Evans School of Public Affairs
UNIVERSITY OF WASHINGTON

**Evans School Policy Analysis and Research (EPAR)**
*Professor Leigh Anderson, PI and Lead Faculty*

# Gender and Cropping: Rice in Sub-Saharan Africa

Jessica Henson Cagley, Professor C. Leigh Anderson, Professor Marieka Klawitter, and Georgine Yorgey

*Prepared for the Science and Technology Team of the Bill and Melinda Gates Foundation*

May 9, 2009

As a source of employment for over 20 million Sub-Saharan African (SSA) farmers and the fastest-growing food source in Africa,[1] rice plays a vital role in African economies and daily life. Between 1961 and 2003, rice production more than quadrupled in Africa,[2] yet production is still not keeping pace with demand, which is estimated to be growing at 6% per year.[3] In 2007 alone, Africa spent over $1.5 billion importing 8.2 million tons of rice, making increasing self-reliance a growing focus of the region.[4,5]

Women play a substantial role in SSA rice production and rely heavily on the income it generates.[6] Not recognizing this role has often resulted in development and research projects failing to address women's well-being and also failing to achieve project and development goals.[7] Female farmers in SSA have been less likely than male farmers to adopt productivity-enhancing rice technologies such as improved seeds, fertilizer, pesticides, or small machinery, even when those technologies are designed specifically to help women.[8,9] A more complete understanding of the dynamics and diversity of gender roles in rice farming is necessary to improve the likelihood of successful interventions.

## Intrahousehold Dynamics

African farming households typically farm on multiple plots controlled by different household members from which the resources (both inputs and outputs) are often not pooled.[10,11] Women are usually responsible for cultivating food for home consumption on household plots whereas men usually grow the main cash crop on personal plots.[12,13] In many areas, women are also allowed to cultivate and gain income on a personal plot.[14,15] But how farming inputs and outputs are allocated depend on household needs, norms, and power differentials.

Household distribution of labor, land, and income by gender may result in a loss of efficiency.[16,17] In Cameroon, for example, Jones found that women withdrew labor from men's irrigated rice fields (the main cash crop) and cultivated more sorghum (the main food crop) when they felt that compensation from their husbands (through cash and harvested rice) was not adequate.[18] The returns on sorghum labor were much lower than for irrigated rice so the household was less efficient, but the mutual understanding that women would withdraw labor if not adequately compensated was a way for women to increase bargaining power. Control over their own labor is one of women's few bargaining tools.[19]

**Table 1. Characteristics of Rice in SSA**

| | |
|---|---|
| **History** | *Oryza glaberrima* (African rice): indigenous to The Gambia/Guinea region<br>*O. sativa* (Asian rice): introduced in 16th century |
| **Uses** | Staple and cash crop, hulls for fodder, fuel, and soil amendment |
| **Supply/ Demand** | Consumption: +4.2% yearly (FAO '94-'03)<br>Production: + 3.6% yearly (FAO '94-'07) |
| **Primary Challenges** | Labor intensive, water management, weeding, birds, drying, drought, processing, rice blast, rice yellow mottle virus, rice rust, bacterial blight, sheath rot |
| **Current Technology Efforts** | Machinery: micro mills, flour mills, drum seeders, rice hullers<br>Traits: broad leaves, drought tolerance, earlier maturing, higher yielding, disease resistance, reduced plant height |
| **Inputs** | Fertilizer or other sources of nutrients |

## Land

Control over land and income generated from rice varies by region, ecosystem, and socioeconomic status and also changes over time, making *a priori* predictions of how an intervention will affect these dynamics difficult.[20] One consistent finding across rice production, however, is that when women's crops or activities become more profitable, men tend to take control of the crop.[21,22] In The Gambia in

1984, rice was considered a woman's crop so introducing pump irrigation was expected to raise yields and increase income for women. Women were even given priority in land registration in an attempt to keep women's control of the land.[23] However, when yields improved under the new irrigation scheme, men took over control of the land.[24,25] In Burkina Faso, women traditionally cultivated and controlled both the household and personal inland fresh water swamp rice crops and passed their land rights down to daughters. However, after an irrigation system was introduced, control was transferred to men and inheritance rights were transferred to sons.[26]

The ability to access land for cultivation varies considerably among women. In The Gambia, women establish individual rights to rice land by clearing and bringing an area under cultivation.[27] Some women rent land, such as the women of Ndop, Cameroon who secure access by renting swamp land from the state.[28] Some women may have legal rights to land but lack of enforcement restricts *de facto* rights.[29] In any circumstance, access to land influences the preferences and needs of different groups of women. Paris et al. reported that women with secure access to land will benefit from technologies that are labor saving and drudgery reducing.[30] Landless women, however, who are involved in wage laboring might be displaced by labor-saving technologies. In some cases, alternative income earning opportunities to mitigate the negative consequences of labor-displacing technologies have been designed and implemented where this is a risk.[31] For example, when 100,000 women were being displaced per year by mechanized rice mills in Bangladesh in the 1980s, a large NGO helped organize the women into cooperatives and provided them with loans to purchase their own mills.[32]

**Labor**

How farmers expect new rice technology to change labor allocation can largely determine whether the technology is adopted because of labor's significant consequences for men's and women's well-being.[33] Understanding these dynamics should increase the success of interventions.

Division of Labor

Huvio estimated that women's labor contribution to rice cultivation and processing varies from three percent of total labor input for floating rice cultivation in Mali to over 80 percent for mangrove swamp cultivation in The Gambia and Liberia.[34] Variation within geographic area by ethnic group is also common. For example, in Cote d'Ivoire, the Gouro and Bété women are the main cultivators of upland rice, but men are the main cultivators among the Sénoufo.[35]

Despite the differences across cultures, in general women are the primary producers of rice in West and Central Africa.[36] Planting, weeding, harvesting, threshing, winnowing, milling, and seed preservation are usually the duties of women.[37,38,39] This might explain why they value certain rice characteristics such as hulling and milling quality more than men. For example, participatory research in India found that women preferred white-grained over red-grained rice because it saved time in milling.[40]

Labor Constraints

The activities primarily undertaken by women in rice production, especially post-harvest processing, are usually the most time-consuming and arduous. This puts a strain on women who are also responsible for the majority of childcare and household tasks, especially for a crop as labor-intensive as rice.[41,42] Women often report back pain and pelvic problems in rice cultivation and weeding.[43] Fonjong and Athanasia reported that women spent as many as ten hours per day weeding and maintaining rice crops in Ndop, Cameroon because most were unable to afford any labor saving technology.[44] Furthermore, demand for women's labor in agriculture in SSA is increasing as men increase their participation in rural and urban wage labor.[45,46]

Early efforts to increase rice yields often had detrimental effects on women. In the 1920s, introduction of Asian rice to the central Gambia by the colonial government doubled output by the 1950s but taxed women's labor capacity, increasing the time worked in the swamps by 13%.[47] During the Green Revolution in Asia, fertilizer and improved seeds greatly increased rice yields and family income, but also increased women's labor requirements because of the increased volume of rice to process and increased male migration to cover costs of inputs.[48,49] Asian rice's high labor requirement (due to less weed resistance) is a key reason for its low adoption in Africa despite its high yields.[50] This is another example of how improvements in certain rice traits, such as early vigor for out competing weeds, can reduce the additional labor requirements for women that often arise with efforts to increase yields.

Labor Saving Technology

The generally high and competing demands for women's labor emphasizes the value of labor saving technology in rice production in order to increase women's overall

productivity.[51,52] Plastic drum seeders, rice hullers, micro mills, and flour mills have all generally been successful at saving women time in rice production.[53,54] When implementing new technologies, however, care must be taken in a number of ways. First, new technologies that are culturally appropriate for women are more likely to be adopted by women. For example, a thresher mounted on a bicycle was introduced to a rice project in Nigeria, but was not adopted because bicycle riding exposed female thighs while wearing a skirt and wearing trousers was not culturally acceptable.[55,56] Second, when the return has increased on a woman's activity through adoption of new technology, work done by women has often become the work of men. Projects that consult women to understand the gender division of labor are more likely to achieve the development results they seek without negatively affecting women.[57,58,59] Lastly, evidence suggests that implementing technologies that are simple to operate, maintain, and master benefit the greatest number of women (and men).[60]

Women's high labor demands necessitate frequent multitasking.[61] Often, women conduct farming tasks at the same time as household tasks. This makes rice machinery that is small and portable enough for women to easily carry between the field and the home more desirable. Because women are often around children while working, the safety of rice technology (i.e. minimal exposure to dangerous machines, toxins, or chemicals) is also important. Postharvest technologies can greatly improve production efficiency and, with these caveats in mind, may be a more efficient way to ease women's labor demands than the development of new varieties.[62]

**Access to Inputs**

Despite women farmers' need for labor-saving and other rice technologies, limited access to inputs and extension consistently hampers their ability to obtain such tools.

Credit

Women's less secure land rights reduce their access to credit, which often requires land or other collateral.[63] Because many inputs and technologies require substantial upfront or ongoing capital, lack of credit has substantial implications for women farmers. Hybrid rice seeds, for example, are generally expensive and need to be purchased every year, often requiring access to credit.[64] With limited access to credit, improved technology that either requires little capital or is introduced with programs providing access to credit is more likely to be adopted. Seibel and Almeyda reported that women with access to microcredit in Uganda often purchased rice mills which consequently increased labor efficiency.[65]

Extension Services

An additional barrier to technology adoption is extension services which consistently bypass women.[66,67,68] Extension agents are often men, who may lack sensitivity to women's time and credit constraints[69] or may ignore women with low levels of formal education, thinking them incompetent.[70] Low education levels are related to low technology adoption,[71] 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, again considering cultural appropriateness.[72] For example, women extension agents were given motorcycles to travel to villages in Nigeria but riding them was not appropriate for women so they were mostly used by the agents' male relatives.[73]

Collective Action

Formal farmers' organizations are an excellent way to extend knowledge and resources to rice producers, but they are often dominated by men. Organizing and promoting informal networks, women's farmer organizations, or credit cooperatives is a strategy that has been shown to increase women's ability to access credit, markets, inputs, and retain control of new technologies.[74,75,76] Group participation increases bargaining capacity, makes communication with extension officers easier, and offers an opportunity to share resources for production or collateral.[77,78]

**Whole-System Approach**

Because women's work often involves different crops, household tasks, and livestock management, a holistic approach to rice technologies can increase overall efficiency and poverty-reduction. For example, a rice husk stove uses available biomass from rice production to decrease money and time spent gathering other fuel sources.[79] Rice husks can also be used for mulch in vegetable gardens or livestock feed, decreasing purchase of fertilizers and feed. Characteristics related to non-grain uses have been shown to be more important to women than men.[80]

Soil depletion and pest problems also require sustainable and integrated solutions that women are well-suited to implement as household managers. Pressures to increase food production in SSA have reduced fallow periods, consequently depleting soil.[81] In Ghana, efforts to intercrop leguminous plants during fallow periods on rice fields has

improved soil fertility and increased incomes in comparison to typical farm management. [82] Non-edible legume portions can also be used for fodder or soil input. Integrated pest management is another technique which can reduce harmful health effects of chemical pesticides and increase savings for women,[83] but extending knowledge and skills effectively to women is often a constraint.

**Participatory Research**

Because women farmers are most knowledgeable about their gender roles, negotiating power, and preferences, involving them in planning, implementation, and evaluation of rice technology is suggested to ensure their greatest benefit.[84,85,86] Participatory research (the development of technologies within the ecological and cultural context where they will be used) builds on farmers' existing knowledge to improve varieties.

Recently, the Africa Rice Center (WARDA) has used Participatory Varietal Selection in developing New Rice for Africa (NERICA) varieties, hybrids between hardy African rice and high-yielding Asian rice.[87] In development, men and women farmers formally and informally evaluated dozens of varieties and received chosen varieties to grow on their own farms. In one trial in Ghana, women and men's top trait preferences reflected their respective responsibilities. As primary food providers, yield was the most important trait for women. Men were more likely to choose based on how well the variety did with little fertilizer because they were responsible for purchasing inputs.[88] Other major criteria for women have included ease of dehulling and good emergence, seedling vigor, and droopy leaves for weed competitiveness, whereas short growth duration, plant height, and taste are more important for men.[89,90,91] Also of note, NERICA seeds do not require purchase every year because they are true-breeding, which is important for women. Early evidence shows NERICA adoption results in significant increases in yield and income, which are higher for women than for men.[92]

Rice taste panels and cooking tests are other forms of participatory research that can be used to assess new rice hybrids. WARDA has used domestic processing, palatability, and willingness to pay as criteria in judging unhusked seed and rice by men and women of different socioeconomic statuses and women are involved in cooking tests three months after harvest.[93] Efforts to ascertain preferences such as these are likely to increase future adoption of new varieties.

**Conclusion**

In conclusion, labor constraints, low education levels, cultural inappropriateness, and asymmetric access to resources all contribute to low adoption of rice technology by women. In order to fully realize the poverty reduction benefits of increased rice production in SSA, evidence suggests that research and extension programs must consider how interventions will affect women along every stage of the production chain. The effect on women and their households will vary depending on region, culture, ethnicity, socio-economic status, and role in cultivating rice.

Involving women in planning, developing, and disseminating rice technologies can potentially increase rice yields and food security in a manner that does not disproportionately increase women's labor burden, which is already so high for rice cultivation. On its own, however, participatory research may do little to alter the unequal power dynamics that underlie the barriers women face in rice cultivation. In the long term, integrating agricultural strategies with broader efforts to improve women's equality, empowerment, and rights will likely be necessary to fully capitalize on women's potential in making the agricultural gains essential for poverty reduction.

**Endnotes**

[1] Nwanze, K. F., Mohapatra, S., Kormawa, P., Keya, S., & Bruce-Oliver, S. (2006). Rice development in sub-Saharan Africa. *Journal of the Science of Food and Agriculture, 86*(5).
[2] Calpe, C. (2007). *Review of the rice market situation in 2007*. Rome: Food and Agriculture Organization of the United Nations.
[3] Nwanze et al., op. cit.
[4] Calpe, op. cit.
[5] WARDA. (2005). *Rice trends in Sub-Saharan Africa*. Bouaké, Côte d'Ivoire: Africa Rice Center (WARDA).
[6] Fonjong, L. N., & Athanasia, M. F. (2007). The fortunes and misfortunes of women rice producers in Ndop, Cameroon and the implications for gender roles. *Journal of International Women's Studies, 8*(4), 133-147.
[7] Dey, J. (1985). Women in African rice farming systems. In *Women in Rice Farming: Proceedings of a conference on Women in Rice Farming Systems, the International Rice Research Institute, Manila, Philippines, 26-30 September 1983* (pp. 419-444). Andershot, England: Gower.
[8] Doss, C. (2005). Engendering agricultural technology for Africa's farmers. In E. Kuiper & D. K. Barker (Eds.), *Feminist economics and the World Bank: History, theory, and policy* (pp. 79). Washington D.C.: World Bank.
[9] Nkamleu, G. B., & Adesina, A. A. (2000). Determinants of chemical input use in peri-urban lowland systems: bivariate probit analysis in Cameroon. *Agricultural Systems, 63*(2), 111-121.
[10] Udry, C. (1996). Gender, agricultural production, and the theory of the household. *Journal of Political Economy*, 1010-1046.
[11] Dey, J. (1984). *Women in rice-farming systems: Focus: Sub-Saharan Africa* (Women in Agriculture No. 2). Rome: Food and Agriculture Organization of the United Nations.
[12] Ibid.
[13] Huvio, T. (1998). *Women's role in rice farming*. Rome: Food and Agricultural Organization, Women and Population Division.
[14] Dey, op. cit.

[15] Saito, K. A., Mekonnen, H., & Spurling, D. (1994). *Raising the productivity of women farmers in Sub-Saharan Africa*. Washington D.C.: World Bank.
[16] Udry, op. cit., Gender, agricultural production…
[17] Fletschner, D. (2008). Women's access to credit: Does it matter for household efficiency? *American Journal of Agricultural Economics, 90*(3), 669-683.
[18] Jones, C. (1983). The mobilization of women's labor for cash crop production: A game theoretic approach. *American Journal of Agricultural Economics, 65*(5), 1049-1054.
[19] Quisumbing, A., & Pandolfelli, L. (2008). *Promising approaches to address the needs of poor female farmers*. Washington D.C.: International Food Policy Research Institute.
[20] Doss, op. cit., Engendering agricultural technology…
[21] Ibid.
[22] von Braun, J. & Webb, P. J. R. (1989). The impact of new crop technology on the agricultural division of labor in a West African setting. *Economic Development and Cultural Change, 37*(3), 513-534.
[23] Ibid.
[24] Quisumbing & Pandolfelli, op. cit.
[25] von Braun & Webb, op. cit.
[26] Dey, op. cit.
[27] WARDA, op. cit
[28] Fonjong & Athanasia, op. cit.
[29] Quisumbing & Pandolfelli, op. cit.
[30] Paris, T. R., Feldstein, H. S., & Duron, G. (2001). *Empowering women to achieve food security: Technology*. Washington, D.C.: International Food Policy Research Institute (IFPRI).
[31] Ibid.
[32] World Bank/FAO/IFAD. (2009). Module 7: Gender in agricultural innovation and education. In *Gender in agriculture sourcebook* (pp. 257-314). Washington D.C.: The World Bank.
[33] Doss, C. R. (2001). Designing agricultural technology for African women farmers: Lessons from 25 years of experience. *World Development, 29*(12), 2075-2092.
[34] Huvio, op. cit.
[35] Dey, op. cit.
[36] Fonjong & Athanasia, op. cit.
[37] FAO. (2004). *Gender and rice*. Rome: Food and Agriculture Organization of the United Nations.
[38] Huvio, op. cit.
[39] Norman, J. C., & Kebe, B. (2006, May 3-5). *African smallholder farmers: Rice production and sustainable livelihoods.* Paper presented at the International Rice Commission Twenty-first Session, Chiclayo, Peru.
[40] Paris, T. et al. (2001). Listening to farmers' perceptions through participatory rice varietal selection: A case study in villages in Eastern Uttar Pradesh, India. Paper presented at the Systemwide Program on Participatory Research and Gender Analysis for Technology and Institutional Innovation Workshop. May 1-5, 2000,
[41] Doss, op. cit., Engendering agricultural technology…
[42] Fonjong & Athanasia, op. cit.
[43] World Bank/FAO/IFAD. (2009). Module 8: Gender issues in agricultural labor. In *Gender in agriculture sourcebook* (pp. 315-360). Washington D.C.: The World Bank.
[44] Ibid.
[45] Doss, op. cit., Engendering agricultural technology…
[46] Paris, T. R., et al. op cit. *Empowering women to achieve food security: Technology*.
[47] Carney, J., & Watts, M. (1991). Disciplining women? Rice, mechanization, and the evolution of Mandinka gender relations in Senegambia. *Signs, 16*(4), 651-681.
[48] FAO, op. cit.
[49] Huvio, op. cit.
[50] Lilja, N., & Erenstein, O. (2002). *Institutional process impacts of participatory rice improvement research and gender analysis* (Working Document No. 20). Cali, Colombia: CGIAR Program on Participatory Research and Gender Analysis.
[51] FAO, op. cit.
[52] Paris, T. R. (2000). *Bringing women from the margin to the mainstream of rice research and technology development: Strategies and lessons learned.* University of Western Sydney, New South Wales, Australia.
[53] World Bank/FAO/IFAD. (2009). Module 7: Gender in agricultural innovation and education. In *Gender in agriculture sourcebook* (pp. 257-314). Washington D.C.: The World Bank.
[54] Paris, T. R., et al. op cit. *Empowering women to achieve food security: Technology*.
[55] UNIFEM. (1993). *Cereal processing*. Food Cycle Technology Source Book, No. 3. London: The United Nations Development Fund for Women.
[56] Quisumbing, op. cit.
[57] Doss, op. cit., Engendering agricultural technology…
[58] Taiwo, K. A., & Faborode, M. O. (n.d.). *Gender, technology and poverty: Issues in post harvest crop processing technologies*. Cape Town, South Africa: The African Gender Institute.
[59] Quisumbing & Pandolfelli, op. cit.
[60] Taiwo & Faborode, op. cit.
[61] Balakrishnan, R. (2000). Widening gaps in technology development and technology transfer to support rural women. In *Human resources in agricultural and rural development*. Rome: Food and Agriculture Organization of the United Nations.
[62] Sumathi, P. & Budhar, M. N. Postharvest technology of rice: The role of farm women in storing grains with different storage practices. In K. Toriyama, K. L. Heong, & B. Hardy (Eds.), *Rice is life: Scientific perspectives for the 21st century: Proceedings of the World Rice Research Conference held in Tokyo and Tsukuba, Japan, 4-7 November 2004* (pp. 320-323). Los Baños, Philippines: International Rice Research Institute.
[63] FAO, op. cit.
[64] Doss, op. cit., Designing agricultural technology…
[65] Seibel, H. D., & Almeyda, G. (2002). *Women and men in rural microfinance: The case of Uganda*. Cologne, Germany: University of Cologne Development Research Center.
[66] Quisumbing & Pandolfelli, op. cit.
[67] Saito, op. cit.
[68] Due, J. M., Magayane, F., & Temu, A. A. (1997). Gender again--views of female agricultural extension officers by smallholder farmers in Tanzania. *World Development, 25*(5), 713-725.
[69] Ibid.
[70] Eisemon, T. O., & Nyamete, A. (1990). School literacy and agricultural modernization in Kenya. *Comparative Education Review, 34*(2), 161-176.
[71] Nkamleu, op. cit.
[72] Quisumbing & Pandolfelli, op. cit.
[73] Ibid.
[74] Ibid.
[75] Paris, T. R., et al. op cit. *Empowering women to achieve food security: Technology*.
[76] Fonjong & Athanasia, op. cit.
[77] Quisumbing & Pandolfelli, op. cit.
[78] Taiwo & Faborode, op. cit.
[79] Paris, T. R., et al., op cit. *Empowering women to achieve food security: Technology*.
[80] Paris, T. et al.. op. cit. *Listening to farmers' perceptions…*
[81] Nkamleu & Adesina, op. cit.
[82] Yiridoe, E. K., Langyintuo, A. S., & Dogbe, W. (2006). Economics of the impact of alternative rice cropping systems on subsistence farming: Whole-farm analysis in northern Ghana. *Agricultural Systems, 91*(1-2), 102-121.
[83] Paris, T. R., et al. op cit. *Empowering women to achieve food security: Technology*.
[84] Doss, op. cit., Engendering agricultural technology…
[85] Ibid.
[86] Lilja & Erenstein, op. cit.
[87] Nwanze et al., op. cit.
[88] Africa Rice Center (WARDA). (1997). WARDA Annual Report 1996. Mbé, Côte d'Ivoire: Africa Rice Center (WARDA).
[89] Ibid.
[90] Hargrove, T. (2000) *Bintu and her New Rice for Africa: Breaking the shackles of slash-and-burn farming in the world's poorest region.* Bouaké, Côte d'Ivoire: Africa Rice Center (WARDA).
[91] Africa Rice Center (WARDA)/FAO/SAA. (2008). NERICA®: The New Rice for Africa – a compendium (E. A. Somado, R. G. Guei, & S. O. Keya, Eds.). Cotonou, Benin: Africa Rice Center (WARDA).

[92] Agboh-Noameshie, A. R., Kinkingninhoun-Medagbe, F. M., & Diagne, A. (2007, August 18-22). *Gendered impact of NERICA adoption on farmers' production and income in Central Benin.* Paper presented at the 2nd Conference of the African Association of Agricultural Economists (AAAE), Accra, Ghana.

[93] Farnworth, C. R, and Jiggins, J. (2006). P*articipatory plant breeding and gender analysis.* PPB Monograph 4, Systemwide Program on Participatory Research and Gender Analysis. Cali: Consultative Group on International Agricultural Research.