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Gender and Cropping:  
Millet in Sub-Saharan Africa

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The millets, a group of small-seeded grasses indigenous to Africa, are an extremely important staple food in resource-poor regions of Sub-Saharan Africa (SSA). Millet requires few inputs, suffers less from insect pests and disease than other grains,<sup>1</sup> and can tolerate areas even too hot and dry for sorghum.<sup>2</sup> This makes millet the only crop that can grow in some of the most arid areas of SSA, especially in the Sahelian zone. This drought-resistance makes millet an essential component of food security and risk management strategies for many Africans, especially as the world climate experiences more hot and dry climate variations.

The most prevalent millet species in SSA are pearl millet (*Pennisetum americanum*) and finger millet (*Eleusine coracana*). Pearl millet makes up roughly 90 percent<sup>1</sup> of the 22 million hectares<sup>3</sup> of millet cultivated in Africa and is grown mostly in the Sahelian zone, where it is the primary staple crop despite its low yields. Pearl millet has high protein content and balanced amino acids, making it more nutritious than alternative grains. Finger millet makes up the majority of the remaining 10 percent of millet grown and is cultivated in eastern and southern Africa. Under optimum conditions, finger millet can yield over 10 tons of grain per hectare.<sup>4</sup> Additionally, finger millet is high in calcium, iron, and methionine, an amino acid lacking in African diets and is therefore important as a weaning food and for pregnant and nursing women. Lastly, finger millet can be stored for several years without insect damage. Both millets are grown primarily as subsistence crops although excess production is sold if markets are available.

Despite its important role, both consumption and production per capita of millet has declined in the last 20 years. In southern and eastern Africa, this is largely due to a movement toward maize as a result of research-led productivity increases, government policies increasing profitability, and easier processing.<sup>1</sup> Although the increases in maize productivity can be beneficial and reflect the

increasing opportunity cost of women's time as they enter the workforce in urban areas,<sup>5</sup> maize has been pushed into millet-growing areas where it is not well suited.<sup>1</sup> In West Africa, millet is being replaced with rice for similar reasons.<sup>6,7</sup>

Table 1. Characteristics of Millet in SSA

<b>History</b>	Pearl: Descended from W. African grass, domesticated in Sahara Desert <sup>1</sup> Finger: Native to Ethiopian and Ugandan highlands <sup>8</sup>
<b>Uses</b>	Staple food, beer, fodder, poultry feed, building material, fuel <sup>9</sup>
<b>Supply/Demand</b>	Consumption: +3.7% yearly (all Africa '94-'03) <sup>3</sup> Production: +2.5% yearly (all Africa, '94-'07) <sup>3</sup>
<b>Primary Cultivation Challenges</b>	Pearl: <i>Striga</i> , downy mildew, low soil fertility, drought stress Finger: Blast, soil fertility, drought stress
<b>Current Technology Efforts</b>	Machinery: threshers, dehullers, mills Traits: disease resistance, insect resistance, earlier maturation, tolerance to low soil fertility and drought
<b>Inputs</b>	Few inputs necessary; fertilizer and irrigation increases yields
<b>Major Producers</b>	Pearl: Nigeria, Niger, Burkina Faso, Mali, Sudan, Chad Finger: Kenya, Tanzania, Uganda, Ethiopia, Malawi, Zambia, Zimbabwe

The momentum away from millet production and consumption partially reflects relatively limited research efforts compared to other crops. Though multiple hybrids of pearl millet are marketed, finger and other millet varieties lag behind other major grains in research for a number of reasons.<sup>1</sup> Private sector research tends to concentrate on internationally traded and economically rewarding crops<sup>10</sup> and millet is generally neither. In addition, pearl millet is largely self-pollinating, making cultivar exclusion difficult.

Low research efforts may also reflect a gender bias in research as women tend to farm the crops that are not internationally traded. A better understanding of gender issues in millet production may help researchers develop technologies to help resource-poor millet farmers in SSA.

### **Women and Millet**

In general, women are the primary producers of subsistence crops such as millet.<sup>11</sup> In the Kagera Region of Tanzania, for example, women have exclusive responsibility for all activities in millet production, in contrast to almost all other crops where responsibilities are split or shared for at least one task.<sup>12</sup> However, millet's gendered division of labor is rarely so straightforward. In West Africa, men are often considered responsible for millet production.<sup>13,14,15</sup>

As in most African small-scale farming, millet can be farmed on multiple plots, including household plots, men's personal plots, and women's personal plots.<sup>16</sup> If millet is a primary staple food, it will likely be grown on the household plot but if a market exists for sale, woman or men may also grow millet on personal plots and control the income from the sale. In general, the most profitable crops are grown on men's personal fields. Among the Kussai of northeastern Ghana, men were traditionally responsible for millet production on both household and men's plots although women contributed considerable labor.<sup>15</sup> Women were not allowed to grow millet on their personal plots. In recent years, however, women have taken on the traditionally male tasks of weeding and some land clearing in response to migration-related male labor shortages. In addition, women have started growing millet on their personal plots to make up for the household shortfall caused by men's transition toward cash crops (e.g. rice and groundnuts). These changes have increased women's work time from 3.3 to 4.1 hours per day in the wet season and 2.3 to 5.2 hours in the dry season.<sup>15</sup>

### **Access to Land**

When women have access to personal plots of land, their plots tend to be smaller than men's plots. Among the Kussai (who grow millet as well as sorghum, rice, groundnuts, and cowpeas), women's and men's plots average 0.25 and 0.8 hectares respectively and therefore, men's income from their plots is higher. This discrepancy is probably due to the patrilineal system of land inheritance and the land allocation authority of male lineage heads.<sup>15</sup>

### **Seed Procurement**

Researchers often cite lack of seed production as a constraint in the spread of improved varieties of millet.<sup>17</sup> An example from Niger shows that farmers' most important source of millet seed, even today, is from their own harvest.<sup>18</sup> This is especially true for women, who tend to rely on informal systems to access seeds whereas men seem to benefit more from formal seed markets because of their involvement in commercial crops.<sup>11</sup>

Women are often the suppliers of millet seed and grain in markets. In Mali, 98.6 percent of millet and sorghum seed vendors are women farmers.<sup>19</sup> This makes women important players in maintaining biodiversity and seed security. Encouraging local seed banks and establishing small-scale seed enterprises are potential interventions for strengthening local seed markets.<sup>11</sup>

Harsh environmental conditions in millet-growing areas generate the need for locally adapted varieties and local markets. A participatory varietal selection study in four countries in West Africa found that farmers greatly valued adaptation (defined as good germination, stout growth, resistance to lodging, tolerance to drought and pests, and resilience to damage by livestock) in seed characteristics and found that their local varieties generally outperformed "improved varieties."<sup>20</sup> These findings suggest that breeding efforts should produce varieties adapted to specific zones.

### **Land Preparation**

Preparing land is a task generally done by men in SSA for almost all crops including millet, although women are increasingly involved in land preparation. Adequate land preparation facilitates favorable conditions for planting, germination, and plant development. Broadcasting, or scattering the seed by hand, is a common method of millet planting. Broadcasting requires extensive land preparation to create a very fine seedbed.<sup>8</sup> Land preparation can be made substantially easier through the use of oxen-led plows, but women face gender-specific constraints in the use of this technology and are therefore less likely to use animal traction.<sup>21</sup>

### **Planting**

Most millet is planted by broadcasting.<sup>8</sup> Planting seeds in rows can greatly reduce the need for weeding and allows the use of animal-drawn tools to weed between rows.<sup>8</sup> However, planting in rows is more labor-intensive than

broadcasting and might deter women from this technique if the labor increases are too burdensome. Technology to mitigate this extra labor requirement has been shown to be highly valued. In the late 1980s, a Cameroonian organization produced a seeder with a special distributor for millet, reducing planting time by 60 percent and seed requirements by 33 percent.<sup>22</sup> This innovation was not only simple to handle and maintain, but it also reduced back pain associated with planting and the need for hired labor. Perhaps most importantly for women, a line of credit was set up and distributed to increase women's access to such implements. Ninety-seven percent of farmers who tried the tool purchased it, though gender disaggregated statistics are not available.

Other management practices and tools to increase millet yields and decrease labor requirements include minimum tillage seeding, wide rows, bird control, intercropping or undersowing with legumes, and using ox-drawn implements. However, tools are more difficult for women to access because of credit constraints, and extension services teaching management practices have been shown to reach men more than women farmers.<sup>23</sup> Women may increasingly adopt technology and management practices with efforts to improve their access to extension services and credit.

### **Crop Maintenance**

Weeding is often cited as a major constraint to increased agricultural production and the most difficult and time-consuming job women face in the fields.<sup>21</sup> This difficulty is particularly pronounced in millet cultivation. When finger millet is broadcast, weeding with implements is nearly impossible and weeds look very similar to finger millet sprouts in the early stages of growing, requiring a trained eye and careful observation.<sup>8</sup>

Evidence from Zimbabwe indicates that using an animal-drawn cultivator can save women considerable millet weeding time compared to using a hoe.<sup>21</sup> However, as noted above, women face constraints to adopting animal traction. In western Uganda and parts of Zambia, there are cultural taboos against women working with cattle (although not with donkeys). Expense is another constraint because women have less access to credit than men and purchasing oxen is a relatively expensive investment. Lastly, animal-drawn implements in Zambia and Zimbabwe tend to be inappropriately heavy for women, although lightweight equivalents are available in countries such as Senegal.<sup>21</sup>

### **Soil Fertility**

An estimated 72 percent of millet in SSA is grown with minimal or no fertilizer.<sup>24</sup> Because traditional millet varieties tolerate low soil fertility, the fertilizer requirements of improved varieties limit adoption. In a study in West Africa, farmers cited cost and lack of available fertilizer as the main constraints to adoption of improved varieties.<sup>20</sup> The authors recommended that millet seed dissemination should include fertilizer and agronomic instructions to increase adoption. Fertilizer is generally a larger constraint for women who have lower access to extension services and credit.<sup>25</sup>

Alternatives or additions to inorganic fertilizer for soil fertility include manure, other biological soil amendments, and intercropping with legumes. A study in Gambia's Upper River Division concluded that intercropping is more effective than fertilizer in stabilizing millet crop yields when environmental conditions are poor.<sup>26</sup>

### **Harvest**

Harvesting by hand is another high labor requirement in millet cultivation. In a field survey in Zimbabwe, women spent a full month harvesting millet every year.<sup>21</sup> In most of Africa, harvesting finger millet includes removing the individual heads with sickles or small knives, leaving a few centimeters of stalk.<sup>8</sup> The harvested heads are then piled in heaps to trigger fermentation, making threshing easier. Once ready for harvest, pearl millet needs to be harvested quickly to avoid losses due to birds.<sup>1</sup>

### **Processing**

The most burdensome task for women in millet-producing areas is post-harvest processing.<sup>27</sup> Processing millet includes threshing, winnowing, drying, dehulling, soaking, and grinding. Processing enough pearl millet for a family meal takes approximately 3 hours and up to 7 hours if the millet is processed into flour.<sup>28</sup> Some argue that no development could help rural Africa more than relieving women from the arduous, time-consuming, and often health compromising task of grain processing.<sup>28</sup> Reducing processing time could also ensure that local grains such as millet are not fully replaced by crops that are easier to process. Processing technologies can also increase productivity, as dehulling by hand yields a relatively small amount of flour compared to machine dehulling.<sup>1</sup>

Introducing labor-saving processing technology has the potential to greatly increase productivity, saving women time and energy. However, gender issues are likely to influence technology adoption rates. In Senegal, women's work groups called *Santanée* traditionally thresh grain. However, with the introduction of a thresher, dehuller, and mill in one village, threshing became the responsibility of men, perhaps due to the heavy work required to bring bundles of millet heads to the centralized machinery. This was of great value to the women as they no longer had to manually thresh and did not have to maintain the mechanical thresher. Interestingly though, men did not take on responsibility for using the mechanical dehuller or mill, perhaps because they did not consider processing small amounts of millet for daily consumption a task worthy of their time. The result was that most women, only able to afford either the huller or mill, chose not to use the huller.<sup>34</sup> Milling by hand is more time-consuming and tiring than hulling by hand and the huller produced low-quality product, breaking grains and leaving bran in the flour.

Local tastes and preferences may also influence technology adoption. Traditionally, millet is soaked before grinding in order to trigger fermentation, reportedly improving taste. Imported mills often require millet to be dry, which alters the taste. Also, imported mills sometimes clog because the sieves are too small, resulting in more time and fuel use. When villagers in Morry Laye, Senegal decided to buy a locally produced mill, they found use of the mill saved 2-3 hours of processing time for women and girls, reduced grain losses, and resulted in higher nutritional value because the mechanical mill ground the few centimeters of stalk along with the grain.<sup>35</sup> In addition, the local mill was much cheaper than imported mills. Locally developed machinery that does not require substantial upfront investment can be extremely beneficial to women. However, where technology increases profitability, there is a risk that men will take over the crop, lowering women's gains and control over the technology.<sup>29</sup> Involving women in the development and introduction of technology may help mitigate this risk.

Many other factors influence the use of mechanized processing methods. A village may have only one machine, requiring farmers to transport their grain to and from the machinery; in this case transport may be just as onerous as hand processing.<sup>28</sup> Efforts to minimize time spent traveling to mills would likely help increase demand for such services. In Botswana, a donkey cart was used to transport grain and flour without cost and the donkey was fed the customer's

bran waste.<sup>28</sup> Another alternative is to mount the machinery on a cart and wheel it either directly to customers or to various villages or parts of villages.

Another strategy to decrease women's processing burden is to introduce millet varieties that are easier to thresh, dehull, and grind. Multiple studies have shown that women greatly value these traits. In Tanzania, trials of pearl millet showed that women farmers prioritized easy dehulling whereas men farmers did not include it among their criteria.<sup>30</sup> Similarly, a pearl millet trial involving a women's cooperative in Namibia found that ease of processing was the second most preferred grain trait for the women.<sup>31</sup> Involving both women and men early and throughout breeding and selection processes and reporting gender disaggregated preferences is a cost-effective way to develop varieties that farmers are more likely to adopt.

### Household Use

Millet is important for its multiple household and farm uses. Excess stalks and leaves can be used for fencing, roofing, and fodder.<sup>32</sup> In northeastern Ghana, dried millet stalks are the main source of fuel from November to March and when they run out, women have to walk long distances to gather wood.<sup>15</sup> Millet stalks can also be used as a soil amendment, partially protecting soil from sheet and gully erosion, but stalks are often more valuable as fuel, resulting in bare exposed soil.<sup>15</sup> These uses may imply that women, as household managers, prefer varieties with more leaf and stalk as opposed to only preferring higher yields.

### **Marketing**

Millet markets are not well developed. Only 5-10 percent of millet produced in Africa reaches commercial markets.<sup>33</sup> When markets are available, women are largely responsible for selling and marketing traditional crops.<sup>10</sup> Access to markets also appears to encourage adoption of new millet technologies. In Gwendomba, Zimbabwe, women have little access to processing facilities, but in nearby Madangombe, better market conditions create incentives for millet mill owners and thus, access to and use of millet mills is widespread.<sup>5</sup> Using the same logic, one could assume that increasing access to markets would also increase private investment into millet development.

### **Conclusion**

Per capita millet production and consumption in SSA has been decreasing over the last several decades. The shift

away from millet may result in poorer nutrition and increased time burden for women where they must find alternatives to millet fuel, yet little is known about these consequences. Investing in improved varieties that account for both men's and women's preferences, introducing labor-saving technology, and increasing market access all have the potential to increase millet's production and consumption on the continent.

## Endnotes

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