4thICAAAE 2013 SEPTEMBER 22-25, Hammamet Tunisia
4th International Conference of the African Association of Agricultural Economists
icaaae.org aaae-africa.org

Gender Analysis and Approaches to Gender Responsive Extension to Promote Quality Protein Maize (QPM) in Ethiopia

Kidist Gebreselassie, Hugo De Groote and Dennis Friesen

Invited paper presented at the 4th International Conference of the African Association of Agricultural Economists, September 22-25, 2013, Hammamet, Tunisia

176- Gender Analysis and Approaches to Gender Responsive Extension to Promote Quality Protein Maize (QPM) in Ethiopia

April 19, 2013

Kidist Gebreselassie[1], Hugo De Groote and Dennis Friesen

[1] Corresponding author: wawuye@yahoo.com

Abstract

Improved technologies are important in improving agricultural productivity and food security. The NuME project aims at improving food security among rural households through the dissemination of quality protein maize varieties. However, the project has yet conducted a gender analysis, which this paper tries to address. The analysis is conducted based on literature review, key informant interviews, focus group discussions and gender audit of the implementation partners conducted in two *kebeles* in Dore Bafana *woreda* of Sidama zone and one *kebele* in Bure *woreda* of West Gojjam zone. The study presents gender strategies to inform NuME project methodologies and means. Women were fouind to play a substantial role in household food and care production and income generation. However, they face sever constraints in terms of access to resources and services such as technological information and control over income with unfavorable implications to their participation and benefit from technology endeavours. The formal extension system is reduced to addressing female headed households. Farmer-to-farmer communication seems to be a useful tool in information dissemination in the study communities. Most women and many men in the sites are illiterate, which should be taken into account. Finally, the project collaborators lack gender personnel to carry out gender equality activities in relation to the technology. Extension staff needs training on integrating gender into their activities and collect gender disaggregated data at the intra-household level.

Key words: gender, maize, QPM, Ethiopia

1. Introduction

1.1. The problem

Improvement in agricultural technology contributes to improving agricultural productivity and food security (Barrett and Minten 2008). Women and men in Ethiopia play distinct and often complementary roles in agricultural production activities ranging from land preparation through harvesting and marketing (Mogues *et al*. 2009; WFP 2011); yet they often face different access to resources in agriculture.

Despite their role in agricultural production, income generation, and food processing (MoA 2010; Gittinger *et al*. 1990), women continued to enjoy lower access to resources (e.g. Wondimu *et al*. 2003; Devereux and Sharp 2006), education (Demissie and Yitbarek 2008) and extension services (Mogues *et al*. 2009; World Bank and IFPRI 2010) than men. Unlike the lack of access to resources among the poor in general, inherent in the women's lack of access to resources is the perception bias on the part of the formal extension system as well as the gender norms limiting use of important farming tools e.g. plow oxen. Often, development and technology interventions tend to be male-focused, with the assumption that the men are the important farmers (Mogues *et al*. 2009) and technology related information and benefits will trickle down to other household members including women (Aregu *et al*. 2010).

In a context where women are faced with intertwined constraints ranging from limited education and resources to limited decision space shaped by gender norms, addressing male household heads with development interventions is a more appealing and perhaps more feasible strategy, in the short run. However, this situation has implications to technology adoption, agricultural productivity, sharing the resulting benefit among women and men as well as food security.

Since agricultural technology interventions often require resources such as land and cash to purchase inputs and sometimes education to better comprehend and use technical concepts (World Bank and IFPRI 2010), which many women have limited access to, gender disparity in technology adoption is perhaps to be expected. Indicating the potential implications of gender disparity in resource access to gendered technology adoption, Peterman *et al*. (2010) found that

when background factors e.g. education, land, and wealth are controlled, gender may be less important to technology adoption.

Empirical evidences further show that due to gender inequality in access to resources, women continued to have lower productivity and incomes (Gittinger *et al*. 1990). Also Pender and Gebremedhin (2006) found lower crop yield among female headed households for similar level use of oxen, labor and other inputs due to gender norms constraining female engagement in critical farm tasks mainly oxen plowng and lack of adequate access to farming skills.

Also, women's role in decision making and control over income are important for sharing the benefits of technological interventions. However, a study of loan use and loan based enterprise outcomes among beneficiaries of two microfinance institutions in Amhara and SNNP regions by Haile (2010) and a study of beneficiaries of a microfinance institution in Tigray region by Borchgrevink *et al*. (2005) found that women beneficiaries play limited role in decision making and control over income. Such deprivation in resources, decision making, and control over income among women has daunting implications for food insecurity. Empirical evidences indicate that women in Ethiopia shoulder an inequitably higher burden of food insecurity particularly among the food insecure male headed households (Amare 2009; Belachew *et al*. 2011). Also, food insecurity is found to be higher among female headed households than male headed ones (Ellis and Woldehanna 2005; Teklehaymanot 2009).

It seems that relevant stakeholders and development practitioners have come to grips with the fact that poverty reduction and the envisaged food and nutritional security in Ethiopia is hard to come by without sufficient heed to the needs and constraints faced by women, who are also important players in agricultural production as well as in household food provisioning. Addressing nutritional security among households and women in particular is not only a question of equity but also one with implications for sustainability of intervention outcomes (Quisumbing and Pandelfoli 2010).

Against this backdrop, the nutritious maize for Ethiopia (NuME) project aims to develop and distribute Quality Protein Maize (QPM) varieties to improve the nutritional status of rural households in four regions of Ethiopia, Amhara, Tigray, Oromia and SNNP. The project is

committed to ensure women's participation in the dissemination and adoption of the QPM technology as well as sharing its benefits by addressing their specific needs and constraints pertaining to the technology. It acknowledges that addressing gender equality issues associated with the QPM technology requires examining how women may be affected by the technology and exploring strategies to align the project in such a way that women not only participate in the project activities but also can equally benefit from it.

The purpose of this paper, therefore, is to provide a gender analysis of the agricultural sector relevant to extension activities and thus designs a gender strategy to inform NuME project and improved technology endeavors in general on methodologies and means to ensure women and men's participation and benefit. The analysis largely draws on the previous studies, providing a historical view of the socioeconomic situation of women as well as their role in agriculture and technology related activities, the NuME baseline study conducted during June-July 2012, and in-depth studies.

1.2 The state of food and nutrition insecurity among women and men in Ethiopia

The section presents a brief overview of national status in terms of poverty and gender inequality indicators and gender issues in access to resources and services and control over benefits to enhance understanding the gender aspects of food insecurity in the country. Ethiopia is among the poorest countries in sub-Saharan Africa and the world with a multi-dimensional poverty index of 0.562 (compared to its neighboring countries: 0.229 in Kenya, 0.367 in Tanzania and 0.367 in Uganda); over 72% of the population is in severe poverty (UNDP 2011). In 2011, Ethiopia ranked 174 out of 187 countries with an HDI of 0.363, up from 0.274 in 2000 but below the SSA average of 0.463. The country also ranks low among non-OECD countries in the Social Institutions and Gender Index (SIGI), a composite index that focuses on social institutions and formal and informal social norms that act as root causes of gender inequality (OECD Development Center 2012). It includes family code (early marriage, polygamy, parental authority and inheritance rights), civil liberties (freedom of movement and of dress), son preference, physical integrity (violence against women and female genital mutilation) and

ownership rights (land, property and credit). In 2012, Ethiopia ranked 64th out of 86 countries while in 2009 it placed 89th among 102.

Women in male headed households have limited access to land partly due to the fact that the male spouse brings in to marriage nearly all land (Fafchamps and Quisumbing 2005) as well as inherits land from deceased parents which is not often the case for wives (Mogues *et al*. 2009). Poverty and vulnerability seems to be higher among female headed households (Devereux 2000; Devereux and Sharp 2006; MoA 2010). Often, endowment of other complementary inputs for land cultivation, e.g. oxen and male labor, are concentrated among the male headed households (Sharp *et al*. 2000; Beyene 2003; MoA 2010). Gender norms also constrain women from using the available plow technology (Pender and Gebremedhin 2006), which often causes female headed households to engage in sharecropping (e.g. Gebreselassie 2009; Aregu *et al.* 2010). Gender inequalities also exist in access to inputs and agricultural extension (Wondimu *et al*. 2003; Demissie and Yitbarek 2008; World Bank and IFPRI 2010) due mainly to male bias in the formal extension system (Mogues *et al*. 2009).

Intra-household power asymmetry which is influenced by asset holdings also has implications to women's lack of control over the benefit derived from interventions meant to support women (Kabeer 2001; Borchgrevink *et al*. 2005; Haile 2010). In practice, women are increasingly troubled by the workload associated with the adoption of technologies which did not consider their roles and constraints (Ayele *et al*. 2006). Yet, women's engagement in controlling the benefits due to the technology is limited by their little participation in marketing (Farnworth and Gutema 2010).

Such constraints in relation to resource access, gender roles interacting with production technologies, male bias in conventional technology diffusion, and intra-household power asymmetry have implications to women's food insecurity. This has been revealed in Amare (2009) based on a qualitative case study of chronic food insecurity among the urban poor in one sub-city in Addis Ababa as well as in Belachew *et al*. (2011) based on a case study of households in Jimma zone of southwest Ethiopia for women in male headed households. Similarly based on a study of rural households in Tigray region, Ellis and Woldehanna (2005) and a case study in

two sub-cities in Addis Ababa Teklehaymanot (2009) both found that female headed households are more food insecure than male headed ones.

1.3 The Policy Context for Gender Equality and Food Security

In this section, a brief description of the government's policy on gender equality in access to resources and services as well as in food security including specific measures taken to achieve the same are presented. The Government's commitment to gender equality was announced in the National Policy on Women in 1993. Women's rights and gender equality are enshrined in Ethiopia's constitution of 1995; all persons are equal before the law and discrimination on grounds of gender is proscribed. In the Constitution, matters of employment (including female entitlement to equal pay for comparable work), acquisition and management of property, participation in policy and decision making, family planning, are stated to ensure gender equality. Gender issues were incorporated in national policies including education and training, health, HIV/AIDS, population, food security and others. Subsequently, a National Action Plan for Gender Equality (NAP-GE) was formulated in 2006 to promote gender equitable development. In the NAP-GE, strategies have been formulated to improve the wellbeing of women, through enhancing equitable access to resources and services, the key issues being poverty reduction and women economic empowerment, education and training of women and girls, and advancing women's role in decision making (MoWA 2006). The NAP-GE is also designed to mainstream gender in policies and programs such as Plan for Accelerated and Sustained Development and Eradication of Poverty (PASDEP 2006-2010) (MoFED 2006) to ensure a more gender equitable outcome in poverty reduction.

The national Food Security Strategy is centered on increasing food supply, improving access to food and strengthening emergency response (MoARD 2010). The food security programs (FSP) and particularly the FSP of 2010-2014 gave an explicit account of women's food insecurity status and designed ways to address them through paying attention to food insecurity, experiencing food gap, at the intra-household level. Some of the measures include assisting financial institutions to provide various financial products needed by women, amendments to the productive safety net program's public work to be more gender responsive, direct support transfers, and promotion of off-farm activities. Also gender equality was a cross-cutting issue in

all pillars of the Government's Growth and Transformation Plan for 2010-2015 (MoFED 2010). Despite the legal basis for gender equality, and notwithstanding the progress that has been made to date in acknowledging women's roles and constraints in agriculture and designing strategies to address them, tremendous gaps continue to exist between policy and reality. Gender issues still remain with regard to access to land and extension (improved technologies) and sharing the benefits resulting from development and technological interventions among women.

1.3 Gender Issues in the NuME Project

The gender issues in the NuME project directly and indirectly relate to the importance of maize as a food crop, gender based division of labor, and women's role in food supply activities. The importance of maize has been increasing in Ethiopia over the years, from 2682940 tons in 2000 to 4986130 tons in 2011 (FAOSTAT 2012). Such trend makes initiatives to improve rural household food and nutrition security through improved maize varieties (such as the NuME project) relevant. Moreover, given the existing gender-based division of labor, the increase in area under maize may have implications for the workload and time allocation among women and men in the household as well as for the adoption of improved maize technologies. The trend in maize culture and existing gender norms may influence the adoption of and benefit from quality protein maize (QPM) technology, which aims at improving the nutrition status of rural households through dissemination of improved maize varieties within the NuME project.

Empirical evidences show that men have greater control over marketable crops grown in larger quantities (IPMS 2011) whereas women are more interested in technologies that address food supply issues for the household (Aregu *et al.* 2010). Hence, unlike technologies that focus on high-value cash crops, the NuME project and the QPM technology, by virtue of targeting an important food crop and food security for rural households, has a potential to draw women's attention and enhance their participation in technology dissemination and benefit sharing.

Enhancing women's participation in technology dissemination and sharing benefits requires identifying gender roles and the constraints women face that are relevant to the introduction of QPM varieties, as well as designing strategies including efficient information and communication to enhance women's participation in all the stages of the QPM project activities.

1.4. Objectives

The overall objective of the paper is to develop a gender analysis and equality strategy to inform the NuME project on methodologies and means to bring about equal participation and benefits of women through their involvement in project activities. Specifically, the project sets out to
Conduct gender analysis in the target areas, including description of the role of women in agricultural production and household economy and identification of constraints faced by women, and men, in technology related efforts and benefits; it looks into the gender differences in access to extension, knowledge of improved technology and QPM in particular and the role of access to technology
Based on the findings of this gender analysis, develop a gender strategy to inform the QPM and related improved technology efforts on methodologies and means to ensure full and equal participation of women in project activities.

2. Methodology

2.1. Conceptual and Analytical Tools

A combination of tools consisting of the Harvard Analytical Framework (HAF), the Gender Analysis Matrix (GAM), and descriptive statistics were used for the analysis (CEDPA 1994). HAF was used to assess the activity profiles, gender roles as well as the circumstances (political, economic, cultural), constraints and opportunities influencing gender disaggregated activity, access and control profiles as well as women's equal participation and benefit. The project cycle analysis component of the HAF applies the results of the gender analysis to the planning/ design, needs assessment and monitoring and evaluation stages of the NuME project.

In addition, a reduced form equation based on the farm household frame work is estimated which takes into account gender disaggregated household and other variables is estimated to identify the role of frequency of extension contacts to building knowledge on protein among men and women. Estimations is also conducted to examine the role of QPM knowledge to raising household crop sales revenue and reducing food shortage.

2.2. Research Design

The gender analysis exercise and the development of the project's gender equality strategy was conducted by using three approaches: consulting the literature (on gender issues in agriculture, food security, technology adoption and benefit sharing), analyzing the NuME baseline data collected during June-July 2012 as well as conducting an in-depth study at selected NuME project sites, which includes both the QPM target beneficiaries and implementation partners. The analysis was conducted during November 2012 to February 2013.

Selection of study sites and respondents: target areas of the NuME project consists of 11 zones and 41 *woredas* in Amhara, Tigray, Oromiya, and SNNP and regions of which NuME baseline data has been collected in 10 *woredas*. Target beneficiaries for the NuME project and QPM technology were rural households in potential maize areas. The fieldwork was conducted during January and February 2013. Within the broader framework of the NuME project sites, two sites were selected for the in-depth study. The sites were purposely selected to capture diverse insights of potential gender strategies and constraints hindering women's participation and benefit from QPM by taking into account criteria including QPM trial sites and adoption history, diverse livelihood activities and cultural contexts, potentials for maize, and to the extent possible availability of seed producer women in the area. Accordingly, Bure *woreda* (in West Gojjam Zone) of Amhara and Hawassa Zuria *woreda* (in Sidama Zone) of SNNP regions were included in the study in consultation with the QPM implementation partners. Two *kebeles*, Kejima Umbullo and Gallo, are studied in Dore Bafana *woreda* and Zalma *kebele* is covered in Bure *woreda*.

Target QPM beneficiary women and men were purposively selected for participation in the FGDs based on their profile obtained from the documents of the QPM implementation partners. Also purposive selection of key informant interview has been conducted. Key informants were also purposively selected from each category of participants and non-participants in QPM technology trial, with a focus on women, but involving also men.

In the two study *kebeles* in Dore Bafana *woreda*, a total of 12 key informant interviews (involving QPM participant and non-participant female and male farmers, *woreda* gender person,

and WARDO personnel) and 4 FGDs (involving QPM trial participant women and men as well as dis-adopter men and women in the case of Gallo *kebele*) were conducted. In Zalma and surroundings a total of 10 key informant interviews (involving QPM participants' wife and non-participant women and men, female extension workers, *woreda* gender personnel, WARDO head, *woreda* WYCA officers, zonal crop extension expert and female extension expert) has been conducted in Bure. A total of 3 FGDs, with QPM participant male heads, with non-participant females and with non-participant gender village women have been conducted.

Besides, key informant interviews were conducted with important QPM implementation partners, BoARD at various levels, Sasakawa Global 2000 (SG2000), Farm Radio International (FRI) Ethiopian seed enterprise (ESE), gender personnel from EARO and gender researchers from IPMS in Addis Ababa with the purpose of identifying the key gender issues in agricultural and seed technology endeavours in Ethiopia.

Data and methods: the analysis employs both qualitative and quantitative methods. The quantitative method used the NuME baseline data to generate quantitative indicators on the gender roles in various activities at the household, farm, and market levels. It also looked into gender differences in access to and acquisition of resources and services, key sources of agricultural and nutritional information, QPM knowledge, membership in rural institutions, and food security status specifically focusing on the NuME project sites.

The qualitative method included focus group discussions (FGDs), key informant interviews, and case stories, at the levels of both the target beneficiary women and men and knowledgeable persons in the community. The FGDs were conducted with the target beneficiaries with particular focus on those who participated or not participated in QPM trial and in one special case those who dis-adopted QPM. Key informant interviews were conducted with the women of the households (both female and male headed) who did and did not participate in QPM trial activities. This helped to see the strategies that enabled the current women's participation as well as identify constraints hindering their participation, opportunities for increasing their participation and benefits, and expansion of improved maize and QPM technology.

The objectives of the FGDs and interviews were to i) examine the strategies that worked for women's participation and ii) identify constraints hindering their participation and the expansion

and sustainability of the QPM technology and related improved technologies in general. For this purpose FGD and interview checklists were employed and particularly gender disaggregated information was collected based on the gender analysis toolkit developed by IPMS (Bishop-Sambrook and Ranjitha 2007) which is adapted to focus on maize, QPM, and agricultural technology. Data were analyzed qualitatively and quantitatively (using descriptive statistics and some regression analysis).

3. Results and Discussion

3.1. Role of Women in the Household and Food Production

The results of the NuME baseline survey indicate that gender roles are observed in some of the crop production activities, in particular that animal traction and input selection and purchase are in the male domain (see Table 1). However, there are a considerable number of activities carried-out jointly by men and women, in particular planting, weeding, and harvesting. Most wives interviewed in the survey (68%) indicated that plowing is an activity conducted by men only while some of them indicated that it is mainly done by men (18 %) or equally shared by men and women (11.6%). Most wives indicated that the selection of seed variety is carried out solely (55%) or mainly (21%) by men, with only a few (17%) indicating it is equally shared by men and women. Several other activity are judged by the wives to be solely men's activities, in particular the purchase of improved seeds (89% of responding wives) or fertilizer (94%), and paying of casual labor (64%). Women seem to have equal labor contributions in weeding (73.8%) and planting (49.3%). Harvesting maize seems to be an equally shared activity for most of the households (63.5% for maize grain and 51.1% for maize green) although more women seem to be involved in harvesting green maize (as reported by 34.1% of the wives) than harvesting grain maize (8%). Interestingly, women are hardly involved in harvesting of other cereals. This may be because maize is the main food crop (and conversely other cereals are grown mainly for cash) in the study areas and that women are more engaged in food crops than cash crops activities.

For most women, crop marketing seems to be an equally shared activity (54.6%) whereas for 14.5% it is mainly a men's and for 16% mainly a women's activity. However, women are less involved in livestock marketing activities which the wives indicate to be a men's activity entirely

(51.2%) or mainly (12.9%). In livestock, important women's activities are milking, which 59.5% indicate to be an entirely women's activity and 9.5% indicate to be an activity equally shared by men and women.

Purchasing food is conducted mainly (43% of respondents) or solely (30%) by women. Other activities which are equally shared by men and women include paying for family health expenditure (63%) and paying for *equb* (a traditional revolving fund) and other social obligations (56%). On the other hand, men are responsible for seed purchase (89% entirely by men), fertilizers (94.1%), paying casual labor (64.2%), veterinary expenses (64.5%) and animal feed (61.9%).

The traditional household chores are judged by most women to be entirely or mainly women's activities, in particular laundry (85.8% of women respondents), cooking (98.9%), house cleaning (88.9%), and child care (79.2%).

3.2. Gender Differences in Access to Resources

Almost all (94%) of the sample households own oxen of which 95% of the male headed households and 75% of the female headed households own oxen, with the maximum number owned among male equals six, and female headed households being one (Table 2). A few male-headed households own a water pump (4%), horse cart (5%) or donkey cart (1%), but none of the female headed households own them. Ownership of radio/cassette/CD player and mobile phone is reported to be 59 and 44% for the overall sample, 59 and 45% among male headed households whereas it is 44, 41.7 and 16.7% among female headed households.

Almost all households own their land (98% of the sample households, 97% of the male headed and 100% of the female headed) but male-headed household have larger holding (1.9 ha) than female headed (1.6 ha). A third of the men (32%) but only a quarter of the women in male-headed households (28%) and 17% of female household heads (representing all of those who asked for credit) have acquired loan during the year. Average loans were larger among male household heads (Br 2951) and lowest among females in male headed households (Br 2552.8).

3.3. Gendered Access to Extension

It is shown that 92% of the sample households, 61% of the married women and 83% of the female household heads had access to extension services, whereas 93% of the male household heads had access to extension (Table 3). On the average, the sample households had about 10 extension contacts over the 12 months period prior to the study. Male household heads reported the highest average frequency of extension contacts over the 12 months period prior to the study (10.5) whereas females in male headed households reported the lowest average contacts (5).

This result has been confirmed by the key informant interviews and FGDs which reported that the agricultural extension workers constitute an important source of agricultural information; albeit exclusion of women in training events that take place outside the farm. However, the formal agricultural extension is not necessarily the first and only source of agricultural information as some women may obtain first-hand information from friends and families.

As far as differential access to extension is concerned, ANOVA results show significant mean differences (at 0.05%) in the frequency of extension contact between men and women in married couple households (see Table 7). On the other hand, no significant mean difference has been identified between the frequency of extension contacts between male headed and female headed households (at 0.05%). Similarly, there have been significant differences between the frequency of extension among women in male headed households and female heads of households. Two implications can be derived from this. First, the agricultural extension system is preoccupied with addressing the household rather than the individual members. Second, the agricultural extension is not equally addressing men and women of the same household and that there is intra-household gender disparity in the frequency of extension contact and possibly in access to technological information.

3.4. Knowledge and the Role of Agricultural Extension contacts for Household Food Security

Knowledge of proteins is the lowest among women in male headed households (10.9%) followed by female headed households (25%) and male headed ones (32.1%) (Table 8). Similarly, knowledge of QPM is the lowest among women in male headed household (3.0%), followed by

male household heads (9%) and the highest amongst female headed households (16.7%). Despite the low access to resources such as land, inputs and earnings, female headed households showed better knowledge of QPM (16.7%), higher rate of QPM adoption (8.3%) and lower rate of QPM dis-adoption (0%) than male headed households. The likelihood of men's and women's knowledge of QPM seems to be significantly associated with their respective extension contacts each at the 5% level (see Tables 9 and 10). For knowledge of protein, the frequency of extension contact was important only for men's likelihood of knowledge of protein (at the 5% level of significance) but not of significance importance for women's likelihood of knowledge of protein. Other factors affecting QPM knowledge among the sample households include education and region.

Different QPM adoption rates have been reported by male household heads (5.9%) and wives (2.2%), which is not expected in a situation where clearly separate plots for men and women of the household are uncommon. This difference is a likely manifestation of the difference in the quality of information and knowledge of the QPM varieties which is consistent with the finding of differential QPM knowledge and lack of QPM information sharing at the intra-household level. In other words, only a third of wives of QPM producing male headed households are aware that the maize variety planted on their farm is QPM. The QPM varieties introduced in the in-depth study sites were BHQY545 and AMH760.

3.5. Agricultural extension access and crop sales

The frequency of extension contact by male and female spouses among married couple households is not found to be significant for the household income from crop sales (Table 11). This is found to be the case even after accounting for interaction of extension contacts with the level of education and potential differences in the extension structure and implementation across regions. This may mean that the extension contact may have helped to raise production but not to the level enough to bring the crops to the market i.e. the raise in production due to the extension access is just filling the food gap and hence perpetuating the traditional subsistence farming. For this to be a sound argument, the degree of food gap must decrease among the households with better access to extension which is discussed below.

3.6. Agricultural Extension Access and Household Food Gap

Over the twelve months period prior to the study, the sample households on the average faced about two months of food shortage (Table 5). Female headed households are reported to have more months of food shortage (three) than male headed households (two). Moreover, due to food shortage, there were more incidents of eating food that are not wanted (50%), smaller meals than needed (50%) and fewer meals per day than normal among female headed households (42%) over the four weeks prior to the study as compared to that of females in male headed households (43.2, 49.1, and 38.7% respectively). On the other hand, there are more females in male headed households (49.6%) who worry about not having enough food for the family than female headed households (41.7%).

Findings further reveal that although frequency of extension contact is significantly important for knowledge of protein and QPM among women and men, knowledge of QPM is not significantly important for bridging household food gap (Table 11). This result coupled with the discussion in section 5.3.2 suggests that the current extension accessed by male and female farmers does not seem to be adequate to raise crop production among the households. If it did, then it would have shown in increase in sales or reduction in the degree of food shortage among the households. This means that one needs to go beyond extension contacts to understand access to and practice of extension and technology information towards revisiting the contents and efficiency of the current agricultural extension.

The in-depth study results also show that women did not get the chance to attend the QPM related training activities which involve training offered in the classroom, farmers training center (FTC) and on-farm demonstration. In particular women, including those responsible to lead some of the QPM trial plots, were not invited to any of the trainings conducted outside the farm as the focus was on the male. They were only able to attend the on-farm demonstration because they were on the farm doing their usual maize sowing tasks with their husbands when the extension workers arrived to give the on-farm demonstration training. The training involved training on distance between rows and between plants and fertilizer rates and applications through learning-by-doing during sowing on the individual household farm. The men were given prior notice as to the date when the extension workers are coming to conduct the on-farm demonstration. Even in

the field day where many villagers were supposed to attend to evaluate the technology based on the results of the trial as well as get some nutrition information in relation to the new crop variety, women formed a minority. Many men in the study *kebeles* expressed that they are not comfortable with sending women to agricultural technology related trainings and meetings. They believe that official activities outside the household are men's domain and it should be sufficient if the men attend and some women seem to have bought the idea.

4. Discussion and Conclusions

4.1 Lessons Drawn from the Gender Analysis

Findings suggest that the formal extension system is generally oriented towards the household head which in most cases is male. This has been reflected in the significant difference between the extension contact between men and women among married couple households and lack of significance difference between the extension contacts of male and female household heads. Two assumptions underlie such household orientation of the formal extension system. First, the land titleholder and the prime decision maker in seed selection is the one that matters for targeting in technology endeavours. Hence, as a gender responsive strategy, the formal extension system focuses on the female headed households and in some cases women in polygamous households who normally hold title to land. Second, there is the assumption that technology will trickle down to the rest of the household members including women. On the contrary, the findings show that while male household heads are the most knowledgeable groups as far as protein and QPM is concerned, only about a third of the women in such households have the QPM knowledge that their husbands have. This indicates that the notion of knowledge trickle down seems unrealistic here. However, women's labor is obviously needed in carrying out the farming practices associated with new technologies. Intra-household power inequality linked to ownership of resources and assets influences women's control over income and involvement in household decisions (Fafchamps and Quisumbing 2001; Holmes and Jones 2011). As a result, although women, particularly those in male headed households, may have shouldered much of the drudgery associated with the household's adoption of improved technologies and practices, they may not be benefitting from it (Ayele *et al*. 2006). This has serious implications for the individual and household food security as money in the hands of women contributes more for household food security by increasing expenditure on food in the households than money in the

hands of men (Quisumbing and Maluccio 2000). To the extent that women are concerned about household food security, food security efforts such as QPM need to adequately engage women in the process.

The findings of the study also show that women in male headed households have half the frequency of contact that their husbands have and the mean difference in the degree of extension contact is significant. Only a third of the sample women have the QPM knowledge that their men have. On the other hand the in-depth study results show that women are not often invited to agricultural technology related trainings whereas when the training involves on-farm demonstrations, women often attend as they will normally be on the farm carrying-out the agricultural tasks with their men. Three implications can be derived from these findings. First, it suggests the need to look beyond 'extension contacts' in order to understand and address women's access to technology interventions by looking into the quality of the information delivered to women. Second, it suggests the need to distinguish between the type of extension contact women have i.e. contacts involving on-farm demonstration sessions versus contacts involving every stage of technological information. Third, it suggest that the problem that women in male headed households face may not necessarily be related to getting in contact with the agricultural extension workers. Rather, it may be on the value attached to involving women at every stage of the technology, the communication strategy pursued in delivering technological information to women and the quality of the extension information delivered to women. Whereas the literature acknowledges that the formal extension system is male-focused, and in its most gender responsiveness embraces female headed households, little has been done on the contents of the extension information delivered to men and women.

Findings further show higher QPM adoption rate among female headed households which is consistent with the higher prevalence of QPM knowledge among them, albeit the small sample size. This implies that sufficient work needs to be done on awareness raising and building knowledge of QPM in order to increase QPM adoption among the target population and women in particular. Given that the major drive for the QPM technology is addressing nutritional security among the rural households; and more so given the little incentive to QPM adoption in terms of yield, the success of the QPM in terms of benefits among the target women and men is contingent upon the achievement in the nutrition extension.

Results also indicate that men have important roles in household decisions, including on women's participation in events outside the house. Hence, enhancing men's engagement in nutrition related QPM activities contributes to enhancing household adoption of the technology and men and women's participation and benefit from the technology.

8.2 Gender Strategy To Inform NuME Project Methodologies and Means

Based on the results of the literature review, the baseline study, the in-depth study and the focus group discussions, the following strategies are suggested to enhance participation of women in QPM project activities and benefit from adoption of QPM. The strategies are addressed to QPM implementation partners, QPM technology supplier and policy makers.

4.2. Lessons for the project's implementation partners

Acknowledge that not all women are alike: three types of women are identified in this study, women in conventional male headed households, women in polygamous male headed households and female headed households. Any technology endeavour should be aware of the fact that the different categories of women face different needs and constraints and be responsive to such specific needs.

Intra-household and individual oriented QPM extension: the formal extension system needs to enrich its traditionally household oriented approaches by integrating intra-household orientation. If technology endeavours are to generate better outcomes, the extension system needs to address the individual rather than the household. This helps to actively engage men and women in every stage of the technology activities by attending to the specific needs.

Invite women to training events: if technology endeavours are to generate better outcomes, the extension system needs to engage women in every stage of the technology activities including in the various training stages. QPM project can be integrated with efforts of relevant stakeholders e.g. *kebele* and *woreda administration*, Women's Affairs Offices and CSOs engaged in empowering women. Traditional and informal religious institutions such as '*Senbete*' can be also used as a channel to convey messages including on the importance of involving women in the QPM technology activities. One may as well consider linking the activities of CSO initiated women's self-help groups in various parts of the country with QPM activities. The groups can be

targeted to enhance exchange of QPM related nutritional and agronomic information and initiation of QPM seed production as a group or individual income generating activity. Also, depending on the specific socio-cultural settings, women could be approached for technology participation through their spouses, home agents, and religious groups. Regarding trainings conducted outside the on-farm demonstrations, women and men could be invited to technology training events as couples but trained in their separate groups.

Identify convenient time and place for training and information sharing with female farmers: in order to ensure active participation of women in improved technology and QPM training, training events need to be responsive to women's daily activity program. Since preference for the specific place, time and date of training varies across regions and sites, it is important to identify it in a participatory manner with the women. One also needs to be considerate of the venue for theoretical sessions and information sharing events if the participation of women is to be meaningful. Given that women have a better chance of participating in events taking place around the farm than in other places, it may be worth considering conducting some of the information sharing or communication events with groups of women within the villages.

Provide prior notice to women about the training days: the findings of this study suggest that given the multiple roles of women in the household, prior notice of technology related trainings is necessary to ensure women's participation. In particular, women need to be informed well in advance of trainings offered outside the farm.

Support women-managed plots in male-headed household: using women-managed plots in male-headed households can actively engage women in technology endeavours. In some cases one may find that the home garden is mainly managed by women and hence technology trials could be integrated in such plots to enhance women's participation. The effectiveness of such setups should be demonstrated in women's lead roles in receiving technological inputs from the extension offices, participation in every stage of the technology training and field day events, managing and participation in decision concerning the activities on the trial plots. Hence, women are able to describe all the activities conducted on the trial plots including the recommended spacing and fertilizer applications.

Communication strategies: in addition to the agronomic and nutritional attributes of QPM, messages to be conveyed to the target beneficiaries should include the importance of involving women in the QPM activities. The QPM communication media may include awareness and training sessions, posters, fliers, and radio which all need to be gender-sensitive both in content and language e.g. responsive to the literacy situation of rural women and local languages, among others. Since many farmers, and women in particular, are illiterate, QPM messages on posters and fliers are better conveyed pictorially than verbally. In addition, fliers can be prepared with texts written in simple local languages for hand-outs to the farmers to make use of the few educated male and female farmers through the powerful farmer-to-farmer information transfer and availability of school children in the household.

Also, the awareness and training sessions for women farmers are better conducted through female extension workers and trainers to foster women's participation. The trainer needs to enhance ease of interaction by being sensitive to the culture of the community and by using simple examples from the women's daily lives. For this purpose, the trainer should better be from the surrounding, familiar with the culture of the community and if possible has already been in contact with the women in the community. Posters need to be hanged in public places such as health centers, market places, millhouses, tea houses, and religious worship places. Fliers with nutrition messages may also be distributed during field days.

Also, radio can be used to reach radio owners radio, although their numbers are few, or by providing radio access to listeners' groups created for this purpose. In the radio programs, women's as well as men's listeners groups can be created for which facilitators can be selected to enhance discussion and listenership. The date and time for radio transmission as well as the place where group listening takes place need to be identified in consultation with the target women. Because farmers are more in favor of music and entertainment channels, the radio programs may need to consider conveying QPM messages through dramas, poems, and role plays.

QPM communication materials may as well be prepared at higher levels, which could be more technical on the agronomic practices and nutritional aspects of QPM targeting agricultural and health extension workers, and also targeting the general public.

Engage health extension workers*:* engaging health extension workers or home agents in QPM nutrition activities can be helpful to engage more women farmers, as well as to give the mandate of the nutritional aspect of QPM to relevant institutions. This involves allowing the nutrition classes to be offered by the health extension workers or home agents as appropriate.

Activities to enhance men's participation in QPM food demonstration and nutrition education: the field days lack food and nutrition component which many men consider as a women's job; however, it is beneficial that the NuME activities pay attention to enhancing men's participation in food demonstration and nutrition events in order to enhance QPM adoption as well as sharing the women's burden of addressing household nutrition security.

Incentive mechanisms: incentives appear relevant to supply-driven technologies such as QPM. Relevant incentives should be designed by taking into account the specific situations of each project site. Incentives given to the farmers may include awards or recognition, another round of free QPM seed, free QPM food for those who attend trainings, demos, and field days as a couple and particularly for men. Incentives could also be provided to the extension workers in response to the number of women and men they were able to engage in each stage of QPM project activities. These may include the number of participants, women and men, as a performance indicator for evaluation the extension agents (also recommended by IPMS (2011) for the case of women's participation).

Nutrition extension: more work needs to be done on increasing awareness of the nutritional benefits of the QPM variety. In fact, the currently poor QPM nutrition extension has implications for the poor demand for QPM seed which in turn limits the expansion of the seed production venture. Besides, some market assessment may as well be conducted by looking into trends in the demand for QPM (seeds, grains) through analyzing household plan to start or expand production of QPM seed and grain as well as consumption.

QPM technology supply

Establish NuME advisory panel: the NUME advisory panel ensures that all the NuME project implementation partners have equal understanding of the gender strategy and have the initiative to follow-up the implementation of the strategy at every stage of the technology activities. The

panel may consist of representations from the NuME communication personnel, nutrition expert, and agronomist.

Assist in filling the capacity gaps of the QPM implementation partners for better women's participation and benefit: some of the gaps of the QPM implementers could be addressed through creating a forum for sharing leverage across the different implementers. For instance, the strengths and opportunities at SG2000 e.g. in conducting women-managed plots, gender mainstreaming and training experiences can be useful to fill the gaps of WARDO in this respect for better achieving gender equity in NuME project activities. Similarly, the crop extension expertise and the good working relationship and trust that the WARDO built with the farmers can be used to improve the situation of the different types of women in technology participation and benefits.

Train the QPM extension workers (WARDO personnel): based on the findings of the study training of the QPM extension team should aim to help: i) create an understanding of the importance of engaging women in technology activities and conviction towards achieving the same; ii) look beyond the household as a unit of intervention towards engaging women in technology interventions as well as men in food and nutrition activities by attending to their specific needs and constraints, iii) demonstrate commitment in putting extra effort to enhance women's benefits from technological access. These includes enhancing consistency and lucidity of the quality of technological information delivered to men and women as well as increasing participation and use of technology by women e.g. by persuading male household heads through various mechanisms; iv) be sensitive to the female participation rates at every stage of the QPM technology activities, classroom, FTC demonstration, on-farm demonstration, and field day sessions as well as men's participation rates in food related demonstrations. In line with this, it is also important to train the staff on collection of gender disaggregated data (including about the participation and benefit of women in male headed households) and simple gender analysis tools such as recording activity profiles and impacts of projects. It is also important if the training is assisted with handbook for the extension workers, which gives guidelines to address gender equality issues in the NuME project activities.

Periodic monitoring and evaluation of progress in implementing the gender equality strategy and achievement in gender equality: a system of tracking progress in the gender equality activities and achievements throughout the NuME implementation stages is helpful to meet NuME targets in women and men's participation and benefits in relation to the QPM technology. It also enhances identifying and addressing gender related issues and challenges that may emerge in the course of implementation.

Conduct experience sharing events: based on the discussions at the PIC workshop held during Feb 13-15, 2013, some variation has been reported across the NuME sites on the degree of women's participation in QPM project activities e.g. in trainings and field days. Thus, it may be worth considering periodic experience sharing events e.g. workshops and feedback mechanism on the gender strategies across the NuME sites in order to explore emerging and relevant gender strategies and implementation approaches, including gender sensitive information, education, and communication strategy, to enhance the participation and benefits of women and men in QPM project activities. The experience sharing events may also involve QPM producers and other institutions such as ILRI.

Policy makers

Enhance intra-household oriented extension system and collection of gender dis-aggregated data*:* the household orientation of the formal extension system in addressing technological access and collection of gender dis-aggregated data contributed to the distancing of women in male headed households from technology endeavors, particularly in terms of quality of technological information. If women in male headed households are to benefit from technology extension both in contacts and quality, the formal extension system has to change its focus into more household orientation in delivering technological information and collecting gender dis-aggregated data.

Increase the number of female extension workers: could help to enhance participation of and benefits to women farmers. This could be done through providing facilities such as vehicles, bikes and housing; or through providing scholarships opportunities targeted towards women interested in agricultural training.

Mandate QPM food and nutrition extension to relevant institutions: in particular the health bureau, health clinics and ARDO home agents, to take over activities beyond QPM production, in particular nutrition education, preparations, and demonstrations of the preparations.

References

Amare, Y. 2010. "Urban Food Insecurity and Coping Mechanisms: A Case Study of Lideta Sub-City in Addis Ababa." Research Report No. 5, FSS, Addis Ababa.

Aregu, L., C. Bishop-Sambrook, R. Puskur and E. Tesema. 2010. *Opportunities for promoting gender equality in rural Ethiopia through the commercialization of agriculture.* IPMS (Improving Productivity and Market Success) of Ethiopian Farmers Project Working Paper 18. ILRI (International Livestock Research Institute), Nairobi, Kenya. 84 pp.

Ayele, S. B. Kuma, and K. Nesha. 2006. "Opportunities and Challenges in Accessing Potato Technologies among Rural Women." In Yeshi Chiche and Kaleb Kelemu (eds.) Gender Differentials for Planning Agricultural Research. Proceedings of the Workshop on Gender Analysis in Agricultural Research, 27-29 November 2006. Ethiopian Institute of Agricultural Research (EIAR), Addis Ababa.

Barrett, C. and Minten. 2008. "Agricultural Technology, Productivity, and Poverty in Madagascar." World Development 36: 797-822.

Belachew, T., C. Hadley, D. Lindstrom, G. Abebe, W. Kifle, G. Yehenew, C. Lachat, and P. Kolsteren. 2011. "Gender Differences in Food Insecurity and Morbidity among Adolescents in Southwest Ethiopia." *Pediatrics* 127(2): 397-404.

Berhane, G., J. Haddinott, N. Kumar, A.S. Taffesse, R. Sabates-Wheeler, M. Handino, J. Lind, M. Tefera, and F. Sima. 2011. "Evaluation of Ethiopia's Food Security Program: Documenting Progress in the Implementation of the Productive Safety Nets Programme and the Household Asset Building Programme".

Berhane, G., Z. Paulos, K. Tafere, and S. Tamru. 2011. Food Grain Consumption and Calorie Intake Patterns in Ethiopia. Ethiopia Strategy Support Program II (ESSP II). Working Paper 23 Development Strategy and Governance Division, International Food Policy Research Institute.

Beyene, A. 2003. Soil conservation, land use and property rights in Northern Ethiopia. PhD Dissertation, Agraria 395. Swedish University of Agricultural Sciences, Dept. of Rural Development Studies, Uppsala.

Bishop-Sambrook, C. 2004. "Gender Analysis: An Overview of Gender Issues in the Agricultural Sector of Ethiopia. IPMS (Improving Productivity and Market Success) Gender analysis and strategy paper, Addis Ababa, Ethiopia.

Bishop-Sambrook, C and R. Puskur. 2007. Toolkit for Gender analysis of Crop and Livestock Production, Technologies and Service Provision, Prepared for IPMS of Ethiopian Farmers Project, ILRI, Ethiopia, Available on: http://www.ipmsethiopia.org/content/files/Documents/publications/Gender/IPMS%20gender%20toolkit_English%20Nov%202007.doc/.

Borchgrevink, A., T. Woldehana, G. Ageba, and W. Teshome. 2005. "Marginalized Groups, Credit and Empowerment: A Study of Debit Credit & Saving Institutions (DECSI) of Tigray." Report Commissioned by Norwegian People's Aid (NPA) and the Association of Ethiopian Microfinance Institutions (AEMFI).

Buchy, M. and F. Basaznew. 2005. "Gender-blind Organizations Deliver Gender-biased Services: The Case of Awasa Bureau of Agriculture in Southern Ethiopia." *Gender, Technology and Development* 9(2):236-251.

Center for Development and Population Activities, CEDPA. 1994. Gender and Development. The CEDPA Training Manual Series Volume III, Washington, D.C.

Darity, W. 1995. "The Formal Structure of Gender-Segregated Low Income Economy." *World Development* 23(11): 1963-1968.

Davis, K., B. Swanson, and D. Amudavi. 2009. Review and Recommendations for Strengthening the Agricultural Extension System in Ethiopia. IFPRI Working Paper.

De Brauw, A. and S. Rozelle. 2008. "Reconciling the Returns to Education in Off-farm Wages Employment in Rural China." *Review of Development Economics* 12(1): 57-71.

Demessie, S. and T. Yitbarek. 2008. "A Review of National Policy of Ethiopian Women." In Taye Assefa (ed) Digest of Ethiopia's National Policies, Strategies and Programs. FSS, Addis Ababa.

Devereux, S. 2000. "Food Insecurity in Ethiopia." Discussion Paper, DFID, IDS, Sussex.

Devereux, S. and K. Sharp. 2006. "Trends in Poverty and Destitution in Wollo, Ethiopia." *Journal of Development Studies* 42(4):592–610.

Dominguez, A. M. 2010. "Why Was There Still Malnutrition in Ethiopia in 2008? Causes and Humanitarian Accountability." *Journal of Humanitarian Assistance*. Retrieved December 12, 2011 (http://jha.ac/2010/02/21/why-was-there-still-malnutrition-in-ethiopia-in-2008-causes-and-humanitarian-accountability-2/).

Ellis, F. and T. Woldehanna. 2005. *Ethiopia Participatory Poverty Assessment 2004-05*. MoFED Development Planning and Research Department.

Ethiopian Economic Association (EEA)/Ethiopian Economic Policy Research Institute (EEPRI). 2006. Evaluation of the Ethiopian Agricultural Extension with Particular Emphasis on the Participatory Demonstration and Training Extension System (PADETES). EEA/EEPRI, Addis Ababa.

Ethiopian Society of Population Studies. 2008. Gender inequality and Women's Empowerment: In-depth Analysis of the Ethiopian Demographic and Health Survey 2005. UNFPA, Addis Ababa.

Fafchamps, M., and A. Quisumbing. 2001. Control and Ownership of Assets within Rural Ethiopian Households. Food Consumption and Nutrition Division (FCND) Discussion Paper No. 120, IFPRI, Addis Ababa.

Fafchamps, M., and A. Quisumbing. 2005. "Marriage, Bequest and Assortative Matching in Rural Ethiopia." *Economic Development and Cultural Change* 53(2): 347–380.

FAO. Statistical Databases (FAOSTAT). Available at: http://faostat.fao.org.

Farnworth, C. R. and T. H. Gutema. 2010. Gender Aware Approaches in Agricultural Programmes – Ethiopia Country Report: A special study of the Sida-Amhara Rural Development Programme (SARDP III) and the work of selected agencies in Ethiopia. UTV Working Paper 2010:4, Sida. http://www.sida.se/publications.

FDRE Ministry of Agriculture (MoA). 2010. "*Programme Implementation Manual (2010).*" Addis Ababa, Ethiopia.

FDRE Ministry of Agriculture and Rural Development (MoARD). 2010. "*Food Security Programme 2010-2014*." Addis Ababa, Ethiopia.

FDRE Ministry of Finance and Economic Development (MoFED). 2006. *Ethiopia: Building on Progress; A Plan for Accelerated and Sustained Development to End Poverty (PASDEP), (2005/06-2009/10)*, vol. 1, *Main Text*. Addis Ababa. September 2006.

FDRE Ministry of Finance and Economic Development (MoFED). 2010. Growth and Transformation Plan (GTP) 2010/11-2014/15. Draft, September 2010.

FDRE Ministry of Foreign Affairs. 2002. *Federal Democratic Republic of Ethiopia Food Security Strategy*, FDRE 2002-2010.

FDRE Ministry of Women's Affairs (MoWA). 2006. *National Action Plan for Gender Equality (NAP-GE), 2006-2010*. Addis Ababa.

Gallina, A. 2010. Gender Aware Approaches in Agricultural Programmes – International Literature Review, Swedish International Development Cooperation Agency/UTV Working Paper 3, Stockholm: Sida

Gebreselassie, K. 2009. "HIV/AIDS, Labor Organization and Agrobiodiversity: The Case of Farm Households in Southwest Ethiopia." Ph.D. Dissertation, Wageningen University, The Netherlands.

Gittinger, P., S. Chernick, N. R. Horenstein and K. Saitor. 1990. "Household Food Security and the Role of Women." Discussion Paper No. 96, Washington D.C.: World Bank.

Haile, H. B. 2010. "Targeting Married Women in Microfinance Programs: Transforming or Reinforcing Gender Inequalities?" Evidence from Ethiopia. Ph.D. Dissertation, Wageningen University, The Netherlands.Hareg Consult PLC. 2005. Gender Situation Analysis in Ethiopia. Draft Report, Addis Ababa.

Hassena M. B. Diriba, and G. Dama. 2006. "Gender Analysis in Cereal Crop Production Systems of Bale Highlands." In Yeshi Chiche and Kaleb Kelemu (eds.) Gender Differentials for Planning Agricultural Research. Proceedings of the Workshop on Gender Analysis in Agricultural Research, 27-29 November 2006. Addis Ababa: Ethiopian Institute of Agricultural Research (EIAR).

Holden, S. and M. Bezabih. 2009. "Gender and Land Productivity on Rented Land in Ethiopia." In S. T. Holden, K. Otsuka and F. M. Place (eds.) The Emergence of Land Markets in Africa: Impacts on Poverty, Equity and Efficiency. Washington, D.C.: Resources for the Future.

Holmes, R. and N. Jones. 2011. "Gender Inequality, Risk and Vulnerability in the Rural Economy: Refocusing the Public Works Agenda to Take Account of Economic and Social Risks ESA." Working Paper Nos. 11-13.

IPMS. 2011. Empowering Women through Value Chain Development: Good Practices and Lessons from IPMS Experiences. ILRI KMIS, May 2011.

Joireman. S. F. 2008. "The Mystery of Capital Formation in Sub-Saharan Africa: Women, Property Rights and Customary Law." *World Development* 36 (7): 1233–1246.

Kabeer, N. 2001. "Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment." In SIDA, Swedish International Development Cooperation Agency (ed.), Discussing women's Empowerment. Theory and Practice, Sida Studies, No.3, pp. 17-57.

Kassa, H. 2008. "Agricultural Extension in Ethiopia: Historical Evolution, Relevant Policies and Challenges." In Taye Assefa (ed.) Digest of Ethiopia's National Policies, Strategies and Programs. Addis Ababa: FSS.

Kelemework, F. and H. Kassa. 2006 Assessment of the current extension system of Ethiopia: A closer look at planning and implementation. Ethiopian Economic Association/Ethiopian Policy Research institute (EEA/EEPRI), Issue Paper Series No. 2/2006.

Mogues, T., M. J. Cohen, R. Birner, M. Lemma, J. Randriamamonjy, F. Tadesse and Z. Paulos. 2009. Agricultural Extension in Ethiopia through a Gender and Governance Lens. Ethiopia Strategy Support Program 2 (ESSP2) Discussion Paper No. ESSP2 007, IFPRI/EDRI, Addis Ababa.

Morris, P. T. 2003. *The Gender Audit Questionnaire Handbook*. Commission on the Advancement of Women, InterAction, Washington, D.C.

Negatu, W. 2008. "Food Security Strategy and Productive Safety Net Program in Ethiopia." In Taye Assefa (ed.) Digest of Ethiopia's National Policies, Strategies and Programs. FSS, Addis Ababa.

Niehof, A. 2002. "The Household Production of Care." In C.A.A Butijn, J.P. Groot-Marcus, M. van der Linden, L.P.A. Steenbekkers & P.M.J. Terpstra (eds.) Changes at the Other End of the Chain. Wageningen, Maastricht: Wageningen UR, Shaker Publishing, pp. 179-89.

OECD Development Center (2012) http://genderindex.org/

Pender, J., and B. Gebremedhin. 2006. Land management, crop production and household income in the highlands of Tigray, northern Ethiopia: An econometric analysis. In Strategies for

sustainable land management in the East African highlands, ed. J. Pender, F. Place, and S. Ehui. Washington, D.C.: International Food Policy Research Institute.

Peterman, A., J. Behrman, A. Quisumbing. 2010. A Review of Empirical Evidence on Gender Differences in Nonland Agricultural Inputs, Technology, and Services in Developing Countries. Poverty, Health and Nutrition Division Discussion Paper 00975. IFPRI (International Food Policy Research Institute). 48 pp.

Quisumbing, A. R. and J. A. Maluccio. 2000. "Intra-household allocation and Gender Relation: New Empirical Evidence from Four Developing Countries", FCND Discussion Paper No. 84, Food Consumption and Nutrition Division International Food Policy Research Institute.

Quisumbing, A. R., and L. Pandolfelli. 2010. "Promising approaches to address the needs of poor female farmers: Resources, constraints, and interventions." *World Development* 38 (4): 581–592.

Quisumbing, A. R., and Y. Yohannes. 2004. How fair is workfare? Gender, public works, and employment in rural Ethiopia. Policy Research Working Paper 0-3039. Washington, D.C.: World Bank.

Sharp, K., S. Devereux, and Y. Amare. 2000. Destitution in Ethiopia's Northeastern Highlands (Amhara National Regional State). Final Report. London & Addis Ababa: Institute of Development Studies and Save the Children, April.

Sharp, K., T. Brown and A. Teshome. 2006. Targeting Ethiopia's Productive Safety Net Programme. Commissioned Report. Overseas Development Institute: London.

Teklehaimanot, G. and M. Haile. 2007. Women in Backyards: Root Crop Production and Biodiversity Management in Backyards: A Case Study in Five Selected Woredas of Tigray Regional State, Northern Ethiopia. DCG Report No. 50. Available on: www.drylands-group.org/noop/file.php?id=1787. Accessed on: Feb 1, 2013.

Teklehaymanot, N. 2009. "Dynamics of Poverty in Addis Ababa." Research Report No. 3, FSS, Addis Ababa.

Teshome, A. 2008. "A Review of Education Policy, Strategies and Programs." In Taye Assefa (ed) Digest of Ethiopia's National Policies, Strategies and Programs. FSS, Addis Ababa.

UNDP. 2011. http://hdrstats.undp.org/en/countries/profiles/ETH.html.

WFP Agricultural Learning and Impacts Network. 2011. P4P and Gender: Literature Review and Fieldwork Report. WFP, Rome.

Winters, P., B. Davis and G. Carletto. 2009. Assets, Activities and Rural Income Generation: Evidence from a Multicountry Analysis. *World Development* 37(9): 1435–1452.

Wondimu, H., H. Terefe, Y. Abdi, and K. Kefetew. 2003. *Gender and cross cultural dynamics in* Ethiopia: The Case of Eleven Ethnic Groups, CERTWID, Addis Ababa

World Bank. 2007. World Development Report 2008: Agriculture for Development. Washington DC.

World Bank. 2008. Ethiopia A Women's Affairs Office and World Bank (WAO/WB). 1998. *Implementing the Ethiopian National Policy for Women: Institutional and Regulatory Issues.* Washington DC.

World Bank. 2009. Gender and Agriculture: Source Book. Washington D.C.

World Bank and IFPRI. 2010. Gender and Governance in Rural Services: Insights from India Ghana and Ethiopia. Gender and g Governance Author Team. Washington, D.C.: International Bank for Reconstruction and Development/ World Bank.

TABLES AND FIGURES

Table 1. Gender roles with respect to specific crop, household and livestock production activities (wives' perspective) (in % of respondents putting the activity in this category).

Activity	Men only	Mainly men	Equally shared	Mainly women	Women only
Plowing	68.6	17.9	11.6	1.7	0.2
Planting	12.6	35.7	49.3	1.9	0.2
Weeding	1.9	13.8	73.8	7.9	1.3
Harvest maize grain	4.6	22.8	63.5	6.1	1.9
Harvest maize green	2.9	11.2	51.1	17.9	16.2
Harvest other cereals	17.5	30.1	0.5	1.9	0
Harvest legumes, other	7.9	23.9	55.1	9.2	3.1
Choice of variety	54.9	21.4	17.3	4.6	1.8
Threshing	28.8	33.2	30.1	5.5	2.2
Marketing	8.3	14.5	54.6	15.8	6.8
Purchase improved seeds	89.5	7.6	1.7	0.4	0.7
Purchase fertilizer	94.1	5.0	0.4	0.2	0.2
Pay casual labor	64.2	17.4	17.4	0.5	0.5
Laundry	0.2	0.2	8.5	30.6	55.2
Cooking	0	0	0.2	10.0	88.9
Cleaning/house	0	0.2	0.4	10.5	78.4
Paying school fee	39.9	21.7	34.8	0.9	2.8
Purchase clothing	22.7	18.6	52.4	4.8	1.5
Purchase food & groceries	41.6	3.5	19.3	42.7	30.2
Paying Equb[a] & social obligations.	17.9	18.2	56.0	4.8	3.1
Family health (med, hospitalization, home care)	17.5	9.6	63.7	7.7	1.5
Child care	0	0.2	20.3	36.9	42.3
Grazing	18.0	20.0	15.4	2.9	1.8
Feeding/cutting forage	20.9	29.1	19.4	2.6	1.5
Watering	11.7	20.3	17.4	2.2	3.3
Milking	4.4	5.5	19.4	9.5	59.6
Marketing	51.2	12.9	10.3	11.9	13.6
Purchase livestock feeds	64.5	17.3	16.6	0.7	0.9
Animal health (purchasing)	61.9	11.9	24.6	0.9	0.4

[a]Equb is a traditional type of revolving fund. Source: NuME baseline data (2012).

Table 2. Ownership and access to assets across headship profiles.

	Male headed households (n_1=458)			Female headed households (n_2=12)		
	HH owns (max ox=6) %	Average owned	Access %	HH owns (max ox=1) %	Average owned	Access %
Ox plough	94.8	0.95	93.4	75	0.75	75
Water pump	3.9	0.04	3.9	0	0	0
Horse/mule cart	5.5	0.06	5.5	0	0	0
Donkey cart	1.1	0.01	1.1	0	0	0
Radio, cassette or CD player	59	0.71	57.9	41.7	0.42	41.7
Mobile phone	45	0.62	41.3	16.7	0.17	16.7
Land owned, ha	96.9	1.91	96.3	100	1.6	100

NB: maximum oxen ownership is one ox for female and six oxen for male headed households.

Source: NuME baseline data (2012).

Table 3. Access to loan and extension among male heads, females in male headed households and female heads.

	Overall sample (n=470)		Male heads (n_1=455; 3 are missing males)		Females in male headed household (n_3=458)		Female heads (n_2=12)	
	%	Average	%	Average	%	Average	%	Average
Bank account	5		5		4		8	
Loan demand	38		39		32		17	
Loan acquired	32	928	32	947	28	706	17	470
Extension access	92		92.5		61		83.3	
Extension contacts		10.4		10.5		5.0		9.8

Source: NuME baseline data (2012).

Table 4. Membership in rural institutions for the overall sample and by headship status.

	Overall sample		Male heads (n_1=455; 3 are missing males)		Females in male headed household (n_3=458)		Female heads (n_2=12)	
Rural institutions	%	Average	%	Average	%	Average	%	Average
SACO	31		31.4		27.1		25	
Equb	12		12.5		13.1		8.3	
Coops	62		62.6		20.3		41.7	
Producer groups	4		3.9		0.22		0	
Marketing groups	2.8		2.9		1.1		0	
Women's assoc	1		0		28.6		33.3	
Youth assoc	10		9.9		1.1		8.3	
Religious	72		72.1		60.7		91.7	
Funeral	85		85.3		78.4		100	
No. of membership		2.8		2.8		2.3		3.1
Non-members (overall)	5.5		5.7		12.4		0	

Source: NuME baseline data (2012).

Table 5. Food shortage and insecurity across headship profiles.

			Females in male headed households (n_3=458)		Female headed (n_2=12)	
	Food insecurity indicator	Sample Average	% facing the problem	Average	% facing the problem	Average
Over the last 12 months	Food shortage months	2	53.5	2	50	3
Over the past 4 weeks	Worrying about the household not having enough food		49.6		41.7	
	The individual or any household member having to eat food they didn't want to because of lack of other food		43.2		50	
	The individual or any household member having eaten smaller meal than needed because of shortage		49.1		50	
	The individual or any household member having eaten fewer meals in a day because of shortage		39.7		41.7	

Source: NuME baseline data (2012).

Table 6. Sources of agricultural and nutritional/health information across headship profiles.

	Male headed households (n_1=458)			Women in male headed households (n_3=458)			Female headed households (n_2=12)		
Sources of information	Ownership	Agri. info	Health/ nutrition info	Ownership	Agri. info	Health/ nutrition info	Ownership	Agri. info	Health/ nutrition info
	%	%	%	%	%	%	%	%	%
Radio	66.4	60.7	58.7	61.6	40.8	41.0	41.7	33.3	33.3
TV	18.7	7.7	6.6	7.2	3.1	3.1	8.3	8.3	8.3
Newspaper/ magazines	16.0	13.2	10.8	1.5	1.1	1.1	8.3	8.3	8.3
Mobile phone	30.9	9.7	7.3	18.3	0.7	1.1	16.7	0	0
Posters	11.9	8.6	10.9	7.4	1.1	6.6	8.3	8.3	8.3
Flyers/leaflets	0	0	0	2.8	0.9	2.6	8.3	8.3	8.3
Family & friends	87.5	84.8	75.2	74.7	64.2	65.7	100	100	100
Social & relig groups	56.9	49.5	42.6	51.9	40.6	36.9	83.3	83.3	66.7
Input traders	10.8	10.8	1.3	0.7	0.7	0.2	8.3	8.3	0
NGOs	6.2	4.8	2.6	1.3	0.7	0.9	8.3	8.3	8.3
Training	63.5	62.2	46.8	40.2	31.4	36.2	33.3	33.3	33.3
Extension agents	94.3	92.9	21.3	62.4	58.5	13.9	83.3	83.3	25
Health ext./ clinic	92.3	4.8	91.4	92.8	3.1	91.9	91.7	8.3	91.7
Local admin	49.0	38.5	23.1	24.5	11.8	8.3	66.7	50	33.3

Source: NuME baseline data (2012).

Table 7. ANOVA Results.

Tested mean differences	F-value	p-value	Hypothesis of no mean difference (alpha value=0.05)
Extension contact of male household heads, female household heads and women in married couple households	20.43	0.000	Rejected
Extension contact of men and women in married couple households	40.59	0.000	Rejected
Extension contact of female household heads and women in married couple households	3.26	0.071	Rejected
Extension contact of male household heads and female household heads	0.03	0.868	Do not reject

NB: the null hypothesis is that there is no difference in the mean frequency of extension contact among the different groups tested.

Table 8. QPM knowledge, adoption, dis-adoption and non-adoption across headship profiles

	Male heads (n_1=458)	Women in male headed households (n_3=458)	Female heads (n_2=12)
	%	%	%
Knowledge of protein	32.1	11.0	25
Knowledge of QPM	9.0	3.0	16.7
QPM current adoption	5.9	2.2	8.3
QPM dis-adoption	1.7	0.7	0
QPM non-adoption	94.1	97.8	91.7

Source: NuME baseline data (2012).

Table 9. Description of variables included in estimation.

Variable	Unit/index	Mean	Std. dev.
Age of the husband	Husband's no. of life years	43.72	11.92
Age of the wife	Husband's no. of life years	36.29	9.47
Education of husband	Years of formal schooling completed by husband	2.58	3.31
Education wife	Years of formal schooling completed by wife	0.94	1.52
Household size	Total no. of household members during 2011/12	6.92	2.42
Family labor force	No. of household members in the age group 14-60	3.63	1.68
Land holding	ha	1.92	1.85
No. of oxen	Head count	1.29	0.69
Loan size	Loan taken during 2011/12 in Br	928.90	1556.70
Non-working household Members	No. of household members in the age group below 14 and above 60	3.29	1.82
Region	1= Tigray or Amhara; 0=otherwise	0.39	0.49
Extension contact husband	No. of husband's extension contacts during 2011/12	10.44	15.61
Extension contact wife	No. of wife's extension contacts during 2011/12	5.2	8.55
QPM knowledge of husband	1= husband has knowledge about QPM; 0=otherwise	0.09	0.28
QPM knowledge of wife	1= wife has knowledge about QPM; 0=otherwise	0.03	0.17
Protein knowledge of husband	1= husband has knowledge about protein; 0=otherwise	0.32	0.47
Protein knowledge of wife	1= wife has knowledge about protein; 0=otherwise	0.11	0.31
No. of food shortage months	No. of months of food gap in the household	1.65	2.03

Household crop sales	Income from crop sales (in Br) during 2011/12	4665	13161

Table 10. Binary Logistic regression for knowledge of protein and QPM (2011/12).

Explanatory variable	Estimated coefficient for protein knowledge (Std. errors)		Estimated coefficient for QPM knowledge (Std. errors)	
	Husband	Wife	Husband	Wife
Age of the husband	0.009 (0.01)		0.002 (0.02)	
Age of the wife		0.037 (0.02)*		0.011 (0.04)
Education of husband	0.509 (0.07)***	-0.069 (0.06)	0.173 (0.07)**	0.001 (0.09)
Education wife	0.032 (0.07)	0.312 (0.09)***	0.113 (0.08)	0.113 (0.16)
Household size	-0.016 (0.06)	0.055 (0.07)	0.132 (0.08)*	-0.039 (0.14)
Land holding	0.012 (0.08)	-0.182 (0.114)	-0.034 (0.10)	-0.229 (0.24)
No. of oxen	0.07 (0.24)	0.338 (0.29)	-0.295 (0.34)	-0.128 (0.61)
Loan size	0.000 (0.00)	0.000 (0.00)	-0.000 (0.00)	0.000 (0.00)
Region	-1.103 (0.35)***	-2.001 (0.60)***	-2.853 (1.058)***	-20.0 (4391)
Ext. contact wife		0.031 (0.02)		0.069 (0.03)**
Ext. contact husb.	0.040 (0.02)**		0.052 (0.02)**	
Constant	-2.667 (0.77)***	-4.531 (0.97)***	-3.590 (1.05)***	-3.146 (1.57)**
Log likelihood	-170.362***	-119.30***	-101.38***	-47.390***
N	436		436	438

Note: Statistical significance is given at the 10% (*), 5% (**) and 1% (***) levels.

Table 11. Regression for months of household food gap and crop sales (2011/12).

Explanatory variable	Estimated coefficient for food gap (Std. errors)	Estimated coefficient for crop sales (Std. errors)
Age of the husband	-0.012 (0.01)	-144.4 (122.0)
Education of the head	-0.032 (0.03)	1255.3 (450.4)***
Education wife	-0.031 (0.05)	-569.5 (691.3)
Family labor force	-0.156 (0.08)*	722 (1120)
Land holding	-0.332 (0.13)***	7866 (1684)***
No. of oxen	-0.613 (0.15)***	5461 (1981)***
Loan size	0.000 (0.00)	-0.532 (0.809)
Non-working household members	0.097 (0.05)*	-10.8 (709.6)
Region	-0.598 (0.22)***	-3 (2917)
QPM knowledge of male	0.126 (0.37)	-6515 (4873)
QPM knowledge of female	0.281 (0.58)	1165 (77620)
Constant	2.875 (0.52)***	-766.0 (6904)
R^2	12.9	21
F	5.19***	9.37
N	435	436

Note: Statistical significance is given at the 10% (*), 5% (**) and 1% (***) levels