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Introduction

Though not indigenous to Sub-Saharan Africa (SSA), cassava plays, to varying degrees, five major roles in African development: famine-reserve crop, rural food staple, cash crop for urban consumption, livestock feed, and industrial raw material.¹ Cassava production in SSA was historically a significant staple crop for smallholder farmers and continues to be the second most important food crop in Africa (after maize) in terms of calories consumed.² Although cassava in SSA has been grown primarily as a staple crop, it is now expanding to a cash crop as markets expand in urban areas of Africa and around the globe.

Nigeria dominates cassava production in SSA, producing nearly 40% of SSA's cassava. Other key producers include Democratic Republic of Congo (DRC), Ghana, Tanzania, and Angola. DRC leads consumption both in terms of tons per year (15.9 tons) and per capita yearly consumption (300 kg/person/year). Because of its large population, Nigeria also consumes a large amount of cassava (14.2 million tons/year), but their per capita yearly consumption ranks 15th in SSA. Data show that Angola, Ghana, and Nigeria consumed slightly less than half of the amount of cassava produced in country.³ Unfortunately, official trade statistics do not often record intra-SSA cassava trade. We do know, however, that trade in fresh cassava is limited due to its bulkiness and high perishability. Therefore, most cassava in SSA is used domestically or traded to bordering countries, limiting its role in foreign exchange and import substitution.^{4,5}

Subsistence crops such as cassava are often considered women's crops with the standard explanation that women are responsible for feeding the family and thus

prefer to grow crops for the household. However, it is difficult to tell whether women grow lower-value crops because they have different preferences and concerns or because they cannot access the land, inputs, credit, information, and markets that would allow them to produce higher value commercial crops.⁶ In Ghana, for example, women farmers would like to plant maize for cash income, yet continue cultivating cassava and yams because they lack the capital to purchase the required inputs for corn and to hire someone to plow the fields.⁷

To increase understanding of cassava production practices, the International Institute of Tropical Agriculture (IITA) funded the eight-year Collaborative Study of Cassava in Africa (COSCA). The study systematically reviewed cassava cropping practices in six countries. These data, along with other research in SSA, highlight the role that women play in cassava production, and can illustrate ways to better address gender issues from planting through post-harvest production.

Land Preparation

Women's ability to access land for cultivation varies considerably across regions and cultures. Some women may have legal rights to land but lack of enforcement restricts *de facto* rights.⁸ In general, for most crops women are responsible for cultivating food for home consumption on household plots whereas men usually grow the main cash crop on personal plots.^{9,10}

Because of the physical demands, men more often than women prepare land for cassava planting. Land preparation requires tilling the soil and creating mounds that house the stem-cuttings from which cassava is grown. The COSCA study found that the average cassava field per household was less than one hectare and contained on average 8,000 cassava plants.^{1,11}

In the six COSCA countries, men provided 85% of the labor in clearing the land, though their share of labor dropped during plowing and planting to 65% and 40%, respectively. These findings were fairly constant across the six countries, with the exception of Congo, where women provided over 75% of the labor for both plowing and planting.¹ Unlike most other crops, cassava can be planted throughout the rainy season, a flexibility which may be particularly important to households suffering from a labor deficit, such as those suffering from HIV/AIDS, or female-headed households.¹²

Plots are prepared using manual labor, as farmers in SSA have, in general, limited access to tractors.¹³ As labor becomes mechanized, it is often men who purchase and operate the machinery, decreasing women's control over crop mix and use of profits and threatening their role in household food security.^{11, 14}

Soil Fertility and Cassava Production

One of the benefits of cassava and reasons for its widespread adoption is that it can grow on extremely poor soils, growing efficiently without the addition of soil amendments (though yields are higher in more fertile soils). In the case of SSA this means that cassava can be grown on plots that require shorter fallow periods in order to maintain usufruct rights or on land that is somewhat depleted after previously growing higher input-demanding crops like maize or upland rice. As cassava production expands in Africa, the crop is to a

Table 1. Characteristics of Cassava in SSA

History	Species: <i>Manihot esculenta</i> : Introduced to SSA by Portuguese in 1880s
Uses	Famine-reserve crop, rural food staple, cash crop
Demand	Steady as a staple-crop; increasing as cash-crop, livestock feed, and industrial raw material
Primary Cultivation Challenges	Cassava Mosaic Disease (CMD), Cassava Bacterial Blight (CBB), Cassava Brown Streak Disease (CBSD)
Current Technology Efforts	Machinery: graters for processing into <i>gari</i> Traits: resistance to CMD and CBB; TMS varieties with increased yields
Inputs	Low-input crop (fertilizer)
Major Producers	Nigeria, DRC, Ghana, Tanzania, Angola
Major Consumers	Tons/year: DRC, Nigeria, Tanzania, Mozambique, Ghana Kg/person/year: DRC, Mozambique, Angola, Congo, Ghana

large extent replacing fallow, though its long cropping cycle constrains this use somewhat.⁵

Women's insecure land tenure leads to lower investment in the land and a risk of soil degradation, with potential implications for cassava production. In Ghana, for example, where fertilizer use is low, the primary investment in land is fallowing. However, longer fallows are likely to lead to loss of land when tenure is insecure; therefore in at least some cases, women with less political capital have less tenure security and leave their land fallow for shorter times.¹⁵ Over time, this leads to reduced soil fertility, smaller profits per hectare and reduced availability of food for household consumption.¹⁶

Unlike leguminous plants that fix nitrogen in the soil, cassava does nothing to rebuild soil fertility. While cassava can grow on poor soils and be an important subsistence or cash crop in land-poor communities, its continuous cultivation significantly depletes soil quality. Cassava's extremely efficient extraction of soil nutrients makes it difficult to use intercropping techniques to maintain soil quality.

Plant Propagation

Cassava has historically received less attention from private and public plant breeders, both because it is a low-value crop, and because it is propagated from stem-cuttings, rather than planted from seed. However, some new varieties have been developed such as the high-yielding Tropical Manioc Selection (TMS) variety, which is resistant to cassava mosaic disease. These new

varieties were able to increase yields by over 40% without fertilizers.¹⁶

Smallholder farmers can propagate their own cuttings, meaning the crop is accessible to even the poorest farmers. In some cases, farmers also purchase plant stocks from local markets. Whether they perform their own propagation or purchase cuttings, many farmers continue to use stems that have been affected by pests and disease, spreading the contaminants.¹¹ In a small survey of cassava experts carried out in 2003, respondents ranked “a lack of clean planting material” as the most significant problem limiting subsistence production of cassava.¹⁷

In the COSCA countries, women provided labor for planting in nearly half of all plots, although the percentage of labor supplied by women dropped as households increased the amount of cassava produced for sale.¹ Women’s high involvement in planting necessitates that local propagation markets be responsive to women’s concerns.¹⁸ Effective strategies to address women’s concerns include: organizing and promoting informal networks and women’s farmer organizations, or increasing access to credit.

Groups and Networks

Group participation increases bargaining capacity, makes communication with extension officers easier, and offers an opportunity to share resources for production or collateral.^{8,19} In Nigeria, for example, women’s groups contributed to the quick dissemination and large-scale adoption of high-yielding TMS varieties in the late 1970s.²

Women’s groups in Uganda are also involved in the bulking up of stem-cuttings. While men generally perform this task individually and keep the profits, the profits from women’s work are reinvested within the group and distributed to group members.²⁰ Finally, the involvement of women’s groups in propagating cassava stem-cuttings can have spillover effects. Evidence from Colombia suggests that women trained on hygiene, budgeting, and literacy during a cassava training session later carried out informal education activities with their neighbors.²¹

Crop Maintenance

Weeding

In the early stages, cassava needs intensive weeding in order to ensure higher yields, but the crop requires little weeding once the full canopy emerges. This is important for women farmers, as they provide the bulk of the weeding labor.¹ Improved varieties produce branches sooner, and the resulting leaf canopy prohibits weed growth by blocking sunlight from reaching the ground.²¹ For example, TMS varieties require little weeding.

Inputs

Because cassava grows well even in marginal soils, farmers rarely need fertilizer. Cassava is also unique in its ability to withstand long dry spells, giving it an important role in supporting household food security during drought periods, particularly for more vulnerable households. However, late bulking of cassava roots can be a very significant problem in these situations, if farmers are forced to harvest cassava early to compensate for crop failures of more drought-sensitive crops.¹⁸

Time Demands

Because cassava is frequently grown without fertilizer, labor costs are by far the most expensive input in cassava production. Although land clearing and harvesting are the most time-consuming activities, crop maintenance can require a significant amount of time. Evidence suggests that implementing technologies that are simple to operate, maintain, and master benefit the greatest number of women (and men).²⁰

A benefit of cassava is that it allows for flexible time management and this may provide one explanation of the central role of women in its cultivation and harvesting. The limited weeding requirements and the capacity to leave the tubers in the ground for extended times, whether to wait for better market prices or labor availability, makes it an ideal fall-back crop. This flexibility also allows women the time to fulfill their childcare and household responsibilities.²² This flexibility has its limits, as tubers left in the ground become woodier, less nutritious, and garner lower market prices.

Role of Extension Agents

Evidence from Nigeria suggests that women cassava farmers are relatively young and largely illiterate, albeit with many years of farming experience. In a 2002 study, women knew a lot about cassava varieties, but were

unaware of the benefits of herbicides, soil amendment technologies, and other modern farming practices.²³

Extension services which consistently bypass women slow the adoption of new technologies, including improved varieties.^{8,24,25} Extension agents are often men, who may lack sensitivity to women's time and credit constraints or may ignore women with low levels of formal education, thinking them incompetent.²⁶ Low education levels are related to low technology adoption,²⁷ making gains in girls' education and appropriate agricultural training for women essential.

Recruiting more women as extension agents and training male agents to meet the needs of female farmers could also give women greater access to extension efforts, where cultural appropriateness is carefully considered.⁸ Quick technological fixes, such as motorcycles, can also have unexpected outcomes. For example, women extension agents were given motorcycles to travel to villages in Nigeria. But, since it was culturally inappropriate for women to drive motorcycles, the motorcycles were mostly used by the agents' male relatives.⁸

Harvest

As yields increase, more labor is required to harvest cassava. Evidence from the COSCA suggests women provide slightly more than half of the required labor for harvesting in most countries, with the exception of Congo, where women provide 85% of harvesting labor.¹ Increased labor demands for harvesting substantially increases the cost of production.² Enete et. al. (2005) used COSCA data to find determinants of the decision to use hired labor. They found that education levels and farm size significantly influenced the decision to hire labor. Unfortunately, the researchers did not control for gender, but we can infer from these results that women are less likely to hire labor because women in Africa are in general less educated and own less land than their male counterparts.²⁸ This conclusion is also supported by evidence from cassava production in Tanzania showing that female-farmers use less hired labor or mechanized transportation than male farmers.²⁹

Left in the ground, cassava lasts up to 36 months, a flexibility that gives cassava a special role in reducing environmental and other food security risks. While these

risks impact both men and women, women are often more vulnerable to these risks because of decreased access to alternate resources and a relatively lower socioeconomic position.³⁰

This flexibility is not without its drawbacks, however. Although in-ground storage protects the root, women farmers are often victims of cassava theft from their fields. In Malawi, for example, women plant bitter cassava to deter thieves. This bitter cassava has a higher cyanide concentration, and thus requires more processing to render the root edible. The threat of theft also causes farmers to harvest roots prematurely, thus lowering yield. Under these conditions, women are forced to make the trade-off between time spent in processing and increased food security.²¹

Once harvested, cassava is subject to rapid deterioration if not stored properly (though it can be stored for up to 6 months once processed). Therefore, farmers who lack access to post harvest facilities and the transportation and communication links needed to connect with markets may find that any cassava beyond that consumed by the household is lost as waste.¹⁸ Rapid deterioration can thus limit women's ability to take advantage of growing commercial markets for cassava.

Post-Harvest Processing

Women provide the majority of the labor in processing cassava for both household consumption and market sale. Processing begins with peeling the root, which is laborious and time consuming. Attempts at mechanizing the peeling process in Nigeria failed because a large amount of the root was lost during mechanical peeling.³¹ Next, it is necessary to cook cassava to rid the root of harmful cyanide. Women often boil cassava to prepare the root for household consumption. Boiled cassava is often pounded using a mortar and pestle to make *fufu*.

Women also produce *gari* from cassava by grating the roots to form a pulp, which is then drained and roasted. *Gari* is much cheaper and easier to transport than the roots in their raw form. Because it is dried, *gari* can be stored for long periods of time.¹

Mechanical cassava graters are widely popular throughout West Africa in large part because the designer incorporated the ideas and suggestions of women users via input from his three wives.³² The

mechanical graters are in some cases owned by community organizations and women's groups. However, individual entrepreneurs more frequently own mechanical graters because their access to credit enables the purchase.³²

Even though labor-saving technologies have the potential to save women time, control of technologies can mean that the benefits accrue disproportionately to men. For example, in Nigeria, the advent of graters does create benefits for women: they save time grating cassava, time that they divert mainly to other economic activities such as retail trade and roasting *gari*. In addition, male owners generally hire women operators. However, women do not share in the profits from the grating process, which are much larger than the profits from *gari* sales.³²

In addition, women from the poorest households experience two down sides from mechanical grating. First, their lack of income excludes them from these services, because they cannot pay for them. Second, the advent of mills can result in a loss of income for the poorest women, who used to be paid to manually process crops.³³

In Nigeria, as profits from cassava increase because of *gari* production, men become increasingly involved. Nweke (2002) points out that although men seemingly take-over the means of production, this is not the whole truth. Often times, men have emigrated to find wage-labor in cities, but return to the household if cassava farming becomes profitable.¹

Consumption and Sale

In some parts of Africa, including Cameroon and Kenya, urban markets for traditional crops grown by women, including maize, sorghum, cassava, and leafy vegetables, are expanding rapidly, linked to the rise of supermarkets. While this presents opportunities for women farmers, the challenge is to ensure that women retain control over production, processing, and marketing. In Uganda, strong demand for leafy vegetables in Kampala markets led men to take over their cultivation.³³ While urban markets for cassava thus create opportunities for women farmers, smallholder farmers often cannot marshal sufficient working capital to meet supermarkets' demands for products of consistently high quality.³¹

In at least some parts of Africa, there is evidence that control over cassava profits vary depending on the end use of the crop. In Tanzania, men usually control the profits when cassava is grown as a cash crop, while women control small cassava sales and often use the money to buy household necessities and support their children's education.^{14,34}

Conclusion

Cassava is undergoing a transformation in Africa, as production expands to fulfill urban demand. Women farmers are integral in this transformation process because they provide much of the labor throughout the cassava crop cycle. The potential gains to cassava production made possible through improved technology will not be fully realized without the participation of women farmers and without women farmers having access to credit, markets, and extension services. Additionally, evidence from SSA suggests that labor for harvesting and processing, rather than labor for weeding, has become the key labor constraint for cassava, and addressing this concern may be more important than further yield increases for raising production levels.²

Endnotes

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