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**Gender Dimensions of Science and Technology:  
African Women in Agriculture**

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**Introduction:**

African governments and international partners have made a commitment to women's and girls' access and participation to science and technology. This paper will concern itself specifically with the plight of African women in agriculture because they comprise approximately 70% of sub-Saharan agricultural workers, and also account for about 80% of food processors. While more women than men are managers of natural resources, they are disadvantaged relative to men in terms of land ownership, access to education, access to extension services, and access to credit. The disparity between women's important role in providing food security, and their poor representation in access to agricultural services indicates that there is scope for improving their contribution to the agricultural sector.

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\* The views expressed in this paper are those of the author and do not necessarily represent those of the United Nations.

† Patricia Bunyasi also contributed to this paper.

## Background:

Overall statistics for Africa conceal important country differences, but on average, the agriculture sector makes up about 30% of Africa's GDP<sup>1</sup> and 30% of exports<sup>2</sup>. Agriculture supports 75% of the people by providing livelihood, trade and subsistence<sup>3</sup>. Therefore, agriculture is of great value to the people, and is vital to meeting the Millennium Development Goals (MDGs). Achieving the MDGs requires investments and operating expenditure. In order to make agriculture productive, capital accumulation and economic development<sup>4</sup> are key areas. It is therefore important to enhance the contribution of African women to agriculture. Currently women comprise the majority of the disenfranchised living in the rural areas<sup>5</sup>. There is a considerable potential for increasing the role and participation of women in agricultural research, extension and development. But this potential has not yet been realized. In order to get a better grasp of the challenges facing women in agriculture, we must paint a picture of who she is.

Average African Woman	
Average literacy rate	Less than 60% <sup>6</sup>
Average number of children <sup>7</sup>	West and Mid Africa: 6 South and East Africa: 4.5 North Africa: 2-4
Land ownership	Less than 2% <sup>8</sup>
Preferred crops	Subsistence <sup>9</sup>
Responsibility of fetching water and fuel	Women and girls <sup>10</sup>

Traditionally, in many African countries, women are not allowed to own or inherit land. This serves to further disenfranchise women because in agricultural communities, wealth and land are essentially the same. Moreover, access to land in many communities is governed by both statutory and customary law. In rural areas, local norms enforced by community elders prevail.

<sup>1</sup> World Bank. *Rural Development from Vision to Action*. 1996

<sup>2</sup> Ibid.

<sup>3</sup> UNIFEM. *Women's Land and Property Rights*. September 9, 2010. (available at [http://www.unifem.org/gender\\_issues/women\\_poverty\\_economics/land\\_property\\_rights.php](http://www.unifem.org/gender_issues/women_poverty_economics/land_property_rights.php))

<sup>4</sup> Marssoud, Karshenas. *Agricultural and Economic Development in Sub-Saharan Africa and Asia*. 1999. Department of Economics, SOAS. Pg. 2.

<sup>5</sup> Khan, M. 2001. *Rural Poverty in Developing Countries. Implications for Public Policy*. IMF (available at <http://www.imf.org/external/pubs/ft/issues/issues26/index.htm>)

<sup>6</sup> International. *Facts About Illiteracy*. 2001. (available at <http://www.sil.org/literacy/litfacts.htm>)

<sup>7</sup> Optimum Population Trust News Watch. 2010. (available at <http://www.optimumpopulation.org/blog/?p=2324>).

<sup>8</sup> FAO Focus. *Women and Food Security, Access to Resources*. September 9<sup>th</sup>, 2010. (available at <http://www.fao.org/FOCUS/E/Women/Sustin-e.htm>)

<sup>9</sup> Ibid. September 9<sup>th</sup>, 2010. (available at <http://www.fao.org/FOCUS/E/Women/Sustin-e.htm>)

<sup>10</sup> World Bank Working Paper No. 73. *Gender, Time Use and Poverty in Sub-Saharan Africa*. 2006. (Available at [http://siteresources.worldbank.org/INTAFRREGTOPGENDER/Resources/gender\\_time\\_use\\_pov.pdf](http://siteresources.worldbank.org/INTAFRREGTOPGENDER/Resources/gender_time_use_pov.pdf))

To clearly understand the plight of women in agriculture, it helps to examine a simplified agricultural production chain. A simplified agricultural chain comprises the following:

**(Production) - (Marketing) - (Consumption)**

Production involves access to land, access to technology (improved seeds and fertilizers), farming practices like plowing, planting and harvesting. If one is not allowed to own land, and is not the primary decision-maker in the household, and she has no voice in the home, her gender-specific needs will not be met<sup>11</sup>. Furthermore, because women do not have material assets, they have a more difficult time gaining access to credit for micro-financing. The ability to afford seed and fertilizer is a central component of technology adoption<sup>12</sup>. In the production stage of the agricultural production chain, the key challenges facing women are access to land, to production technology and to energy (for land preparation and planting).

Marketing involves access to markets, and the management of risks such as handling perishable goods<sup>13</sup>. Women have limited access to markets. They also don't have the financial control over household income, making it even more arduous. Furthermore, because of gender labor divisions, the reliance on subsistence crops means less opportunity to earn income, even if it was possible for women to do so.

Consumption is the process of adding value at the end in a cost-efficient manner that meets the consumer's standards. Women operate only at the artificial level and are thus not competitive against larger firms. In addition, access to technology can be problematic because the type of equipment promoted is often incompatible with women's needs, and underestimates the value of diversified production practices and the many farming tasks for which women are responsible.

Another tenuous aspect for women concerns the division of labor with regard to who farms cash crops versus subsistence crops, and what this means for the ability to compete economically at the local, national and international level. Clearly, the aforementioned are obstacles to women in agriculture. In order to remove the barriers and ensure equality<sup>14</sup>, key areas must be addressed to understand what the critical issues are and how they can be resolved through changes in attitude, access to education, improved techniques and legislation at the local, national and international level, among others.

This paper argues that agricultural knowledge, science, and technology (AKST) can enhance the contribution of women to agriculture<sup>15</sup>. However, women are marginalized in formal AKST, and this disempowerment compromises their ability to improve agricultural production. Access to AKST, combined with norms and policies such as CEDAW<sup>16</sup>; International Assessment of

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<sup>11</sup> Ibid. September 9<sup>th</sup>, 2010. (Available at <http://www.fao.org/FOCUS/E/Women/Sustin-e.htm>)

<sup>12</sup> University of South California. 1999-2008. *Food Marketing, Consumption and Marketing*. (Available at [http://www.consumerpsychologist.com/food\\_marketing.html](http://www.consumerpsychologist.com/food_marketing.html))

<sup>13</sup> Ibid.

<sup>14</sup> Ibid.

<sup>15</sup> [www.akst.com](http://www.akst.com), involved with Science, Technology, Knowledge, Inputs, Markets, Credit, Capital and Assets

<sup>16</sup> Committee on the Elimination of Discrimination against Women <http://www2.ohchr.org/english/bodies/cedaw/index.htm>

Agricultural Knowledge, Science and Technology for Development (IAASTD)<sup>17</sup>; Beijing Platform for Action adopted during the 4<sup>th</sup> World Conference on Women<sup>18</sup> have all been identified as important contributors to the gender agenda in development. The World Bank and various United Nations entities are key players in realizing the need to focus on women in agriculture. As we are interested in meeting the MDGs by 2015<sup>19</sup>, the need to include women (who make up about 50% of the population) is vital in using all available human capital that we have for productive means that can raise the quality of life and eradicate poverty. This paper integrates questions about technology, education, social and traditional customs, legislative policies, research and academia and markets, to women farmers and their livelihoods, and examines their complex relations which we need to understand in order to offer viable policy options.

**Technology:** Technology dissemination is a fundamental part of the AKST system. But the formal system is narrow in scope and entails institutions disseminating information via publications, conferences, and extension services. The conventional extension approach has been to disseminate a few technologies. As a result the number of farmers reached is small and women are often bypassed. Common farming methods include low input, low output, rain-fed farming and multiple uses of the same plot of land. Women farmers could benefit from improved crop diversification and new farming technologies that cut down on unproductive time and low yields. There is a growing consensus that community driven approaches to technology development can improve the value of AKST for women small-scale producers, ultimately enhancing their ability to adopt new technologies. Research and extension can also improve the rate of adoption by increasing the number of women extension workers, and also by communicating in languages that women understand<sup>20</sup>.

Clearly, technology is valuable because of the possibilities it creates in women's lives and the improvements it can provide to their livelihoods. Productivity is vital, and for sub-Saharan African countries that rely heavily on agriculture, knowledge of new techniques that can increase productivity growth is critical<sup>21</sup>. Also, attention needs to be paid to access to markets and credit financing, especially for women. Markets for agricultural products are still remote to sub-Saharan farmers. Improved extension services, technical assistance, expanding basic infrastructure, and capacity building are requisite to linking producers to markets, and overhauling women's farming activities into business ventures.

**Education:** Investments in human resources are crucial to developing a productive and sustainable agricultural sector. But women's marginalization within the AKST system and their numerous household responsibilities increases their subservient position. The use and understanding of new technologies is greatly aided by high literacy and education levels. Currently literacy levels for girls and women are low, and education must therefore be made a priority. Knowledge of improved farming techniques is vital to families, as they can increase

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<sup>17</sup> International Assessment of Agricultural Knowledge, Science and Technology for Development (2009). *Agriculture at a Crossroads, Sub-Saharan Africa*, Vol. V. Washington, DC: Island Press.

<sup>18</sup> Beijing Platform for Action adopted at the Fourth World Conference on Women (1995).

<sup>19</sup> [www.unmdg.com](http://www.unmdg.com).

<sup>20</sup> FAO focus: *Women and Food Security*. (Available at <http://www.fao.org/FOCUS/E/Women/Sustin-e.htm#labour>)

<sup>21</sup> Fulginiti, Lylyan, Perrin, Richard, Bingxin, Yu (2004). *Institutions and Agricultural Productivity in Sub-Saharan Africa*. Department of Agricultural Economics, University of Nebraska, Lincoln, NE.

land productivity, without depleting or eroding the soil. Soil erosion over time decreases the nutritional quality of food<sup>22</sup>. The nutritional quality of food is important for communities suffering from malnutrition and disease burden, as is the case in many sub-Saharan African countries<sup>23</sup>. There needs to be full comprehension of the nutritional value of foods, so that appropriate crops can be grown. As women are the primary providers of food (they fetch the firewood, fetch water, harvest the subsistence foods, cook and serve the family), it is imperative that they understand how to operate their farms in an efficient and productive manner<sup>24</sup>. For example, the knowledge of using irrigation systems to enhance productivity is essential. Land degradation, including desertification, soil erosion and water pollution threaten sustainable livelihoods. Educating women on the value of managing these resources in a sustainable manner is important, and the role that agricultural extension workers play in adopting and diffusing AKST is imperative.

Another factor to consider is that different techniques can be used to prepare one for natural disasters or in regions of conflict where food security is an issue. Studies show that the greater the freedom of individuals and the less conflict that exists, the greater the agricultural output.<sup>25</sup> There are monitoring and evaluation programs that can help farmers prepare for the changes in the environment<sup>26</sup>. These include post-harvest techniques such as food storage and preservation, rotating crops and introducing new foods to the diet that are drought- and pest-resistant<sup>27</sup>. Also, water harvesting is of great importance during times of drought.

When emerging economies take a hard hit in times of economic downturn, the answer for the rural poor is to remove girls from school so they can assist in household chores, farming, raising the children, or to marry them early to decrease the burden of providing for large families. This places women at a disadvantage because schools are where marketable and competitive skills are taught. Education systems are meant to prepare students for meaningful and gainful employment in the real world. What chance does an illiterate woman have, especially in male-dominated fields? Furthermore, the value of education needs to be emphasized at the community level and there needs to be a smoother transition from graduation to meaningful employment for students from rural as well urban areas. If you can show a family that it is of value to educate their daughters because of financial gain that can be translated into a better quality of living for the greater family, it would be of much benefit.

**Social/traditional and national policies:** Land and water are vital to the survival of people and their livelihoods in Africa; these are basic needs. Land provides housing, livelihood and trade. Water is necessary for growing food, and for cooking and feeding families. Those who own the land have more power than those who don't. Very often, the disenfranchised in a community only have use rights. A woman often has the right to use the land to grow crops, but her husband often reserves the right to collect profits from selling the crops at the market. The question of

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<sup>22</sup> USDA. *Plant, Soil and Nutrition Research Unit*. Agricultural Research Services. (Available at [http://www.ars.usda.gov/main/site\\_main.htm?modecode=19-07-05-05](http://www.ars.usda.gov/main/site_main.htm?modecode=19-07-05-05)).

<sup>23</sup> IAASTD, pg. 122.

<sup>24</sup> IAASTD, pg.9.

<sup>25</sup> Fulginiti, Lylyan, Perrin, Richard, Bingxin, Yu (2004). *Institutions and Agricultural Productivity in Sub-Saharan Africa*. Department of Agricultural Economics, University of Nebraska, Lincoln, NE. pg. 11.

<sup>26</sup> Ibid. pg. 11.

<sup>27</sup> Ibid. pg 11.

gender equity then comes into play. In general ‘the institutions of the state have supported the men of property, rather than the poor and those without property’<sup>28</sup>. When we look at women’s rights to land in Africa, traditionally most women are not allowed to own or inherit land<sup>29</sup>. If land and access to water are vital to life, the rural poor will suffer even more so. As already stated, women make up the majority of the rural poor whose opportunities are already diminished. Clearly women are at a great disadvantage. Water and land for that matter are political<sup>30</sup>. Also, since men are not involved with fetching water, they might not have as much relevant input as the women and girls whose responsibility it is<sup>31</sup>. If women are responsible for the majority of household chores, and the feeding of the family, it is imperative that provisions for providing clean water are made available and accessible.

It is important to work with leaders at the community level to illustrate how greater economic activity is of benefit to everyone. Gender divisions of labor and decision-making need to be examined. Women perform the majority of domestic chores and subsistence work, and yet they are not the household decision-maker, and their work goes unrecognized. This is detrimental because it is only women who can best articulate their own needs. If you take a population of working age individuals and only half of them contribute economically, you have another half that it is untapped. In general men are responsible for cash crops, and women are responsible for subsistence crops and domestic chores, which are not officially included in GDP measures. When earnings are small they are controlled by women, but when scaled to commercial levels men take over. This shows bias and inefficiency. However, a World Bank study shows that ‘if you give women the same inputs such as education or access to seeds and fertilizers’ it can increase yields by 22% (World Bank 2001)<sup>32</sup>.

How do national policies aid or hinder the process? Gender related special interest policies need to be implemented at the national and local level. African countries are heavily reliant on agriculture for their economies, labor force and subsistence<sup>33</sup>. One way to look at how a government values a sector or issue is to look at government spending. How much of the total expenditure goes to the agricultural sector and how much of it is used for gender and development? While sex disaggregated data can provide valuable information, government spending does not show such disaggregation.

**Academia and research:** In sub-Saharan Africa, the brightest minds and some of the most influential people come from the world of academia and research. Pertaining to agricultural research, their inquiry, observations and the information on the different crops which men and women grow and harvest, show that men are more likely to plant trees in croplands whereas

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<sup>28</sup> Griffin, K., Khan, A, Ickowitz, A. 2002. *Poverty and the Distribution of Land*. Journal of Agrarian Change, Vol.2 No. 3. Pg.288.

<sup>29</sup> FAO. (Available at <http://www.fao.org/FOCUS/E/Women/tenure-e.htm>)

<sup>30</sup> Funnell, DC. *Water Resources and the Political Geography of Water Development in Southern Africa: The Case of Swaziland*. 2010. SOAS.

<sup>31</sup> IDRC. *Women, Men and Water Resource Management in Africa*. 2010. (Available at [http://www.idrc.ca/en/ev-31108-201-1-DO\\_TOPIC.html](http://www.idrc.ca/en/ev-31108-201-1-DO_TOPIC.html))

<sup>32</sup> IAASTD pg.10

<sup>33</sup> Fulginiti, Lylyan, Perrin, Richard, Bingxin, Yu (2004). *Institutions and Agricultural Productivity in Sub-Saharan Africa*. Department of Agricultural Economics, University of Nebraska, Lincoln, NE. pg. 1

women are more likely to plant trees for firewood for cooking<sup>34</sup>. Research needs to be conducted on how best to meet both needs in a manner that is efficient and environmentally sound. The contribution of agricultural research is that it ‘contributes to growth and development’ and it ‘can contribute significantly to economic growth and development by increasing food availability and income’<sup>35</sup>.

Demographic transitions such as the rural to urban migration, especially of young men in search of opportunities in urban areas, leave behind a majority of women and aged populations<sup>36</sup>. One needs to consider their specific needs and limitations and include them in research. The questions can be as simple as the ability to physically handle a machine, the suitability or versatility of a technology, or the desire to grow new crops that reflect and are compatible with women’s preferences. The Kickstart *money maker* treadle pump provides a compelling example of why it is important to incorporate gender specifications in agricultural technology design. Approximately 60% of these pumps are managed by women because they are lighter than the standard pump, and the treadles are low, closer to the ground allowing women to work with ease. This design was modified in response to feedback from women<sup>37</sup>.

**Markets:** Ease of entry points to markets for the African farmer is limited in general<sup>38</sup>. Obtaining finance for planting necessities like seed and fertilizers is difficult. In order to get micro-financing, individuals need access to assets. As discussed above, women have limited or no rights to property<sup>39</sup>. As a result, small farm holders face draconian challenges entering the market. Therefore, planting and harvesting crops often becomes unproductive. Also, the gender difference on growth preference of crops deserves closer scrutiny from the perspective of how it not only contributes to the local economy but to the sustenance of livelihoods, as well. Strategic gender interests in the form of legislation at the local, national and international level are a means to create gender equity in agriculture.

## **Conclusion:**

African women in agriculture are disenfranchised. Although they are largely responsible for agricultural production and household management, their decision-making is subservient to men. Therefore compared to men, they lack access to the benefits of AKST, and to credit and markets for cash crops. African women farmers are unlikely to benefit from extension services and farm inputs, they are not likely to afford agricultural technologies, and women are also underrepresented in scientific and technical research institutions which may result in technical innovations that do not take account of women’s distinct perspective and farming needs. According to IAASTD, the purpose of the collaborative efforts of governments and NGOs is to reduce poverty and hunger, improve rural livelihoods and human health and achieve equitable, socially, environmentally and economically sustainable development<sup>40</sup>. Since women make up the majority of the world’s poor, special attention to their plight would have a great impact on

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<sup>34</sup> IAASTD pg 120.

<sup>35</sup> IAASTD pg 10.

<sup>36</sup> IAASTD, UN

<sup>37</sup> Kickstart (Available at [www.kickstart.org](http://www.kickstart.org))

<sup>38</sup> FAO. (Available at <http://www.fao.org/FOCUS/E/Women/tenure-e.htm>)

<sup>39</sup> Ibid.

<sup>40</sup> IAASTD.

poverty reduction, inclusion into productive areas in society and health since they are the predominant health caretakers. Encouraging women's productive work can have the effect of increasing their visibility, respect and status in society. Finally, the essential role of women farmers warrants actions to enhance their decision-making, managerial, and technical capacity to authorize them to implement future improvements.