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# Gender, agroforestry and food security in Africa

Evelyne Kiptot<sup>1</sup>, Steven Franzel<sup>1</sup> and Ann Degrande<sup>2</sup>

This paper reviews agroforestry's contribution to food security from a gender perspective. Emphasis is placed on women's contribution relative to men and the challenges they face. Agroforestry practices examined include fodder shrubs, 'fertilizer trees' and indigenous fruit trees. In examining the practices, we highlight women's and men's involvement in management, utilization and marketing of agroforestry products. The review shows that agroforestry makes a substantial contribution to food security. Furthermore, women are as actively involved as men; however, their level of participation and benefits are constrained by cultural norms and lack of resources. For women to benefit fully from agroforestry and hence contribute to food security, various policies, technological and institutional interventions are recommended.

## Addresses

<sup>1</sup> World Agroforestry Centre, United Nations Avenue, Gigiri, P.O. Box 30677, Nairobi 00100, Kenya

<sup>2</sup> World Agroforestry Centre, West and Central Africa Regional Office, P.O. Box 16317, Yaounde, Cameroon

Corresponding authors: Kiptot, Evelyne ([e.kiptot@cgiar.org](mailto:e.kiptot@cgiar.org), [ekiptot@yahoo.com](mailto:ekiptot@yahoo.com))

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## Introduction

About 870 million people were chronically undernourished in 2010, the majority living in developing countries and depend on agriculture for their livelihoods [1,2]. In order to meet the global demand for food which is expected to increase by 60% by 2050, agricultural production must increase by 70–100% and most of this will have to come from smallholder fields [3]. Agricultural production has however been on the decline as a result of natural resource constraints, climate change and

competing demands for land. One of the potential options to increase yields, productivity, food security and resilience to climate impacts is agroforestry — the integration of trees and shrubs with crops and livestock systems. Research has shown that agroforestry contributes to food security by boosting field crop yields, diversifying income, and increasing resilience to climate change [4–8]. Agroforestry requires relatively little land as trees can be planted around the homestead and on field boundaries. It also has low labour requirements [9]. Furthermore, many trees require cash inputs only for the purchase of seed or seedlings (Table 1). The total number of people practicing agroforestry in the world currently stands at 1.2 billion [5].

## Why gender and agroforestry?

The last few years have witnessed a dramatic increase in global attention to gender, its role in development and inequalities that exist between men and women [10–12,13\*\*,14,15\*\*,16–20]. In the present international political arena the view is widely shared that addressing gender imbalances, hold the potential to decrease poverty and food insecurity in Africa while delivering environmental services and mitigating climate change [14,21]. Gender issues in agricultural production have been well documented; however, very little is known about the contribution of gender and agroforestry to food security in Africa. Women farmers, for example, are an integral part of agroforestry systems — they are often responsible for managing trees especially at the early stages of establishment [22]. They provide 50% of the agricultural labour force in sub-Saharan Africa [15\*\*]. Research has however shown that in many contexts, women have less access than men to productive resources and opportunities such as land, labour, education, extension, financial services and technology [9,16]. Land is the key determinant to production and is central to Africa's agricultural and economic development. In a survey carried out in 16 African countries, women are as likely to own land as males in only six countries and only 2% have land titles [23,24]. The survey further shows that conditional to owning land, female headed households have less land than male headed households. In Tanzania current laws grant equal land ownership and inheritance rights for men and women but customary laws still lock women out [25]. As regards to tree tenure, men and women have separate rights to different parts of the tree; however, women's rights are mostly confined to byproducts such as branches, fodder and indigenous fruits. These byproducts are considered secondary with no significant economic importance. Whenever the 'byproducts' become valuable they are usually taken over by men [26]. As regards to extension,

**Table 1****The resource requirements of options that farmers use to obtain agroforestry products such as fruits, firewood and fodder**

Resource/means	Collect off-farm	Buy	Grow annual crops	Practice agroforestry
		Resource requirements		
Land	0	0	High	Low
Labour	High	0	High	Low to medium*
Capital	0	High	Low or 0	Low or 0

Adapted from [26]

\* Medium if a nursery is required.

only 15% of extension agents are women. Furthermore women receive only 5% of extension services [24]. Addressing these inequalities will not only benefit women and men but also increase agricultural productivity and stability [15\*\*]. Armed with the same resources as their male counterparts, women farmers could increase their yields by 20–30%. This increase in production has the potential of increasing women's income as well as reducing the number of hungry people worldwide by 12–17% [15\*\*].

This paper reviews the contribution of gender and agroforestry to food security in Africa and the imbalances that exist. Agroforestry practices likely to contribute to food security examined here include fodder shrubs to boost milk production for improved human health and income, indigenous fruit trees for improved nutrition and income and 'fertilizer trees,' for increased crop production. The paper draws on lessons learned to make recommendations on how to promote gender equity in agroforestry in order to generate greater benefits for both men and women in increasing food security in Africa.

### The contribution of agroforestry to food security: a gender perspective

#### Fodder shrubs for increased milk production, improved human health and income

The shortage and low quality fodder are major constraints to improving livestock productivity in Africa, especially during the dry season [27,28]. Balanced nutrition contributes to improving animal output as well as to reducing both the cost of production and the emission of greenhouse gases per unit of animal products [28]. The use of fodder shrubs has been shown to contribute to increased milk production and improved livestock productivity leading to improved human health and income [29,30,31\*]. Shrubs available in East Africa are easy to grow, capable of withstanding repeated pruning and compete very little with food crops. The plants mature in 9–12 months and are then ready to be cut periodically and fed to cows and goats. *Calliandra calothyrsus* is the most common species grown for fodder in East Africa. Two kilograms of dry calliandra leaves have about the same amount of digestible protein as 2 kg of dairy meal (16% crude protein and 80% digestibility); each increases milk production by about 0.6–1.3 kg per cow per day,

increasing farm income by 5–10% [32]. Across East Africa, it is estimated that fodder shrubs contribute about US\$3.8 million annually to farmer incomes [30].

Estimates from surveys on the dissemination and adoption of fodder shrubs in the East African region indicate that roughly 205 000 smallholder farmers had planted the fodder shrubs by 2005: 82 000 each in Kenya and Uganda, 28 000 in northern Tanzania and 14 000 in Rwanda [29]. About 47% of planters were women. The high participation of women was facilitated by project extension staff, who targeted women's groups [29]. The average number of shrubs per farmer is between 71 and 236 depending on the country. The number is below 500 shrubs (covering an area of 250 m<sup>2</sup> if planted in a block and 250 m in a hedge) recommended for feeding a single cow throughout the year [31\*]. However, lack of seed and adequate knowledge and skills limit the expansion in fodder planting [31\*].

Few studies look at women's access to cash earned from dairy. Results from a study in Tanzania and Uganda show that women managed and controlled 39.8% of the income from milk, and 70.4% of the income if sold in informal markets [33\*]. Studies conducted in Kenya, Uganda and Rwanda showed that formalization of the milk market can erode the traditional female control of milk and its by-products, thereby decreasing their power within the household [34]. Where the milk is sold and whether it is morning or evening milk have implications on whether or not women manage the income [34]. The morning milk is sold to cooperatives where men are the registered members and therefore receive the payment, whereas the evening milk benefits women who sell it to neighbors and local traders. The funds generated from dairy are used to pay school fees and general household improvements [30]. It is important to note that this only happens if households are relatively food secure [8]. Other benefits include improved animal health, fuel-wood which is a direct benefit to women, improved nutrition of the family, seedling sales, high quality manure, bee forage, stakes for vegetable production and environmental benefits [29]. Growing the fodder shrubs also often reduces the amount of fodder that has to be collected off the farm. This benefits women directly, because they are usually

responsible for such collection [32]. This means that women will have more time to prepare food for their families and for child care.

Although women share in some of the benefits of improved livestock productivity, it has been reported they do face some constraints in marketing of fodder. In Tanga, Tanzania, where mostly women farmers collect and process *Leucaena leucocephala* leaves into leaf meal, nearly all traders were men. Bicycles were usually required for trading but were not considered culturally acceptable for women [35]. Additionally, lack of capital and access to institutional credit, competing use of time, poor technical skills and lack of access to improved extension services affect women more than men, and may further limit their participation and efficiency in livestock production [35,36].

#### **Indigenous fruit tree production for improved nutrition and income**

Fruit consumption has clear health and nutrition benefits such as providing essential micronutrients and protecting against chronic diseases [37]. In spite of the growing evidence highlighting the protective effect of fruits, its intake is inadequate in both developed and developing countries. In East Africa, for example, mean consumption is only 35 g per person per day, whereas the recommended minimum consumption is 400 g [37]. Despite the fact that fruit consumption in Africa is low, fruit trees fulfil a vital role in contributing to food security, because the fruit is consumed seasonally at a time when households run out of food [38]. In a survey conducted in Malawi, Zambia and Zimbabwe, 26–50% of households reported collecting indigenous fruits as a coping strategy to deal with hunger [39]. In West and Central Africa, indigenous fruit products are important components of local diets, for example, *Irvingia gabonensis* kernels are used as an essential sauce ingredient in southern Cameroon [40,41].

Women's participation in indigenous fruit enterprises in sub-Saharan Africa is much greater than for exotic fruits because the former are considered a domain for women and children [13<sup>••</sup>,40]. Several authors have reported that women receive substantial financial benefits from indigenous fruit tree products [42,43]. Women generate income through processing and selling of jam, drinks, gruel, sauces and flavouring agents, their involvement is however still mostly confined to the small retail trade while men control the wholesale trade [44,45]. This is supported by Njuki *et al.* [33<sup>•</sup>], who showed that women are likely to control commodities that generate lower revenue whereas men control ones that generate high revenues. Some of the constraints which women face in marketing include lack of capital, poor market infrastructure, high cost of transportation due to the poor road conditions and theft of their products and money at the markets [42]. Other constraints include lack of appropriate

technology and limited access to processing technologies, marketing strategies and market information [46<sup>••</sup>]. In view of these, many research and development organizations have been using various approaches to help rural dwellers, and particularly women, improve the marketing of fruit tree products [40,42–44]. These interventions include: capacity building in business skills, group dynamics and assessing market trends, product specialization, processing, collective action, provision of improved storage methods and facilitating a village-level stabilization fund to allow for off-season sales.

#### **Fertilizer trees for increased crop production**

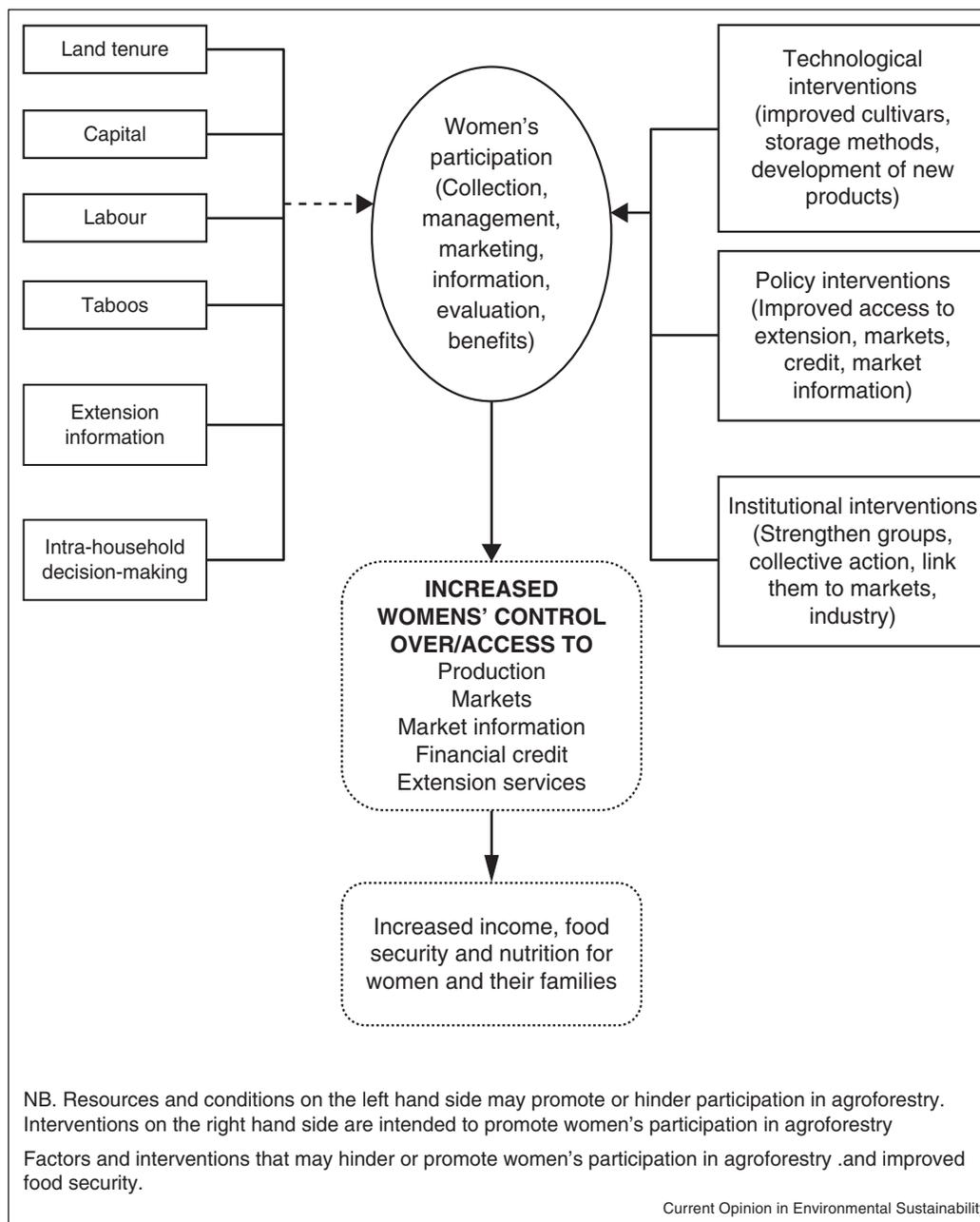
One of the most serious constraints to the sustainability of agriculture in sub-Saharan Africa is soil nutrient depletion [47]. One of the solutions is the use of mineral fertilizer; however, they are expensive and unsustainable. To address these challenges, scientists have experimented on low cost agroforestry options for soil fertility replenishment. Three of the most promising options are the use of improved tree fallows, relay cropping and mixed intercropping [48]. By providing nutrients to crops, these technologies can potentially help farmers improve their soils and incomes, thereby improving food security. The key drivers of farmers' interest in fertilizer tree systems are the low cost and minimal cash transaction involved to establish the trees [9]. The system helps farmers to produce their own nutrients thereby supplementing or substituting for the purchase of mineral fertilizers, which are not affordable to most smallholder farmers.

Studies in Zambia showed that at current per capita maize consumption rates in southern Africa, fertilizer tree fallows can add 57–114 extra person-days of maize consumption per year, assuming that no maize is sold. The system thus has the potential to cut the seasonal hunger period by this period per year [49]. A meta-analysis conducted across several regions in Africa found that fertilizer trees doubled yields of maize relative to the control (maize without fertilizer) in the majority of sites where they have been tested [50]. In relation to gender, a review of 10 studies undertaken in Kenya, Zambia, Uganda and Malawi on factors likely to affect the adoption of fertilizer trees showed that in all except two studies, gender was not a significant variable affecting the use of fertilizer trees [46<sup>••</sup>]. These findings suggest that the use of fertilizer trees for replenishing soil fertility is gender neutral; women farmers are as actively involved as their male counterparts. However, women in Zambia had smaller plots of fertilizer trees than men [51,52]. This may be attributed to the heavy workload that women bear, land constraints or risk aversion.

#### **Conclusions, research needed and recommendations**

Despite the fact that agroforestry has a great potential to contribute to food security, women face several constraints

Figure 1



Factors and interventions that may hinder or promote women's participation in agroforestry and improved food security. *NB:* Resources and conditions on the left hand side may promote or hinder participation in agroforestry. Interventions on the right hand side are intended to promote women's participation in agroforestry.

which reduce their contributions and benefits received (Figure 1).

Research and recommendations that can enhance gender equity in agroforestry thereby increasing food security involve technology, policy and institutional interventions [46,53].

They include:

- Research on the domestication of important agroforestry species, particularly ones which are managed and controlled by women.
- Research on policy, especially land and tree tenure.

- Development of appropriate gender responsive agronomic and processing techniques.
- Training more women extension officers, particularly important in communities that prohibit male extension officers from interacting with women farmers.
- Adapt gender-responsive techniques and methods to the local context.
- Equip all extension staff with the knowledge and skills to address men and women farmers equitably.
- Targeting women's enterprises, to facilitate their engagement in collective action.
- Targeting women's groups for assistance, that is, link them to micro-credit institutions and markets.

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