Abstract

This study explores a conceptual framework which allows pre-project marketing analyses to consider the impact of family consumption of a new processed food on rural African women. General theoretical principles are synthesized from the case studies in Technology and Rural Women: Conceptual and Empirical Issues and applied to hypotheses concerning the proposed introduction of extruded corn-soya products to Njombe families. Embodying time-saving technological change, extruded products will alter Njombe women's use of time and in turn their work burden, income, and leisure. The actual reallocation of their time will depend on such locally-specific conditions as available income-earning opportunities, women's preferences, women's control over their own time, and society's valuation of different tasks. This study identifies questions which should be addressed by marketing analysts when assessing the feasibility of introducing any new food product to rural developing areas in Africa.

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The Impact of Extruded Corn-Soya Blends on Rural Njombe Women's Time and Welfare: A Model for Pre-Project Marketing Analyses

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Introduction

The introduction of new processed food products to rural developing areas often involves problems unanticipated in Western marketing analyses. Of particular concern are instances where affordable, nutritious foods believed to be "good" for people are rejected by local populations for failing to meet other consumer needs. This paper focuses on a composite of women's needs (favorable work burden, income level, and leisure hours), referred to here as women's "welfare attainment,"[1] which may be influenced by changes in women's use of time associated with product adoption. A conceptual framework is explored which allows pre-project marketing analyses to consider how family consumption of a new food affects women's welfare. Thus, possible local resistance or receptivity to a proposed product can be identified.

General theoretical principles are synthesized from case studies presented in Iftikhar Ahmed's edited volume, Technology and Rural Women: Conceptual and Empirical Issues (1985). These principles reflect a new technology's impact on women's use of time and in turn, on their welfare. Three indicators are used to measure welfare: work burden, income, and leisure. These precepts are adapted here to address the welfare impact of a change in food consumption.

The emphasis of this study is thus conceptual rather than empirical. It is an outgrowth of my work as project analyst for a private voluntary organization (PVO) which is considering the introduction of commercial enterprise to process and sell extruded corn-soya blends (CSB) in Njombe District, Tanzania. Recently, project researchers have undertaken a preliminary evaluation of commercial feasibility based on a literature review, personal interviews, and the project director's exploratory visit to the area. Also, they have developed hypotheses which suggest directions for future field research, so that local data can be gathered for a complete feasibility analysis. This paper investigates the hypothesized relationships which concern the welfare impact of food consumption on women. While the paper focuses on the proposed Njombe project as an illustrative case, the analysis has wider implications, in that it enumerates a general model which promises to be applicable when assessing the feasibility of introducing any new processed food to Africa's rural developing areas.

Literature Background: Marketing, Nutrition Project Assessment, and Women in Development

Both the traditional (business) literature on marketing and the more recent literature on nutrition intervention programs

address at least one common concern: how to successfully introduce a new food to a community. Marketing researchers have long recognized the importance of analyzing both a prospective community's ability to pay and the consumer's need or motivation for purchasing consumption goods (Kotler 1980; Weiers 1988). Consumer needs identified in the case of processed foods include nutritional requirements, appetite satisfaction (e.g., taste), convenience of use, and social status derived from selecting the product (Austin 1981). Evaluators of supplemental feeding and food subsidy programs in the developing world have also identified factors influencing target group participation. Besides cash costs, these include the time and energy costs of participation as well as the number of changes required in the participants' usual habits (Berg 1987; Hamilton, Popkin, and Spicer 1984). Both literatures thus go beyond the issue of affordability to recognize the importance of determining how receptive a population will be to the distribution of a new food. When analyzing food projects in rural Africa, however, both literatures could benefit from the approaches taken in recent women-in-development literature.

To assess product ability to meet local needs, marketing analysis requires in-depth knowledge of prospective buyer (or participant) behavior (Kotler 1980). Since the mid 1970s, pregnant and lactating women, and children under five, have been identified as the nutritionally-at-risk target groups in developing areas; women, who often influence food selection, are usually designated as the target buyers or participants. Thus, in the case of prospective market areas in rural Africa, detailed knowledge of rural women's activities and interests is critical to effective project assessment.

The women-in-development literature offers growing documentation of the previously "invisible" role played by rural women as food providers for their families (Charlton 1984; Monson and Kalb 1985). Numerous field studies suggest a substantial variation in rural African women's activities, even across households within a given village (Smith and Stevens 1988; Spring 1988). Fleuret (1988) demonstrates the analytical strength of examining intrahousehold dynamics in her ex poste evaluation of a Kenyan food aid program. These studies indicate the importance of detailed household studies in analyzing a specific project area under consideration. However, the development of a generalized conceptual framework, which is also critical, would aid the marketing or nutrition project analyst in anticipating likely advantages or problems before a new food is introduced and would enhance the initial design of site-specific field studies.

Of particular promise in assessing the feasibility of introducing new foods are studies that evaluate the introduction of new technologies to rural African areas. Empirical studies (e.g., Agarwal 1985; Bay 1982; Bernal 1988; Boserup 1970; Fortmann 1981; Tinker 1981; Ventura-Dias 1985) have documented the impact of modern technology on the rural sexual division of labor, noting that increased socioeconomic differentiation benefits men, while

women experience an increased work burden and greater marginalization. Even technologies specifically designed for women have often proven inappropriate, given women's resistance to their use (Carr 1981, 1985; Charlton 1984). Enhancing the literature's explanatory powers, Bhaduri (1985) and Whitehead (1985) developed components of a conceptual framework to analyze technology's impact on rural women's use of time and on their welfare (e.g., work burden, income earned, and leisure time).

Similar to technological change, a new food with promise of nutritional benefits may still prove to be inappropriate for rural African women. The adoption of processed foods, especially time-saving "convenience" foods, may require changes in customary food preparation or processing techniques. Thus, while not denying the importance of analyzing other consumer needs (such as taste satisfaction), this study synthesizes Bhaduri and Whitehead's conceptual ideas to identify the impact of food on women's time allocation and welfare. Welfare attainment is often overlooked in traditional marketing literature, yet it is a consumer need which has proven critical in determining rural African women's response to technological change. Therefore, an analysis which explicitly recognizes this need can best identify the factors that influence rural women's receptivity to new nutritious foods.

A Case Study: Corn-Soya Blends (CSB) Proposed for Njombe District, Tanzania

Njombe District, located in the Southern Highlands of Iringa Region, is a predominantly rural district with two towns and approximately 160 villages. Only a small percentage of the district population is completely monetarized; the villages and townspeople are reasonably successful cash croppers, wage laborers, and self-employed businessmen. Most households earn their living as small cultivators, producing enough for their own subsistence and selling surplus food crops and some cash crops. Small farmers also sometimes earn extra income by doing seasonal wage labor on estates or engaging in such unofficial activities as producing wine, beer, or handicrafts for sale. Typically, the men and women of small cultivator households each has his or her own shamba (field[s]), with the men usually cultivating cash crops to earn income and the women raising food crops to feed the family. Indications are that Njombe men spend their earned income as they choose, while women use their available resources, including any income they earn, as a first priority to meet family needs (Friis-Hansen 1987; Jakobsen 1978).

Energy-protein malnutrition is prevalent among young children and pregnant and lactating women in Njombe District. A UNICEF field office has found the child death rate, an indicator of child malnutrition, to be very high in Iringa Region; an estimated one in four children died by the age of five during the late 1970s through

mid 1980s. Available empirical evidence, though scant, further suggests that the nutritional status of women has been "very severe" (Government of URT and UNICEF 1985b:i,3-5).

CSB, a soy-enriched maize flour, would improve nutrition for these nutritionally vulnerable groups. Presently in Njombe District, the local staple, maizemeal (sembe), is consumed in the form of a low-calorie-density gruel for weaning infants or as low-protein maize ugali for the main family meal. In contrast, extruded CSB yields a calorie-dense weaning food (Jansen, et al. 1981) and a high-protein ugali for weaned children and pregnant and lactating women. CSB is therefore expected to make a positive contribution to local nutrition when it is introduced to Njombe District.

However, whether Njombe women (the expected buyers) would purchase the new food depends on several additional factors, including local taste preferences, product price, and convenience. Of particular concern here is the product's impact on women's welfare and use of time: the discussion below develops the conceptual questions which should be addressed and identifies the local field data to be gathered when undertaking a thorough assessment of this impact.

The Model: Hypothesized Socioeconomic Impact of CSB Consumption on Rural Njombe Women

Substitution of technology:

If rural Njombe women do buy CSB, they will be buying a food processed and pre-cooked by a single extrusion enterprise, rather than taking their own maize to be processed into sembe (maizemeal) at one of several local mills and then cooking it themselves at home. This involves a substitution of technology, in that centrally-processed and centrally pre-cooked foods are substituted for the more decentrally-processed sembe and decentrally-home-cooked foods.[2] This technological change will affect women's use of time and in turn affect their welfare.

Women's time allocation altered:

The allocation of rural Njombe women's time can be affected in two ways. First, travel time and costs may change. In Njmobe District, the amount of time women spend taking their maize to the grinding mills varies. For some fortunate women, a maize processing mill is located within their village and the travel distance is short. Others have to carry their maize a longer distance to a mill in a nearby village. Extruded product adoption would release women from making these trips. (In those areas in

Africa where women still do their own milling and pounding, extruded product consumption will also spare women the time and tedium of handpounding.)

Whether women will save travel time by substituting CSB for sembe depends on the extrusion enterprise's arrangements for procuring maize and soya and distributing the extruded products. The latest proposal calls for the NJOLUMA cooperative to transport maize, soybeans, and extruded products back and forth between the Njombe town extruder and the villages (Graham 1988:6). Assuming that the extruded products are distributed through village schools or shops, Njombe women might save some transportation time by exchanging their maize at these locations and buying extruded products.

This economy of travel time appears at face value to be a desirable convenience. But will it be? Do the women find the trips to the grinding mill burdensome? Or do they view the trips as a chance to get away from the responsibilities of the house and field? In one Masai village, women have been observed sharing a pleasant time with each other at the local mill while waiting (for roughly half a day) for their maize to be ground (McCurdy 1988). The experience of a USAID project in a Mexican village suggests implications for the proposed extrusion project. Water pipes were installed and conveniently located at several points within this village, but the older children who normally collected water ignored the "more convenient" pipes. They continued to travel a few miles outside the village to collect water from the well, for such trips allowed them to socialize with each other beyond the confines of their homes. In the case of extruded products, if the women's trips to grinding mills are no longer needed, will women perceive this as an advantage? They might prefer to spend the extra time away from home where they can join their friends at the local maize mill. To determine the "convenience" to women of exchanging maize for extruded products, more needs to be learned about women's travel time, frequency of trips, transport mode (e.g., foot, bicycle, truck), shopping patterns and the pleasure value of their trips.

The purchase of CSB may affect women's time in a second way. Instead of buying processed sembe and cooking it themselves, Tanzanian women would be buying processed, pre-cooked foods. Such convenience foods require less cooking time, although the exact amount that can be saved is uncertain. Harper and Tribelhorn (1985) experimented with wood cooking, using a cast-iron Dutch oven suspended over an open pit fire. They found a notable time savings in preparing small servings: for example, 33 minutes were required to cook a weaning food using raw processed rice and soya (0.28 kg), while only five minutes were needed to cook an "instant" extruded rice-soybean blend (0.18 kg). However, the time gain diminished when they prepared larger servings (up to 2.8 kg) using electric

and gas stoves, suggesting that extruded products may offer less "convenience" when cooking for large families or groups.

These laboratory estimates need to be verified under local Njombe conditions. Moreover, ugali is already considered by Njmobe women to be a "fast" food because once the fire is hot, it can be cooked in about 15 minutes. Thus, the amount of time gained by switching from sembe to CSB, whether cooking for a small or large family, might be relatively small. However, the cooking time for local beans may be longer. If the women substitute CSB for both ugali and local bean consumption, a more substantial amount of cooking time can be saved. Comparison estimates of cooking time using local cooking techniques need to be made.

Assuming that the use of CSB reduces cooking time a notable amount, time spent collecting fuelwood and water can also be reduced. (Alternatively, instead of reducing the amount of firewood collected, Stevens [1985:319] suggests the extra firewood can be sold to increase income.) In Africa these tasks are performed almost exclusively by women;[3] women will thus be the direct beneficiaries of any reduced time requirements.[4]

The potential benefits of such time-saving products become relevant when considering African women's work burden. Women, especially poorer women, usually work more total hours than do men, particularly when domestic work is taken into account. According to 1977 data on Tanzania, women worked an average of 3,069 hours yearly, while men worked 1,829 hours yearly (Agarwal 1985:71). Such activities as cooking and collecting wood and water constitute a significant portion of a woman's average work day. Estimates suggest women in Mufindi District (Iringa Region) spend:

> 3 hours and 59 minutes on food preparation, or 28% of their 14+ hour work day
>
> 48 minutes fetching water or 5%
>
> 26 minutes fetching wood, or 3%
>
> (Government of URT and UNICEF 1985a:468)

Sheryl McCurdy, who worked for UNICEF in two Njombe villages and one Makete village in 1985, observed a similar workload. She noted that the women she visited at home always seemed to be cooking. Their trips to collect firewood ranged from 30 minutes to one hour and 45 minutes one way, although wood was not collected everyday. The women did collect water daily, but the trips took less time in some villages (sometimes only 15 minutes roundtrip) because piped water was available nearby. Also, some Njombe District families had a drainage system on the roof which collected rain water and deposited it in a barrel, so they did not need to travel to collect water during the rainy season. In some villages, however, the

local water source was a distant stream,[5] where women would take up to one hour and 30 minutes (roundtrip) to collect water, sometimes taking extra time because they were not in a rush to be back to work (McCurdy 1988).

This last observation raises a question as to whether time savings will be advantageous for women. How burdensome do women find these household tasks? Evidence in Ghana suggests they find carrying wood and water tiresome (for example, see Date-Bah 1985:226-227). Similar to the trips to the maize grinding mills, however, the collection of fuelwood and water gives women a chance to get away from the home. Would Njombe women like to make fewer trips? Or do they enjoy the frequency of these trips? As for cooking, some observers (e.g., Majombe 1986) think women would like the faster-cooking CSB, although it is also possible that they may enjoy the time spent cooking. Women have been observed telling stories, drinking beer, and looking after children while they prepare and cook food. In assessing the potential advantages of CSB, it is critical to find out whether Njombe women would be interested in adopting food products that are convenient and time-saving.

It may well be that convenience foods will have a seasonal appeal. Estimates suggest that rural African women work only slightly longer during the peak season than during the off-peak season. They re-allocate their time; during the peak periods they work longer in the fields, reducing the amount of time spent performing tasks such as collecting water and firewood, processing and preparing food, and caring for children (Carr 1985:117; Hamilton, Popkin and Spicer 1984:39, 45). Thus, Njombe women might be more receptive to using convenient extruded products during the peak season.

Also, in assessing the appeal of convenience foods to Njombe women, it is important to determine whether the traditional cooking method has by-products that may be reduced or eliminated by the adoption of fast-cooking food products. For example, in Sierra Leone wood ash is used to fertilize backyard gardens, clean teeth, remove hair, and facilitate handling of cotton fiber in weaving operations; smoke itself is often used to dry grain stored on the ceiling (Stevens 1985:295). Careful study of local cooking practices and their by-products must be undertaken to fully assess the impact of CSB adoption.

Alternative uses of women's time:

Consideration must also be given to how women might spend their increased time. According to Bhaduri (1985:19-20), the "woman-day" can be divided into three quantifiable time components:

1. the amount of time spend in "gainful economic activity resulting in income" for women;

2. the amount of time spent on "unpaid household activities;"

3. the "residual time" spent on sleeping, eating, leisure, or recreation.

Thus, Bhaduri distinguishes between those tasks for which women directly earn income and those for which they do not. When identifying unpaid household activities as distinct from residual activities, some difficulty may be encountered because the two categories may overlap considerably (Bhaduri 1985:23). A useful definition of "unpaid household activities" is:

> . . . the work that is done for other family members where no direct reward is calculated or where the effective possession of the product or reward for the labour accrues to the user of the family labour (Whitehead 1985:37).

Examples of such activities for rural African women might include cooking, childcare, fuelwood gathering, household chores, and field work on their husbands' plots--depending on whether women are engaging in these tasks for the benefit of their households, for their own pleasure, or for monetary reward.

Application of this time-use classification permits quantification of the impact of a new consumption product on women's use of time. A net reduction in one time category necessarily implies an increase in one or both of the other time categories. In turn, the impact of product adoption on women's income and leisure time can be identified. A change in total work hours can indicate the specific effect on women's work burden, yet the arduousness of the tasks performed is also important when assessing this impact. Substituting a more arduous task for an easier task may or may not hold total work hours constant; however, even if work hours do not change, the work burden will increase.

In the case of CSB, while product adoption will reduce the time women devote to unpaid household activities, women's welfare (e.g., work burden, income, leisure) will not necessarily improve; nor can the possibility of improvement be ruled out <u>a priori</u>.

Several alternatives are possible. First, women might devote more time to other unpaid household activities of their choice. For instance, Njombe women are very concerned about providing food for their families. Thus, they may decide to increase the time they spend in activities such as family food production or attending health and nutrition programs. Presumably, if they made this choice they would receive some satisfaction from the change, although to what extent is not clear; other family members would be the main beneficiaries. Second, if women have free choice to allocate their time, they may decide to engage in more leisure or residual activities, where they clearly receive a gain.

Third, women might choose to pursue income-earning activities. Preliminary evidence suggests that Njombe District women do desire outside employment, because they keep the income they earn.[6] However, the availability of local income-earning opportunities (e.g., brewing beer [pombe], selling surplus food products, working on neighbors' fields in cash crop areas, or working in town) will determine whether this is a feasible alternative. The proposed Njombe project addresses women's needs for income-earning opportunities. The extrusion enterprise is intended to be a female-operated firm, providing employment for a small number of women. Incentives will also be offered to women to encourage them to cultivate soybeans; they will earn income by selling them to the extrusion enterprise. This "package approach" should give women greater options for how they can spend their increased time.[7]

Opportunities will vary according to women's circumstances: women with greater connections and skill will be the ones most able to convert their time savings into an income-earning opportunity. Alternative childcare arrangements may also be critical. Unpaid household activities such as cooking are sometimes combined with watching children. Available income-earning activities that do not permit women to watch their children may discourage them from seeking employment.

Which of these three alternative uses of time (unpaid household activities, residual activities, or income-earning activities) will be chosen by women is likely to be influenced by their socioeconomic circumstances. Women in high-income households might be able to enjoy their extra time by increasing their leisure activities. In contrast, women belonging to low-income households may be more likely to seek an income-earning opportunity. In either case, the adoption of CSB would enhance women's welfare.

A fourth alternative exists where husbands or male household heads are able to exert control over women's use of time. Typically in rural African families, men and women independently "...allocate the resources under their control to activities that best enable them to fulfill their [own individual] obligations," rather than their making joint decisions to promote the household's best interests (McKee 1986:194). Thus, husbands may appropriate women's increased time for unpaid household activities that will benefit men. If such is the case, men, not women, will receive the welfare benefits of adopting extruded products. And should women be required to perform more arduous tasks, their work burden will actually increase. Women's welfare would thus not improve and might even be hurt by extruded product adoption, and women would be less receptive to the products.

Only limited information is available concerning the degree of control which male household heads exert over women's use of time. Whitehead (1985:44-45) cites evidence that in Africa the wife's obligations are sometimes negotiable rather than strictly

controlled, especially when women have alternatives such as income-earning opportunities and divorce. In Njombe District, family decision-making arrangements concerning women's use of time must be explored; only then can the full welfare implications of CSB consumption be identified.

In sum, the ways women spend their released time will depend on the degree of control they have over their use of time as well as their preferences, existing socioeconomic circumstances, and income-earning opportunities. Also, their choice may well be influenced by society's valuation of different tasks. For example, are women expected to cook or engage in other household activities for many hours? Are they discouraged from earning income away from home? The nature of such factors should be explored in Njombe District, for how women spend their released time will determine the impact of CSB consumption on women's work burden, income, and leisure.[8]

Hypothesized Njombe Consumer Receptivity to CSB

CSB promises to help satisfy the nutritional needs of Njombe District's young children and mothers, yet consumer receptivity may well depend on additional factors, such as the impact of product consumption on welfare. The overall net welfare effect, as influenced by changes in women's use of time, is not apparent *a priori*. Preliminary research suggests several hypotheses, some of which support (while others challenge) the idea that CSB consumption will favorably affect women's welfare. CSB consumption promises to release women's time from traveling, cooking, and gathering fuelwood and water, but a thorough consumer analysis must estimate the exact time gain for Njombe women under local conditions. It must also consider the desirability, from women's perspectives, of reducing their time devoted to these activities. And it must identify the ways women will allocate their increased time as well as the resultant welfare benefits or losses. Future field work must address the differing circumstances in which women live; such analyses are critical in determining how receptive Njombe women will be to the introduction of CSB.

By changing women's time allocation, CSB consumption will also affect the welfare of Njombe men. Because cooking and firewood and water collection are sex-segregated tasks performed predominantly by women, the release of time from these tasks should have little or no direct impact on men. (This would not be the case if these are sex-sequential tasks in which men's activities are directly dependent on women completing their segment of the task.) However, men will be affected if they try to compel women to use their saved time for the benefit of men. While women in this instance might be less receptive to the new food products, despite realizing the nutritional advantages, men may become a more receptive market.

At the same time, CSB consumption may threaten Njombe men. Their relative position as cash earners may be challenged if women are able to earn extra income during the increased time. Also, some men's welfare might be reduced in absolute terms since substitution of CSB for sembe would place a female-operated extrusion enterprise in direct competition with local male-operated maize mills. Assessment must include how the maize mills will be affected (for example, loss in sales, number of men affected, and relative decline in their incomes). If men see their money-earning activities threatened by this new competition, they may object to the products' introduction in the area and oppose the consumption of CSB in their own households.

While women may be the expected product buyers, it is important to consider the implications of product adoption for men as well. As an application of the model suggests, extruded product consumption, through its impact on women's use of time, may affect the welfare of both men and women. These impacts must be taken into consideration in order to ensure successful product marketing.

Conclusion

While this paper has focused on introducing one particular processed food in a specific geographical area, its analysis has much broader implications. A major theme throughout the paper is the need for marketing (and nutrition program) analyses to go beyond recognizing apparent product advantages and consider the precise nature of the society within which the product is to be introduced. A product characteristic (such as the "convenience" of saving time in food preparation) that offers an obvious advantage in one social context, may not be as beneficial in another society. Recent studies in the women-in-development literature offer insights into the behavior and motivation of rural African women who are often targeted buyers or participants in nutrition programs. Specifically, women's needs for welfare attainment, often overlooked in Western marketing analyses, have proven to be a critical determinant of their receptivity to modern technologies. These needs can play an influential role in women's response to new consumption foods.

To identify the implications of consumer needs for the successful introduction of a new food, this study has synthesized a conceptual framework primarily from Bhaduri (1985) and Whitehead (1985), and applied it to a specific case study. The adoption of a centrally processed, precooked food, such as CSB, is viewed here as involving technological change. By affecting women's use of time, processed food consumption will consequently affect their work burden, income, and leisure. Accordingly, women's welfare will be altered. The exact nature of the impact will vary for each locale (and perhaps among households within a given locale) and will need to be investigated through field studies. Numerous

questions that have been identified must be addressed by future research. While specific to Njombe, many of the questions, and certainly the logic behind them, should be applicable when assessing the feasibility of introducing processed foods to other rural African locales.

This is not to say that answers to the questions addressed herein will constitute a complete feasibility analysis; consideration must also be given to other product characteristics and consumer needs, such as taste satisfaction. However, assessing the product's likely impact on women's welfare should play a key role in determining product marketability. Moreover, by anticipating consumer resistance due to a perceived unfavorable welfare impact, the conceptual analysis and supporting field research can provide a basis for redesigning and introducing the product so as to overcome the identified opposition. Improvements in the consumption of nutritious foods would thus be encouraged.

Notes

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1. It is expected that an increase in burdensome work will diminish women's welfare, while an increase in leisure or income will improve their welfare.

2. Because both foods are maize-based, the adoption of CSB will not challenge the local maize cultivation pattern or technologies (although soybean cultivation will be encouraged). In that sense, the impact of CSB adoption will be minimal. However, the substitution of CSB for maize will change the traditional manner of acquiring staple foods: a market-purchased, pre-cooked food (CSB) will be substituted for maize, a food predominantly acquired through subsistence farming (with local milling).

3. UNECA/ATRCW estimated that African women contributed 90% of the total adult labor in processing food crops and carrying water and fuel, and 95% for feeding and caring for children, men, and the aged (Carr 1985:120). However, children may help their mothers perform these tasks, thereby reducing the latter's work burden. The children's contribution should be studied in Njombe District.

4. In addition, the need for less firewood would help conserve scarce local forests in Njombe District. For example, Graham (1979:7,9,11) identified a shortage of forests (and firewood) in the Makambako area and Ilembula and noted an inadequate supply of firewood available for tobacco curing in Wanging'ombe. Whether planned afforestation projects alleviate these shortages should be investigated.

5. The Government of URT and UNICEF (1985b:7-8, 51) report that public development expenditure in Iringa Region has been low so that many villages have yet to develop an adequate and accessible water supply.

6. Also, elsewhere in Africa there is "...abundant evidence of women's search for and protection of independent income sources as well as their preferences for allocating their labor to activities where they control the product, e.g., to dairy processing for household consumption and sale rather than to the unpaid weeding of cereal fields that their husbands control (McKee 1986:194)."

7. The possibility does exist that men might take control of the project's income-earning opportunities if these prove lucrative. African men have historically been in charge of cash cropping. Considerable empirical evidence also indicates the tendency for African men to take over and perform women's tasks when these become mechanized or commercialized (e.g., see Whitehead 1985; Agarwal 1985). Indeed, the male-dominated NJOLUMA Cooperative Union responded to the project initiative with a letter indicating its plan to run the project by itself rather than cooperating with organizations that are committed to training local women to manage the firm themselves (Myavidogo 1988).

8. Throughout this analysis it is assumed that women do their own cooking and gathering of fuelwood and water. In some rural African areas, however, households hire labor to perform these domestic chores. The analysis can be adjusted to consider the welfare impact of purchasing CSB in the hired-labor situation. For these households, the adoption of convenient extruded products will reduce the amount of time that hired labor will have to spend on these tasks. Several different welfare impacts are possible. First, the household could make money by reducing the number of required hours of hired labor. Presumably, the wage laborer will experience reduced income. Second, the household can continue to employ wage labor for the same number of hours. With less work to do, the wage laborer will have a reduced work burden, but the household will receive no gain, except from consuming the extruded products. Third, the household could employ wage labor for the same number of hours, but reallocate their time to perform new tasks. The wage laborer will experience no change except perhaps an increase or decrease in the degree of effort required to accomplish the tasks. The household on the other hand, will see more tasks performed for the wages paid (with a possible substitution of wage labor for woman's labor on other household activities). The implications of these various welfare impacts for the households' receptivity to purchasing CSB may depend on who makes the buying decision: women (household members) or hired laborers.

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