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Gender and Cropping in SSA: Executive Summary

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In 1984, a Gambian irrigation scheme introduced pump irrigation to rice fields in an attempt to raise yields and increase women's income. At the time, rice was considered a woman's crop and (anticipating the need to protect their control over the gains from the project) women were given priority in land registration.[1] Nevertheless, with improved yields, men took control of the rice lands and the gains accruing directly to women dissipated.

Introducing technology that is designed to be physically appropriate and valuable to women farmers can increase yields and raise income. But as this case illustrates, gender issues for agricultural technology projects in Sub-Saharan Africa (SSA) are extremely complex. The EPAR series *Gender and Cropping in SSA* offers examples of how these issues can affect crop production and adoption of agricultural technologies at each point in the crop cycle for eight crops (cassava, cotton, maize, millet, rice, sorghum, wheat, and yam).

This executive summary highlights innovative opportunities for interventions that consider these dimensions of gender. We encourage readers to consult the crop specific briefs for more details. Table 1 provides a summary of the critical gender issues for each crop.

Introduction

More than 1 billion people worldwide are estimated to be hungry.[2] The food and financial crises of 2008 aggravated this figure, reaffirming the importance of rural livelihoods for consistent access to food.[3] Because roughly 65 percent of Sub-Saharan Africans rely in some way on farming for their livelihood, increasing incomes for smallholder SSA farmers is essential in reducing hunger.[4]

Women play a vital role in SSA agriculture, providing perhaps more than 80 percent of the labor.[5] But as a large body of literature documents, these same women are often less able to access important farming inputs, while simultaneously contending with greater demands on their time, cultural norms, and other restrictions that decrease their productivity and household contributions. These familiar critical dimensions of gender and cropping in agriculture are:

- Land: ownership & access
- Finance: cash, credit, income, savings
- Information, training, & markets
- Division of labor
- Time demands: childcare, household chores, farming
- Intrahousehold and community cultural dynamics

Table 1. Key technology and gender issues by crop

Crop	Lessons
Cassava	▪ Underdeveloped commercial markets for women's crops ▪ Women provide majority of labor in production
Maize	▪ New or additional fertilizer requirements of hybrids a constraint for women ▪ Local varieties considered women's crops and high-yielding varieties considered men's crops
Millet	▪ Underdeveloped commercial markets for women's crops ▪ Broadcasting results in women's high weeding labor ▪ Processing extremely laborious for women
Rice	▪ New or additional fertilizer requirements of hybrids a constraint for women ▪ Women's weak land rights result in transfer of control to men with introduction of irrigation
Sorghum	▪ Underdeveloped commercial markets for women's crops ▪ Processing extremely laborious for women
Wheat	▪ Strong gendered division of labor in Ethiopia, where most smallholder wheat is grown, limiting women's control over land preparation and planting decisions ▪ Lack of credit largest constraint to adopting new technology, especially for women
Yam	▪ Underdeveloped commercial markets for women's crops ▪ Women's groups important for variety dissemination
Cotton	▪ Limited information on women's role in production ▪ Institutional structure of contracts make female participation less likely, requiring larger parcels of land, ownership rights, or participation in farmers groups

The way women spend money also makes their productivity growth extremely important for household well-being. Increasing women's access to income, technology, and paid work has been shown to improve their children's welfare more than similarly increasing men's access.[6] Considering intrahousehold resource allocation in agricultural projects in SSA is especially important since households typically farm on multiple plots controlled by different household members

from which the resources are often not pooled.[7] Because of these patterns, studies from Burkina Faso, Cameroon, and Kenya estimate that increasing women's control over inputs and income could boost farm yields by up to 20 percent.[8]

Improving technology is a primary focus of many agricultural development efforts. However, efforts to introduce agricultural technology that benefits female farmers have not been nearly as successful as hoped. As our series shows, female farmers in SSA are less likely than male farmers to adopt productivity-enhancing technologies such as improved seeds, fertilizer, pesticides, or small machinery.[9]

Seed Procurement

Understanding how men and women farmers procure seed is an essential first step in designing an intervention that increases the adoption of improved varieties.[10] Our series illustrates three main issues related to gender and seed procurement: women farmers often acquire seed through informal channels, women play a large role in seed saving, and economic barriers limit access to seed.

Women and men access seed differently. Women tend to rely on informal systems whereas men, because of their involvement in commercial crops, tend to benefit more from formal seed markets.[11] Because of their reliance on informal channels and limited access to extension, women are often unaware of improved varieties. Distributing new varieties through local seed markets, seed fairs, and women's groups could potentially increase adoption.

Seed preservation is traditionally the duty of women, making them the "keepers of biodiversity." Supporting local seed banks has been successful in increasing knowledge and strengthening local seed systems.[12]

For crops other than those propagated by cuttings, such as cassava and yam, limited financial assets may prevent farmers, especially women farmers, from making an investment in improved seed. This is particularly true for hybrid corn and rice hybrid varieties, which require purchase every year to gain maximum benefits. NERICA, a relatively new hybrid rice line, overcomes this barrier with its true breeding nature (offspring have the same traits as parent lines). This is an example of how considering women's constraints can increase technology benefits for farmers. Packaging seeds in small and affordable packets is another way to increase adoption, as this affords farmers an opportunity to experiment on smaller plots without assuming too much risk.[13]

Key interventions for Seed Procurement

- Locally organized seed fairs
- Local seed banks for maintaining seed diversity
- True breeding improved varieties
- Package seeds in small, affordable packets
- Seed vouchers
- Distribution through women's groups and other cooperative farmer organizations

Land Preparation

Land preparation tends to be primarily a male activity for most but not all regions and crops in SSA.[14] Where these divisions of labor are particularly strong, as in Ethiopian wheat production, even in female-headed households, sons or male relatives usually prepare land.[15]

Preparing land by hand can be a labor bottleneck; hence the use of oxen-led plows can greatly reduce burden and increase productivity. But due to limited financial assets and cultural dynamics, women tend to use draught animals much less than men. High-capital investments like animals or tractors are especially difficult for women to access.[16] Authors of a study in Botswana suggest that renting draft oxen may be a preferable alternative for women.[17] Improving access to credit or savings or developing rental markets can help overcome financial barriers to oxen use.

Introducing plows, when feasible, may have implications for who controls the crop. A study in Tanzania found that as plow use became more common, men became more active in producing maize, particularly hybrid maize.[18] This illustrates the pervasive finding that when women's crops become more profitable, men tend to assert more control over that crop.

Key interventions for Land Preparation

- Rental markets for oxen and plows
- Adoption of minimum-tillage agriculture
- Rippers or slashers physically appropriate for women

Yield Management

Planting

Responsibility for the time-sensitive and labor-intensive task of planting tends to vary by crop and region. In planting subsistence or small-seeded crops like millet, broadcasting is a typical method of planting to avoid the time demands of row planting.[19] Women and children frequently use this approach, fitting it into an array of other tasks. However, planting seeds in rows uses seed more efficiently and can reduce future weeding labor by allowing the space needed for animal-drawn hoeing, a layer of mulch, or hoeing.[20]

Seeders and jab planters can exploit the benefits of row planting while reducing the time spent planting. In Cameroon, an organization developed a seeder with a special distributer for millet, reducing planting time by 60 percent and seed requirements by 33 percent.[21] This tool was not only simple to handle and maintain, but it also reduced the need for hired

labor and back pain associated with planting. Some of these benefits are likely due to the heavy role farmers had in the seeder's testing and development. Additionally and perhaps most importantly for women, a line of credit was set up to increase women's access to such implements. Ninety-seven percent of farmers who tried the tool purchased it, demonstrating the potentially high payoff of participatory technology development.

Key interventions for Planting

- Seeders physically appropriate for women
- Jab planters physically appropriate for women

Soil Fertility Management

Our series has identified five gendered components of soil fertility. First, the initial financial outlay for fertilizer is difficult for women farmers with limited financial resources.[22] Second, purchasing fertilizer away from the farm is also more difficult for women who may be less able to leave home, access transport, or have difficulty carrying large bags home. Third, women are generally less knowledgeable about how to appropriately apply fertilizer because they receive fewer extension services and have less formal education.[23] Fourth, while conservation agriculture alternatives to inorganic fertilizer may be a good option for cash-strapped women farmers (e.g., nitrogen fixation through legumes), these techniques are often knowledge and labor intensive.[24] Fifth, fertilizer requirements of many improved crop varieties, most notably hybrid maize, often mean that women adopt them at lower rates than men, instead sticking to traditional crops which require less fertilizer like millet, cassava, and sorghum.

Many projects have increased their impact on farmers' livelihoods by addressing some of these gendered constraints. In Kenya, fertilizer dealers have increasingly offered small bags of fertilizer (as small as 1 kg), making fertilizer more affordable and allowing for experimentation.[25] Improved varieties not requiring fertilizer have also shown benefits, as in the widely-adopted Tropical Manioc Selection cassava varieties, which increased yields by over 40 percent without fertilizer.[26]

Key interventions for Soil Fertility Management

- Small bags of fertilizer
- Nitrogen fixation through legumes (if labor available)
- Microenterprises for fertilizer dealership
- Education, extension, and training on soil fertility methods (through pictorial methods if necessary)

Water

Water is another key input for crops and introducing irrigation to smallholders has been a focus of agricultural development for decades. However, without an adequate understanding of intrahousehold dynamics and land tenure these efforts often fall short as demonstrated by the Gambian irrigation projects. Other studies show similar results with irrigation, reflecting intrahousehold power and land tenure issues.[27] In this type of example where women have individual land rights, project planners must help women maintain de facto land rights if women are to receive any project benefits.[28]

Key interventions for Water Management

- Small and medium irrigation schemes (micro-irrigation)
- Drought-resistant varieties

Crop Protection: Pest and Disease Control and Weeding

Weeds, pests, and diseases are estimated to be responsible for annual losses of 20–40 percent of the world's potential crop production.[29] For this vital stage of producing crops, gender issues fall into four categories. First, women play a role in all crop protection tasks, especially weeding.[30] Second, because women play an especially strong role in subsistence crops grown under difficult conditions, women favor adaptation to local conditions. Third, poor men and women can rarely afford the high cost of chemical pesticides. Fourth, women's childbearing role makes them particularly vulnerable to toxins from heavy chemical pesticides, which also pose significant risks to unborn children.[31]

Paying attention to the preferences of both men and women can lead to more successful technologies. NERICA varieties have broad, droopy leaves that shade out weeds, an important attribute revealed by participatory research with women.[32] Another participatory research study in four countries of West Africa found that farmers' preferred local varieties over improved varieties because they generally performed better on "adaptation," defined as good germination, stout growth, resistance to lodging, tolerance to drought and pests, and resilience to damage by livestock.[33]

Key interventions for Crop Protection

- Integrated pest management
- Pest and disease-resistant varieties
- Row planting
- Varieties adapted to local threats and conditions

Harvest

Harvesting usually requires labor resources from all household members. During times of labor scarcity, however, women are often expected to prioritize labor for their husband's crops at the expense of their own. This is especially true of commercialized crops like maize, wheat, and some rice varieties. So even though sorghum and pearl millet require quick harvesting (because of their susceptibility to bird attacks), timely harvesting can be delayed, leading to substantial losses. In some situations, husbands may pay their wives for working during this time and if payment is considered inadequate, wives may refuse to do this work the following year to instead focus on their own crop.[34]

Developing alternatives to the knives and sickles usually used in SSA harvesting can greatly reduce labor expenditure and make households more productive. For rice, using a sickle is very slow but minimizes losses.[35] But for wheat, using a scythe can reduce the time spent in harvesting by a factor of three or four once the skill is mastered.[36] Reaping hooks are a compromise, speeding harvesting up but requiring less skill than the scythe.

Key interventions for Harvesting

- Reaping hooks, scythe, and sickles that are physically appropriate for women

Post-Harvest Processing

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.[37] Project planners have attempted many efforts to increase household productivity by addressing post-harvest processing. These efforts have focused on two channels: processing machinery and easier-to-process varieties.

Introducing processing technology can be a tremendous time-saver but adoption and impact depend on a number of things. First, the technology must meet users' preferences, most clearly revealed through participatory research.[38] Imported millet mills, for example, often require the grain to be dry, but households traditionally prefer to soak the grain before grinding to improve taste.[39] Second, where technology increases profitability, there is a risk that men will take over the crop, so involving women in dissemination is important.[40]

Making varieties easier to process can also be attractive to women. In Malawi, women preferred dent-type maize because it was easier to hand grind.[41] In another study, women complained that new varieties of maize were more difficult to pound than traditional varieties and required more time to process because the required hammer mills were not available locally.[42] Taking these preferences into consideration is important for adoption and impact of any technology.

Key interventions for Post-harvest Processing

- Machinery: Mills, hullers, graters
- Mobile processing machinery

Household Use

As the primary food preparers in SSA, women have distinct crop varietal preferences reflecting this role, especially when it comes to household consumption and multiple household uses. For example, the previously-mentioned study in Malawi determined that women preferred dent-type maize because of its shorter cooking time.[43] If women are not involved in plant breeding trials, cooking and taste traits may be overlooked, compromising household and farm adoption.

Characteristics related to non-grain uses have also been shown to be more important to women than men and neglecting these preferences may lead to low adoption rates.[44] For example, excess millet stalks and leaves can be used for fencing, roofing, fodder, fuel and as a soil amendment, suggesting that women may prefer varieties with more leaf and stalk.[45] Rice husks can also be used as fodder, mulch, or fuel, and technologies that seek to take advantage of available biomass can decrease money and time spent gathering other fuels.[46]

Key interventions for Household Use

- Appropriate biomass content for improved varieties
- Biomass stoves for crop residue (e.g., rice husk stove)

Transport

Transportation can impose another burden on women because locally traded food crops are transported to local markets, whereas cash crops are often collected at the farm gate by others. Women generally spend larger amounts of time transporting food crops to market. One study found that men transport food crops to market approximately 7 metric ton kilometers per year, while women transport an average of 26, often on their heads.[47] Efforts to collect locally traded food crops at the farm gate or provide rental access to carts for transport could reduce the time women must devote to this activity and reduce their cost of reaching markets.

Key interventions for Transport

- Collecting crops at farm gate

Marketing

Gender tends to influence SSA agricultural marketing in two ways. First, commercial markets for "women's crops" are typically underdeveloped. As an example, only 5–10 percent of millet produced in Africa reaches commercial markets.[48] Second, intrahousehold dynamics largely affect who sells the crops and control of the income generated from the sale. In a study in Swaziland, 75 percent of females felt they significantly contributed to decisions regarding inputs and disposal of maize, but only 50 percent of women felt they were involved in decisions over controlling income obtained from maize.[49]

Key interventions for Marketing

- Increasing women's representation in marketing association leadership roles

Moving Forward

Overall, the *Gender and Cropping in SSA* series underscores many key lessons for future agricultural technology and gender interventions:

- Understanding how women can maintain control over benefits when technology is introduced is a persistent difficulty.
- Collecting sex-disaggregated statistics and feedback throughout implementation is vital for understanding pathways and potential roadblocks to adopting technology. Until now, sex-disaggregated statistics have only been collected sporadically.
- When developing technology, participatory and site-specific research improves technological appropriateness.
- Addressing differential access to assets can help both men and women smallholders acquire and adopt technologies.
- Gender is not the only limiting factor affecting technological adoption in agricultural settings. Differences like age, marital status, education level, role in production (e.g., wage vs. subsistence farming), and size of landholding may dominate or interact with the male/female dichotomy.[50]

Involving both men and women in the development, testing, and dissemination of agricultural technology has been shown to be successful in helping both benefit. Nevertheless, a consistent finding throughout the *Gender and Cropping in SSA* series is that maximum benefits from technological innovations cannot be realized when upstream factors like education, power, and land tenure heavily influence outcomes. Addressing these more basic upstream causes of gender inequality may be even more important in helping households increase productivity and maximize the benefits of technological interventions.

The findings and conclusions contained within this material are those of the authors and do not necessarily reflect positions or policies of the Bill & Melinda Gates Foundation.

Please direct comments or questions about this research to Leigh Anderson at eparx@u.washington.edu.

Endnotes

[1] Von Braun & Webb, 1989
[2] FAO, 2009
[3] FAO, 2009
[4] ILO, 2008, Table 3.2
[5] Doss, 2006
[6] Klasen, 2002; Quisumbing, 2003; Smith, Ramakrishnan, Ndiaye, Haddad, & Martorell, 2003; World Bank, 2001
[7] Dey, 1984; Udry, 1996
[8] World Bank, 2001
[9] Doss, 2006, p. 79; Nkamleu & Adesina, 2000
[10] World Bank, FAO, & IFAD, 2009, p. 541
[11] World Bank et al., 2009
[12] World Bank et al., 2009, p. 543
[13] World Bank et al., 2009, p. 542
[14] Ekanayake & Asiedu, 2003; Kotu, Verkuijl, Mwangi, & Tanner, 2000; Nweke, Spencer, & Lynam, 2002; Tibaijuka, 1994; Tiruneh, Tesfaye, Mwangi, & Verkuijl, 2001
[15] Doss, 1999; Tiruneh et al., 2001
[16] Doss, 1999
[17] Fortmann, 1980 as cited in Doss, 1999
[18] Holmboe-Ottesen & Wandel, 1991
[19] Board on Science and Technology for International Development, Office of International Affairs, National Research Council, 1996
[20] Board on Science and Technology for International Development et al., 1996
[21] Board on Science and Technology for International Development et al., 1996
[22] World Bank et al., 2009, p. 530
[23] Spring, 1988
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[25] Kelly & Crawford, 2007, p. 42
[26] International Institute of Tropical Agriculture (IITA), n.d.; Nweke, 2004
[27] Carney, 1993; Dey, 1985
[28] Carney, 1993, p. 334
[29] CropLife International, 2007, p. 8
[30] World Bank et al., 2009, p. 321
[31] WHO, 2006 as cited in World Bank et al., 2009, p. 553
[32] Africa Rice Center (WARDA), FAO, & SAA. 2008, p. 44
[33] Omanya et al., 2007
[34] Jones, 1983
[35] FAO, 2007
[36] FAO, 2007
[37] Board on Science and Technology for International Development et al., 1996
[38] Quisumbing & Pandolfelli, 2009, p. 9
[39] UNIFEM, 1988
[40] Doss, 2006
[41] Farnworth & Jiggins, 2006
[42] World Bank et al., 2009
[43]Farnworth & Jiggins, 2006
[44] Paris et al., 2001; Farnworth & Jiggins, 2006
[45] Awumbila, 1997; Board on Science and Technology for International Development, Office of International Affairs, National Research Council, 1996
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[47] World Bank et al., 2009
[48] ICRISAT & FAO, 1996
[34] Loose, 1979 as cited in UNIFEM, 1988
[35] UNIFEM, 1988
[49] Peter, 2006
[50] Quisumbing & Pandolfelli, 2009, p. 11

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