:

> We need to sell all our products in order to motivate women to produce more of the quality we require. If we cannot sell, nothing will work. Actually, in terms of quality control, we need to be more equipped and have more tools to be able to meet the standards. If we could directly export our shea butter, there would be a significant increase in our profits. If we sell our butter in Mali, we lose part of our profit.

Barriers for Adoption/Diffusion of the New Shea Butter Technologies
A primary adoption barrier was the financial constraint of acquiring the newly introduced mixer machine. According to one participant, “When you consider the cost of the machine, a single woman or group of women cannot presently afford it.” In Zantiebougou, participants believed the process was time consuming. Nevertheless, the Zantiebougou women noted that if one wants money, one has to take time.

The researcher observed the participants were not the main initiators of the technologies introduced in the shea butter processing, but most of them
appreciated the innovations because of time and labor saving rewards. In one village, the majority of participants still preferred the traditional manual churning because they believed it yielded a higher extraction rate and higher quality of the end product. Their main concerns were securing reliable external markets and meeting the international production standards. However, they did concede the machine was labor and time-saving.

For quality improvement, boiling and drying the nuts before storage was practiced in much of the study area. Participants were aware of the benefits of pretreatment. However, the time required for the boiling and drying processes was also an adoption barrier. For some women, the only available time to boil the nuts was at night after other family and domestic responsibilities were completed. Therefore, boiling was not seen as a labor-saving innovation, although most of the women did believe boiling increased the quality of the final product. The very rainy season (August) added constraints to drying. Wood or charcoal stoves with low fire were used to aid drying during the rainy season. Often children were responsible for gathering wood, watching the fire, and turning the nuts.

Comparison of Shea Butter Quality from the Traditional and New Processing Methods. Each community had a homeopathic therapist from whom villagers sought medical advice and attention. The researcher interviewed the therapist in each village to identify perceived health efficiency differences between shea butter processed using traditional processing or the new technology methods. The therapists reported using shea butter from both the traditional and the mechanized processing methods, but noted there were no differences in usability or health benefit. However, women using shea butter for cooking or cosmetics did report differences in color, smell, and viscosity; they believed shea butter derived from the boiling process was higher quality.

One of the adopters of the new technology reported:

There is a difference between the precooked dried nuts (new processing methods) and the traditional process. The butter from the traditional process has some off-odors and flavors. In the traditional drying method with firewood, the nuts get a smoky smell, which is not as valued. In the boiling system there is no off-smell. After drying, the boiled nuts will produce the same texture of paste as the traditional process.

Conclusions and Implications
The study revealed the appropriateness of time and labor saving technologies for women depend on: 1) the relative cost of the technologies; 2) the accessibility of information on new technologies; 3) the arduousness of the work avoided; 4) the economic status of the households and of the women’s associations; and 5) the productivity of the participants in other economic activities.

A strategy for disseminating any technology needed to be based on clear identification of the target beneficiaries and their resources, their preferences, and their constraints. The involvement of rural groups as beneficiaries in the design process of the technological innovations was essential for acceptance and adoption. Amidavi, Kroma, and Davis (2006) reported that rural groups who engaged in partnerships with other actors also promoted mutual learning and created new investment options. Some of the outcomes from these group efforts included the utilization of new technology, enhanced production and incomes, improved infrastructure, and compliant behavior for collective action.

The study reconfirmed the conclusions of Hyman, et al. (1988) that
external technical assistance from developed countries played a vital role in technology adoption. New technologies had to be requested, and an understanding of the local context for their application as well as a strong field presence during design and testing were important for dissemination.

Most participants received information in weekly meetings, from opinion leaders or from a radio station at the village level. Additionally, some participants had access to newsletters from women’s associations and a few had access to internet market information. In some of the study area, there was an extension agent who also contributed to educating participants on shea production and processing technologies.

Participants preferred on-site and in-person training using visual aids. Farmer-to-farmer knowledge distribution had a long history and proven sustainability, therefore was highly valued, especially from one generation to another. Participants perceived on-site trainers and continuously accessible resources like DVDs or extension fact sheets as examples of sustainable knowledge distribution.

Governmental and non-governmental agencies should collaborate to develop an extension-training program for shea butter processing. Effective outreach will require workshops, lobbying, and awareness from all decision makers. The marketing cooperative in Zantiebougou was effective, thus assistance should be provided to organize women in cooperatives and train the members in cooperative management and marketing. The governmental and non-governmental agencies should also provide essential training to potential community educators in adult teaching methods and shea butter quality management methods. All training programs should use visual aids with emphasis on interpersonal methods. The emphasis should be on demonstrations to facilitate increased knowledge and skill development.

The participants valued knowledge. To improve technology assimilation, outsiders must recognize that learning and distribution of information are acquired through both oral and visual transmission. Community leaders were doing most of the dissemination of information regarding shea processing technologies. Those leaders should be trained to access new technologies, then empowered to present the new technologies in their respective communities. Organizing an educational initiative similar to the Farmer Field Schools reported by Simpson and Owens (2002) may prove effective. It must be noted however, Simpson and Owens indicated there was a chance the Farmer Field Schools favored those who were literate and had attracted participants with prior exposure to western-culture sciences.

Alternative processing technologies need further investigation. Additional research is needed to compare the recovery rate and product quality between traditional and new processing methods. The new knowledge generated can be delivered through expanded extension programs. To organize in associations or cooperatives additional management training offered through extension will be necessary. Further study regarding the efficiency of information channels in the villages is also needed.

The increased quality of the shea butter and the reduction of labor will improve the productivity, efficiency, and effectiveness of the shea butter process. Additional research opportunities exist to evaluate the effectiveness of external markets and cooperative marketing systems as they are developed.

A micro finance program with results such as those reported from a study in Ghana by Effa and Herring (2005) can facilitate the adoption of shea butter processing technologies by Malian women. The Malian government and/or non-governmental organizations should provide financial assistance in the form of grants or low-interest loans to women’s cooperatives.
in order to enable adoption of innovations, such as the churning machines. Men must be encouraged to help women care for shea trees in order to promote establishing shea tree orchards, thereby reducing constraints such as travel distance for collection and insecurity of supply. Governmental policies must be developed to protect shea trees. Knowing the long agronomic cycle of the shea species, these actions would benefit future generations of Malian women.

Finally, follow-up studies to this research should be conducted to examine: 1) ways increased quality of shea butter will impact development of quality standards and supply to international markets, 2) effects to the Malian economy from the influx of foreign currency driven by the international demand for shea butter, and 3) channels through which the Malian Extension Service may establish effective education programs for Malian women who engage in shea butter production.

References


