

CAUSAL MAPPING OF THE GENDER INTEGRATION FRAMEWORK

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Women play a substantial role in agriculture in developing countries. Seventy-nine percent of economically active women in developing countries report agriculture as their primary form of employment (Doss 2010). This includes engagement in self-employment, wage labor, and unpaid family labor. Outside of employment, a significant part of women's engagement in agriculture is to produce crops for their households' consumption. Both men and women may work on subsistence crops, however, women are more likely to control its output and contribute more time to its production and processing (Doss 2001). Women's empowerment in agriculture is essential to achieving Feed the Future's topline objectives of improving nutrition and reducing poverty through inclusive agricultural growth. The Food and Agriculture Organization of the United Nations estimates that if women, who are 43 percent of agricultural labor in developing countries, had the same access to productive resources as men, they could increase yields on their farms by 20–30 percent. This increase could raise total agricultural output in developing countries by 2.5–4 percent and reduce the number of hungry people in the world by 12–17 percent, up to 150 million people (FAO, 2011). When women's productivity and incomes increase, the benefits amplify across families and generations in part because women tend to devote a larger fraction of their resources to their children's health and nutrition.

While women make essential contributions to agriculture in developing countries, they face gender-related constraints and inequalities that systematically put them at a disadvantage in agricultural production compared to men. Women are less likely than men to have access to assets such as land, credit, agricultural tools, technological assistance, important social relationships related to production, and other resources that are essential to agricultural production. Additionally, women are less likely than men to have adequate power or input into household decision-making processes related to aspects of agricultural production, or to be able to satisfactorily engage in household decisions around how to use household income in ways that could potentially improve their agricultural production.

The Feed the Future Gender Integration Framework is a USAID programmatic tool developed to better understand how programs are addressing constraints to women's empowerment in the agricultural sector. It consists of seven dimensions: (1) Production: decision-making power over agricultural production; (2) Resources: access to and decision-making power over productive resources; (3) Income: control over the use of income and expenditures; (4) Leadership: leadership in the community and ability to voice opinions in public; (5) Time: control over one's own time and satisfaction in available time for leisure activities; (6) Human capital: possessing the adequate skill and knowledge of activities that could improve the household's economic situation; and (7) Technology: access to beneficial technologies. These dimensions relate directly to key questions Feed the Future's learning agenda to assess how programming to support agriculture and nutrition influence women's empowerment, poverty, and hunger. The Women's Empowerment in Agriculture Index¹ (WEAI) measures dimensions (1)-(5) to track Feed the Future's progress in empowering women both as a means to improve food security and as a goal in itself.

Women's empowerment in these seven dimensions are believed to be particularly important in contributing to (1) improved economic status of poor households, (2) improved nutrition and health, and (3) increased agricultural productivity at the household level. This paper reviews the latter of the three. It reviews the links between women's empowerment and increased agricultural productivity at the household level.

The next section defines women's empowerment, describes each dimension of empowerment used in the Feed the Future Gender Integration Framework, and explains generally how men and women differ within each dimension. Section 3 reviews empirical literature that uncovers the links between increasing women's empowerment and increased agricultural productivity at the household level. The final section concludes.

DEFINING THE DIMENSIONS OF EMPOWERMENT IN AGRICULTURE

Within the development literature the term 'empowerment' embodies a broad range of concepts and outcomes (see Malhotra et al. (2002) for a review of the literature). There are different definitions of empowerment; however, according to Malhotra et al. (2002) most definitions include the ability to define and act on one's goals, and to be in an environment where one has access to the necessary resources to achieve these goals. The ability to define and act toward one's goals requires having awareness of possibilities, being able to voice one's needs, and having the power to make decisions over one's life.

Gender-based empowerment is different from other forms of empowerment in that it cuts through all dimensions of social life. Gender relations—or the social construction of what it means to be a man or woman—are deeply rooted in the makeup of the social order through laws, institutions, social norms, and practices, and is often experienced as being “natural².” Although gender relations vary across culture and ethnic groups as well as class, in general, its construction often produces micro and macro level structures of gender inequality and gender specific constraints, where women are systematically at a disadvantage compared to men in terms of having the necessary conditions that allow for empowerment.

An important component of empowerment is that individuals are their own agents of change. An individual who exercises her choice with the internalized assumption that she is subordinate to others is not empowered even if she has all the resources she needs to make decisions over her life. In terms of women's empowerment, the empowerment process includes becoming aware of all the possibilities and the ability to exercise one's own choices within an enabling environment. Because individual empowerment is partially an internal process, it is difficult to measure. However, what can more easily be measured are the conditions that allow for the empowerment process to happen. These include being able to make decisions over and having access to economic, political, and social resources, as well as having the necessary knowledge and skills.

The FTF Gender Integration Framework provides the conditions that allow for women's greater empowerment within an agricultural context. While the seven dimensions of empowerment in the FTF Gender Integration Framework are interrelated, each dimension alone is significant to an individual's empowerment in agriculture. Each dimension is described further below.

Production: Decision-making power in agricultural production

Empowerment within this dimension means a farmer is aware of the different possibilities, and has the power within the household to make or influence decisions over best use of the household's productive assets in agricultural production. Specifically it means an individual participates, or can participate, in the decisions around raising livestock; the inputs used in agricultural production; the types of crops produced; and the decision around selling the crops (Alkire et al. 2012). It also means the individual is able to make decisions based on what an individual believes is right, rather than being motivated by fear of going against social norms (Alkire et al. 2012). A woman in a household with no male adult may participate fully in decisions around agricultural production; however, she is not empowered if she is internally constrained as a result of deeply ingrained norms that keep her from making the best decisions around agricultural production (Alkire et al. 2012).

Women and men generally have decision-making power over different aspects of agricultural production in the household. Women are more likely to control the production and output of the subsistence crops for home

consumption, whereas men may have more decision-making power over the production and output of the household's cash crops (Doss 2001). Indeed, in a qualitative study of eight households in Yaxcaba, a village in Yucatán State carried out in August–November 2003, Lope-Alzina (2007) found that women primarily made decisions around the production and selection of crop varieties on the household garden, with the exception of maize grown in the home garden; whereas men primarily made decisions over the milpa fields, or traditional maize fields. To some extent, the typical pattern of women controlling subsistence production and men controlling production for cash arises from because women are more likely (and expected) to be the primary caregivers, a role that commonly includes the maintenance of the home as well as care of members of the family. The decision-making process is complex, however, and decisions are not made independently of the others in the household. They are based on a process of negotiation, knowledge of the others' preferences, gender norms, as well as power dynamics (Lope-Alzina 2007).

Gendered roles, inequalities, and constraints in the social economy typically put women at a disadvantage compared to men in regards to agricultural production. As a result, women often have less overall leverage than men within the household to influence major household decisions in agricultural production. For instance, large export firms may be more likely to contract out with a male household member instead of a female household member of smallholder farms, even though both male and female labor are used in the production of the crop. In Kenya, for example, earlier research suggested that more than 90 percent of export contracts to smallholder farms were made with a male household member (Dolan 1997). As a result men are more likely to control the agricultural decisions and profits.

Men's control of important assets can also result in women's lower engagement in decision-making around production (see for example, Rahman (2008) in reference to Nigeria; Bolwig (2012) in reference to Uganda). In an organic coffee scheme in the Kapchorwa district in Uganda, focus group interviews from 2006 found that women perform 50-90 percent of the production but because land is exclusively property held by men, men make the major management decisions and have exclusive control of the revenue (Bolwig 2012). In rural areas in Nigeria, a small study implemented in 1993 consisting of data from rural households suggests while women are the primary decision makers on the farms they own, farms owned by women are small relative to the family farms (Chikwendu and Arokoyo 1997). The data revealed women in these households perceived that because men primarily controlled the land, the majority of the decisions around agricultural production on the family farms were made by men (Chikwendu and Arokoyo 1997)³.

Resources: Control over, ownership of, or access to resources

Having command over and appropriate ownership rights of key resources such as land, large and small livestock, fish ponds, agricultural equipment, the house, consumer durables, and credit is necessary to be able to act on decisions made about agricultural production (Alkire et al. 2012). A farmer may want to invest in land improvement technologies to increase production, but without adequate land rights and access to credit (or income) she will not be able to do so. Empowerment within this dimension means an individual has sole or joint command over key physical assets to agricultural production, such as land (Alkire et al. 2012). Having command over a physical asset means the individual may have full ownership rights, or in societies where full ownership rights may not apply, the individual can make decisions around the acquisition and disposal of the asset (Alkire et al. 2012). Empowerment within this dimension also means having access to and being able to make decisions around financial resources such as credit (Alkire et al. 2012).

Studies suggest there are substantial gaps between men and women's ownership over important agricultural assets. For instance, women own very little land worldwide, a fundamental asset in agricultural production (see introduction in Allendorf 2007). In addition to land, a gender gap in the ownership of livestock and agricultural equipment exists in many countries. Oladele and Monkhei (2008) find a substantial gap in livestock ownership between men and women in six regions of Botswana. Male farmers own approximately three times more cattle and donkeys, and five times more horses than female farmers (Oladele and Monkhei 2008). In Ghana and

Uganda, respectively, six and 11 percent of adult men own large livestock, versus one and eight percent of adult women (Doss et al. 2012). Similarly, there is a gender gap in ownership of agricultural equipment (see, for instance, Doss et al. 2010 for Ghana, Uganda, Karnataka, India, and Ecuador; Peterman et al. 2010 for a general overview in developing countries).

While women may make decisions around the cultivation of particular crops on land or on the care of livestock that they do not own, ownership rights over these key assets gives individuals greater control and authority over those assets. Scholarship around the differences in access and ownership and their impact on decision-making is in the early stages; however, preliminary research suggests women's ownership of these assets ensures participation in decisions around agricultural production. For example, in a study of women land owners in Ecuador, Ghana, and Karnataka, India, the majority make decisions either individually or with others over what to cultivate, what to sell, and how to use the income earned from the crop (Deere et al. forthcoming). Further, married women who own land individually are more likely to make decisions alone around what to grow, what to sell, and the use of income earned from their crops, than married women who own the land jointly with someone else, suggesting women have greater control over land they own individually (Deere et al. forthcoming)⁴.

Income: Engagement in decisions around the use of household income

Influence over the use of household income is another important condition of empowerment. It allows one to benefit from her work and make choices over expenditures. It means an individual can participate in the decisions around the expenditure of the income generated from food crops, cash crops, livestock production, non-farm activities, wage and salary work, and fish production as well as decide whether she would like to engage in salary or wage employment (Alkire et al. 2012).

Women tend to have less access to and control over income than men. This is in part because gender norms generally encourage men to work for an income and women to care for the family and maintain the home. A qualitative study of 20 diverse countries around the world found that in all 20 countries people believed a man's central role in the household is to earn an income and provide for the family, while a woman's central role is to provide care for the family (Boudet, Petesch, and Turk 2012)⁵. As a result of these norms, women are more likely than men to spend time in unpaid labor in subsistence crop production and chores for the maintenance of household and its members. Additionally, women often contribute more time to unpaid family labor to the household's cash crops to which men often control the output (FAO-IFAD-ILO 2010).

When women do earn an income, they are more likely than men to occupy the lowest paying and least secure positions in formal and informal labor in agriculture (FAO-IFAD-ILO 2010). Additionally, as smallholder producers, women may face greater constraints in the market. This was exemplified in studies by Adesina and Djato (1997) and Alene et al. (2008) who found that women receive a lower price for their produce than men in Cote d'Ivoire and Western Kenya, respectively.

Leadership: Strong social relations outside the household and involvement in leadership positions in the community

Strong social relations, community participation, and leadership are essential to empowerment in agriculture in developing countries. Participation in the community allows for greater likelihood of access to information about the newest technologies in agriculture, latest prices the market, and connections that may help increase production and/or marketability. Social inclusion can provide individuals with potential financial support or credit for agricultural investments, as well as an important form of insurance or protection against loss in the event of crop damage or failure.

Since men and women have different roles in society and, thus, may have different preferences (see for example Chattopadhyay and Duflo (2004) on men and women's preferences in community investments in

West Bengal and Rajasthan, India), increasing women's participation in leadership positions is key to having their preferences become a reality. As a community leader, an individual is able to voice their concerns and influence decisions regarding the use and management of community's resources⁶. In general, women are less likely than men to be involved in leadership positions at the community level and national level, around the world (Sweetman 2000). In reference to community leadership positions in rural Ghana, Opare (2005) argues that women's lower participation rates is partly due to women having less confidence in their leadership abilities than men, due to cultural expectations and taboos as well as being constrained by what society deems is appropriate for women. Women are less able than men to be mobile due to social norms as well as greater vulnerability to violence. Women are perceived to be much more likely to face problems of safety in public areas than men especially after dark: "A man can travel alone at night, but not a woman because of safety issues" (focus group participant in Lautoka, Fiji, in Boudet, Petesch, and Turk (2012)). Additionally, there are often time conflicts in having to maintain women's expected household responsibilities. Further, leadership positions often require communication with donors and keeping books. Women are less likely than men to have gained the necessary literacy skills for these specific activities (Opare 2005).

Time: Workload and leisure

The balance of time between leisure and productive and domestic tasks (including any community leadership or participation), as well as the intensity of one's work in terms of juggling simultaneous activities, affects an individual's well-being (Alkire et al. 2012). Adequate time for rest and relaxation allows one to be able to enjoy the benefits of her work in agricultural production. Empowerment in this dimension means that a person is able to choose a workload she does not deem to be excessive and is satisfied with the time available for leisure and non-work activities⁷. It also means that one is satisfied with the time she has available for leisure activities.

Time poverty is defined by not having adequate time for rest and relaxation. Women are more likely to have greater overall time poverty than men. Bardasi and Wodon (2005), for instance, measure the time poverty rate between men and women in Guinea for 2002-2003 and find that women worked approximately 10 more hours per week than men on average, approximately 24% of women experienced time poverty compared to 10% of men, and women's time poverty rates are greater in rural areas than in urban areas (Bardasi and Wodon 2006). Although it varies by age, in general, women's greater role in the household's unpaid labor compared to men is a driver of women's greater time poverty than men. In Kenya, for instance, women allocate ten times more time to gathering water and firewood than men (UNDP 1995). In Mozambique, women spend about 15 hours a week collecting water and about 17.5 hours in Senegal (UNDP 1995). Women are also more likely to spend more time than men on subsistence crop production and in unpaid family labor on cash crops.

Women's greater role in the household's unpaid domestic work for their families' maintenance and subsistence compared to men also results in higher levels of stress from juggling multiple tasks at once. Floro (1995) argues that high levels of work-related stress from having to multitask is especially common for women in poor households, who may not have access to resources that would allow them to purchase market substitutes in order to reduce work time.

Human Capital: Having adequate skill and knowledge of activities that could improve economic situation

Human capital is important for empowerment in that it allows a person to have greater access to labor opportunities. It also allows an individual to be better able to process information that could be economically profitable or socially beneficial. In the context of agriculture, it means having the skills and knowledge needed to maximize the use of productive assets, as well as to be able to use information about new technologies; this includes having at least a basic education as well as having access to skills and knowledge transmitted through extension services and agricultural training programs.

Extension services are an important vehicle for human capacity development in agriculture and yet women often are less likely than men to have access to or to use extension services (see Peterman, Behrman, and Quisumbing (2010) for a review of empirical literature; Doss 2001). Gilbert, Sakala, and Benson (2013), for example, found that while female farmers make up nearly 70 percent of the full-time farmers in Malawi, only one-fifth of the 1385 extension service sites nationwide included female farmers during the 1998-1999 season.

One reason for women's limited access to extension services is that extension workers are often men. In some countries, this may limit women farmers' access due to cultural or religious norms (see for example, discussions from Ofuoku (2011) on Nigeria; Budak, Darcan, and Kantar (2005) on Turkey; Due, Magayane, and Temu (1997) on Tanzania). One study in Taurus Mountain villages in the Southern Mediterranean region of Turkey found that 45 percent of women surveyed about small ruminant production preferred meeting with female extension workers because of cultural norms against meeting with the opposite sex (Budak, Darcan, and Kantar 2005). Due, Magayane, and Temu (1997) found a similar result in Tanzania.

There is also evidence that extension services are the least likely to reach the poorest farmers and many of the poorest farmers are women (Doss 2001). Further, women are more likely than men to have lower educational attainment, and lower levels of education and illiteracy makes information in extension services less accessible (Doss 2001).

Technology: Having access to beneficial technologies

The use of agricultural technologies can improve economic productivity and/or reduce time spent needed in agriculture production, processing, and transporting. Beneficial technologies include improvements to the land or soil; new water management practices; the use of new crop varieties that either produce higher yields, are more resilient, or have greater nutritional content; and more efficient harvesting methods (Feed the Future Indicator Handbook: Definition Sheets April 2012). It also includes technologies that improve processing and handling.

Depending on the type of technology, the use of new technologies may have unintentional costs by increasing labor time in some tasks. Because men and women often have different tasks in agricultural production, changes in labor intensity may have gendered consequences. For instance, according to Mikalitsa (2010) a small field study of households in Busia and Vihiga districts in Kenya found that the introduction of new weeding technologies and the use of High Yielding seed Varieties (HYV), fertilizers, and mechanization increased the intensiveness of farm operations. This resulted in increased the labor time in crop production for more women than men (Mikalitsa 2010). Similarly, a study by Lai et al. (2012) found that the adoption of conservation agricultural practices in Kendujhar in the state of Odisha, India, increased sustainability and agricultural yields compared to the traditional agricultural methods used by the control group. However, two of the three practices increased the labor time needed in activities typically done by women, and one of the three practices increased the labor time needed in activities typically done by men. The most beneficial technologies improve economic productivity without increasing women's or men's time burden.

In a review of empirical literature concerning differences in the access and use of agriculture inputs between men and women, Peterman, Behrman, and Quisumbing (2010) find that men and women have similar propensities to use these beneficial technologies, but women are less likely to have access to them compared to men. For instance, a study of soybean cultivation in Nigeria, Sanginga et al. (1999) found that women cultivators are significantly less likely than male cultivators to adopt improved soybean varieties. The authors argue that it is due to the fact that men are more likely to have greater access to information and extension services than women (Sanginga et al. 1999). Other authors argue that women farmers are less likely to adopt beneficial technologies than male farmers because women are less likely to own or securely hold complimentary assets, such as land (see for example Doss and Morris (2000) in Ghana; Adesina (2001) in southwest Cameroon).

In summary, women face gender-related constraints and inequalities within each of these seven dimensions that systematically put them at a disadvantage in agricultural production compared to men.

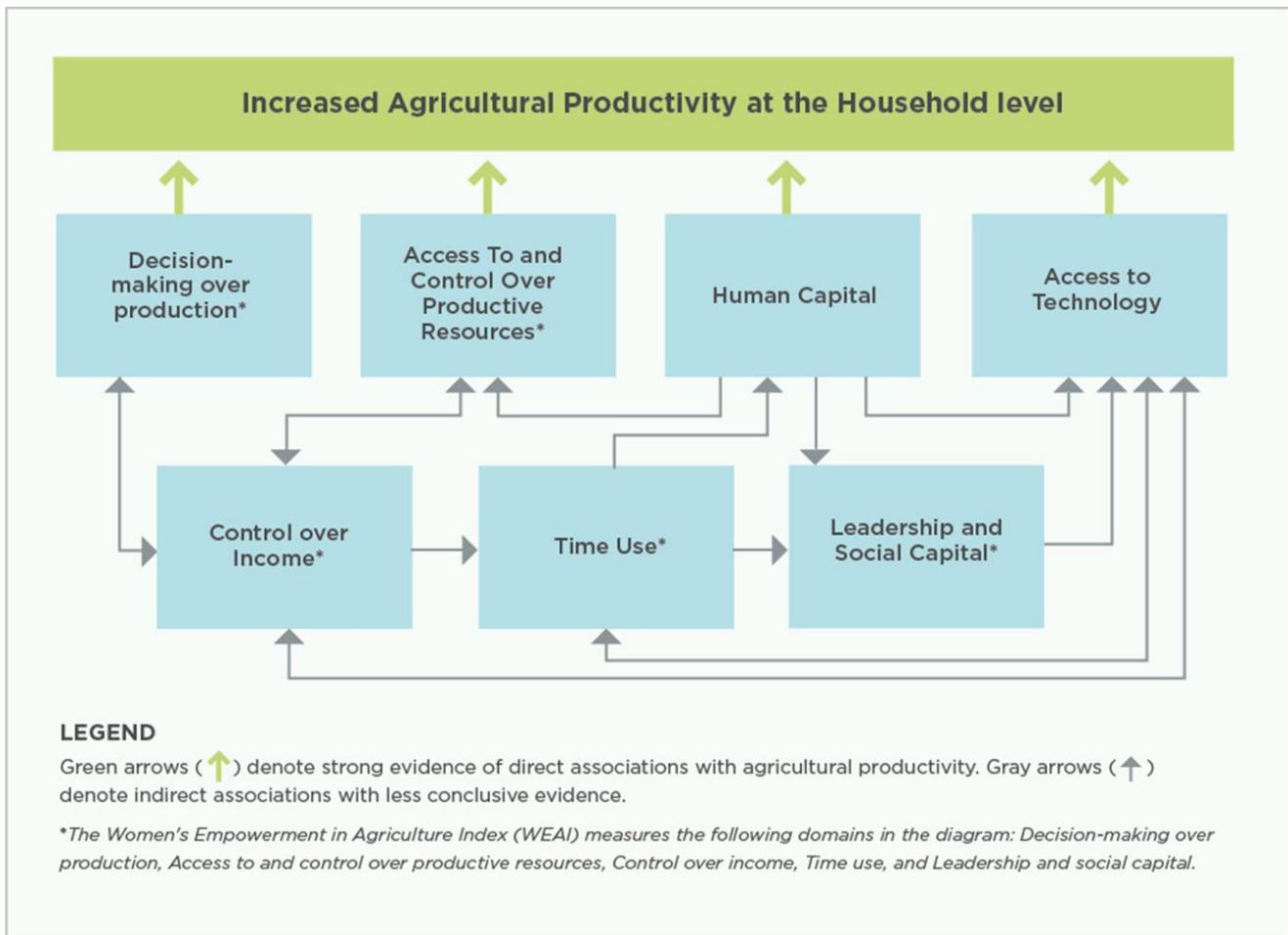
WOMEN'S EMPOWERMENT AND HOUSEHOLD AGRICULTURAL PRODUCTIVITY

Increasing women's empowerment through the seven dimensions of gender integration in Feed the Future programming is hypothesized to contribute to increased agricultural productivity. Many studies find that in low income rural households, women have lower agricultural productivity than men; however, the differences in output are accounted for by differences in access and control over inputs such as the factors of production, access to technologies, and access to appropriate skills and knowledge in agricultural production. That is, if women had similar access to assets, improved technologies, and knowledge around agricultural production (resources, human capital, and technology dimensions), women could achieve similar levels of agricultural productivity, which in turn could increase household agricultural productivity. For example, in reference to the study in Malawi, Kilic, Palacios-Lopez, and Goldstein (2013, 4) state that "...ensuring that female plot managers have similar years of schooling and apply similar levels of non-labor agricultural inputs, including inorganic fertilizer, pesticides/herbicides, and improved and/or export crop varieties could reduce the mean gender gap [in agricultural productivity] by 50 percent." On average, this is equivalent to increasing household agricultural productivity in Malawi by more than 7,000 MK per hectare (46 USD per hectare) per agricultural season⁸.

This section reviews the literature that links women's greater empowerment within the seven dimensions of the Feed the Future framework to greater household agricultural productivity. First, literature that links women's greater decision-making in production, access to resources, access to improved technologies, and access to knowledge around agricultural production (production, resources, technology, and human capital dimensions) to greater household agricultural productivity is reviewed. This is followed by a discussion of how the other three dimensions (income, leadership, and time dimensions) contribute to increased agricultural productivity through their association with the other four dimensions. Figure 1 maps the broader relationships between the seven dimensions and agricultural productivity.

Figure 1: Linkages between Domains of Women’s Empowerment and Agricultural Productivity

The literature reviewed only includes scholarly articles from 1970 to the present and from agriculture and socioeconomic journals that incorporate gender as part of its analysis. Only empirical studies that contain gender-disaggregated household, individual level, or plot-level data and use econometric methods in their analysis are included in the review. This means that this review does not include articles that only contain descriptive statistics or that use aggregate household data. The empirical literature that explores agricultural productivity within this context primarily bases its analyses (implicitly or explicitly) on a basic production function, where output is a function of capital (or assets) and (human capital-adjusted) labor. Consequently, the literature around decision-making within agricultural production (production dimension) is sparse, and there are no studies within this literature that empirically link women’s increased engagement in household decisions around the use of household income (income dimension); women’s greater social relations outside the household and greater involvement in leadership positions in the community (leadership dimension); and



women’s greater control over their use of time (time dimension) to greater agricultural productivity at the household level. However, these dimensions are interconnected with the other empowerment dimensions, and because of these links, these dimensions also potentially contribute to increased agricultural productivity at the household level.

Production: Decision-making power in agricultural production

Studies that explore differences in men and women's productivity, controlling for different inputs (i.e. resources, improved technologies, and labor), implicitly assume that the farm manager or household head is the primary decision-maker in the production of crops. That is, the farmer has some power and autonomy to make decisions over the best use of her own productive resources and improved technologies. Indeed, empirical evidence suggests command over resources and greater decision-making power (production dimension) are interlinked. Members of the household may have different preferences in how to allocate assets, thus the individual(s) who has ownership and control over the household's resources shapes the households' outcomes (see, for example, Fafchamps, Kebede, and Quisumbing 2009; Brown 2009; Doss 2006; Quisumbing and Maluccio's 2003)⁹. In this same way, the individual(s) in the household who has command over productive agricultural assets (resources and improved technologies) through ownership or usage rights will influence the household's activities in agricultural production.

Many of these studies do not take into account that decisions are often made with others or are influenced by others in the household. In thinking about intra-household dynamics, women's increased decision-making power relative to men within a household over the use of productive resources and improved technologies in agricultural production could potentially increase agricultural productivity by improving the allocative efficiency of household assets¹⁰. For instance, two studies found that households engaged in agriculture may not allocate resources for production efficiently across male and female managed plots (Udry et al. 1995; Udry 1996). After controlling for household, plot, crop, and year for 150 households in six villages using a four year panel collected by International Crops Research Institute for the Semi-Arid topics, Udry et al. (1995) and Udry (1996) found that female-managed plots yielded less than male-managed plots in Burkina Faso within the same households, and that by reallocating some of the inputs used in male-managed plots to female-managed plots within the same household, production on the female-manage plots would increase more than production of the male-managed plots would decrease. This suggests that increasing women's decision-making power within these households over the use of the households' agricultural assets could increase the households' productivity. More generally, more equal decision-making power between men and women within the household could ensure household resources are used more efficiently.

As mentioned above, there is little empirical literature in economics and agriculture that directly links women's decision-making power in agriculture with household agricultural productivity. However, one paper, by Bozoğlu and Ceyhan (2007), did find an association. Using data from vegetable farms in Turkey, Bozoğlu and Ceyhan (2007) found that women's participation in the productive activities and women's participation in the decision making process around agriculture within the household decreases technological inefficiencies in production on the household's plots and, thus, could potentially increase agricultural productivity¹¹. Unfortunately, a single variable was used to capture both women's participation in the production activities and women's participation in the decision making process. Thus, it is not possible to know how much women's participation in the decision making process around agriculture contributes to decreasing technological inefficiencies. However, the authors controlled for labor input in their production function, so women's production activities may also implicitly capture women's decision making on these plots. Either way, the study suggests that women's increased decision-making power was associated with greater technological efficiency within these particular households.

Resources: Control over, ownership of, or access to resources

Many studies in agricultural economics that explore the relationship between gender and agricultural productivity suggest there are mean productivity differences between men and women farmers. However, in a review of studies from the 1970s through the early 1990s, Quisumbing (1996) concluded that given differences in access to physical assets (resources and improved technologies) and differences in knowledge of agricultural production, women farmers are as technically efficient as men. This suggests that if women had similar access to resources and improved technologies, as well as similar levels of human capital as men, they

could achieve similar levels of agricultural productivity, which in turn would increase household agricultural productivity¹².

Because of data limitations, most studies look at the differences in men and women's agricultural productivity based on the gender of headship, rather than the gender of the farm manager (see, for example, Holden et al. 2001 for Ethiopia; Chavas et al. 2005 for Gambia; Thapa 2008 for Nepal; Aly and Shields 2010 for Nepal; Horrell and Krishnan 2007 for Zimbabwe; Alene et al. for Kenya; Peterman et al. 2011 for Nigeria; wa Githinji et al. 2011 for Kenya; Nosiru and Rajji 2012 for Nigeria; Kassie et al. 2009 for Ethiopia). Several of these studies find no significant difference in the productivity of male-headed households and female-headed households once differences in access to resources, improved technologies, and human capital are controlled for, but the overall findings in the literature are inconclusive (see discussion in Peterman et al. 2011). One problem with basing conclusions off the differences in the gender of the household head is that definitions of female-headed household differ across studies (Doss 2001). Some studies include women whose partner has migrated in the category as a female heads and others do not. Additionally, the gender of the household head may say more about the household composition than differences in gender. Male-headed households often include a female partner, whereas female headed households usually do not include the male partner. As a result, female headed households are generally smaller (Doss 2001). Further, looking only at the gender of the head of household ignores gender differences and dynamics within the household.

Only a handful of studies since Quisumbing's (1996) review of the literature look at the gender difference in technical efficiency in agricultural production based off the farm manager, as opposed to gender of the head of household (Adesina and Djato 1997; Quisumbing et al. 2001; Kilic, Palacios-Lopez, and Goldstein 2013; Gilbert, Sakala, and Benson 2013; Oladeebo and Fajuyigbe 2007; Timothy and Adeoti 2006; Kinkingninhoun-Médagbé et al. 2010; Ragasa et al. 2012; Peterman et al. 2011 for Uganda)¹³. On the whole, these studies make similar conclusions as Quisumbing (1996). There are differences in productivity between male and female farmers; however, the difference is generally accounted for by differences in inputs (including resources, improved technologies, and human capital) and other gender-related constraints. For example, Adesina and Djato (1997), using a normalized profit function, found that female rice farmers, although they produce less than male rice farmers, were as technically efficient as male farmers in Cote d'Ivoire when controlling for land, fertilizer use, cost of seeds, insecticides, herbicides, draught animals, machinery, access to education, and years of experience in rice farming. In Ghana, Quisumbing et al. (2001) found that women produced similar yields of cocoa on 391 cocoa plots in households with more than one mature cocoa parcel when differences in land rights, land quality, and household characteristics were taken into account.

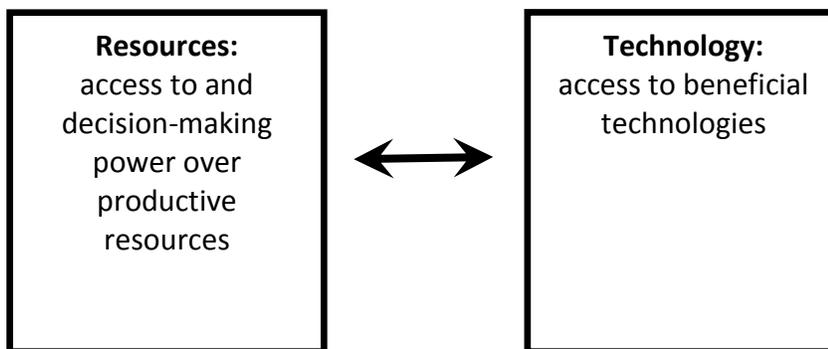
Kilic, Palacios-Lopez, and Goldstein (2013) estimate that the average difference in productivity between male and female farmers in Malawi is about 25 percent. Using decomposition econometric methods, the authors find that the majority of this gap in productivity is explained by differences in resources and technologies. Likewise, Gilbert, Sakala, and Benson (2013), found no gender differences in crop yield in Malawi once differences in inputs were taken into account. Using a Stochastic Frontier Approach to measure technical inefficiency of farm production, Oladeebo and Fajuyigbe (2007) found that women rice farmers in Osun State, Nigeria, were slightly more efficient than men once inputs were controlled for. Similarly, Timothy and Adeoti (2006) found female cassava farmers are slightly more technically efficient than male cassava farmers in Ondo and Ogun, Nigeria once inputs are controlled for but less allocatively efficient. The authors argue that women face greater constraints in market than men which keep them from being able to access the levels of inputs needed to be more allocatively efficient. Kinkingninhoun-Médagbé et al. (2010) found that there were differences in productivity of male and female rice farmers in Benin, but they attributed these to differences in access to social capital, differences in land holdings, and differences in non-land resources. Likewise, Ragasa et al. (2012) found that while there was a significant difference in crop productivity between male and female farmers in Ethiopia, female plot managers would have been as productive as male plot managers if they had equal access to improved technologies and services as well as other inputs.

In contrast, Peterman et al. (2011) found that female farmers were less productive than their male counterparts even when controlling for resources (as well as improved technologies and human capital) in Uganda. The authors were able to control for the bio-characteristics of land in addition of variables describing plot characteristics such as the distance to an all-weather road and access to water by plot (less than two percent of the plots are irrigated), as well as investments made on the plot prior to the crop season. Soil samples were obtained from each plot and lab analysis to determine the soils' biophysical qualities and stock soil nutrients of nitrogen (N), phosphorus (P), and potassium (K) were computed using a method by Foster (1971 in Nkonya 2008). Few studies are able to control land quality to this extent. However, the authors were not able to control for market-based discrimination, and differences in access to information about agriculture, which may account for at least some of the difference in productivity between men and women farmers. It may also be that differences in the crops' end use, which tends to differ by gender, could account for some of the observed difference in productivity. Agricultural households are both producers and consumers of agricultural goods. If the crop is for household consumption, the choice of crop variety may be based on its processing qualities and taste. On the other hand, a crop produced for sale, is more likely to be produced with the intention of maximizing profits, where the primary objective is increasing productivity while minimizing inputs. Women are more likely to produce the crops for household consumption, and thus may be less willing to make changes in inputs that would increase productivity at the loss of the crops' important consumption qualities (Doss 2001).

Technology: Having access to beneficial technologies

Many of the studies on gender differences in productivity discussed in the resources dimension include the use of beneficial technologies in their analysis. For instance, Kinkinginhoun-Medagbe et al. (2010) found that rice yield was positively significantly associated with fertilizer use in Benin controlling for other inputs (such as land and human capital) and explained a part of the gap in gender productivity. Reducing this gap would likely improve women's productivity. Similarly, Kilic, Palacios-Lopez, and Goldstein (2013) find that a substantial difference in productivity between male and female farmers in Malawi is due to differences in use of inorganic fertilizer, pesticides, herbicides, and improved crop varieties. Gilbert, Sakala, and Benson (2013) also found that maize yields on men's plots were higher than women's in Malawi, but this was largely due to differences in fertilizer use. Goldstein and Udry (2008) found that women were as efficient as men in the production of maize and cassava in Ghana but that women produced lower yields and earned lower profits than men because they could not maintain the fertility of their land. These studies suggest that women's greater access to beneficial technologies could increase agricultural productivity at the household level.

Using improved technologies, such as fertilizer, pesticides, herbicides, and improved crop varieties, goes hand-in-hand with having access to other complementary inputs in agriculture. In particular, having access to



major assets (resources dimension), such as land, is positively correlated with having access to technological inputs. For instance, Doss and Morris (2000) found that although male farmers were more likely to adopt modern seed varieties of maize and inorganic fertilizer than female farmers in Ghana, once access to

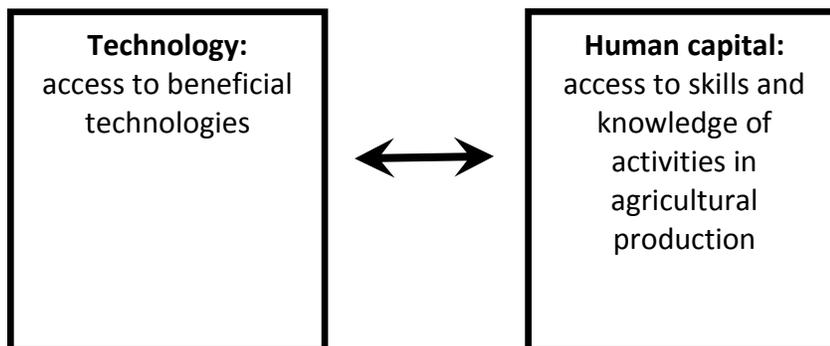
complementary assets such as land, education, and labor were controlled for, there was no difference in the adoption rates.

Human Capital: Having adequate skill and knowledge of activities that could improve economic situation

The studies on gender differences in productivity discussed in the resources dimension also control for human capital. Some find that increased skills and knowledge of agricultural production could result in increased farmer productivity. For instance in Nigeria (Osun State), Oladeebo and Fajuyigbe (2007) found that the level of a farmers education was positively associated with his/her technical efficiency. Likewise, Rahman (2010), in her analysis of women's labor on farms in Bangladesh, found that both male and female education had a significant positive impact on improving technical efficiency. In contrast, an overview of studies that did not explicitly focus on gender, suggest an inconclusive relationship between the education of the farmer and farm productivity (see discussion in Rahman 2010). The apparent contradictory findings may be partially explained by the extent to which the agriculture sector in the study country is modernized. A modernized agricultural sector is more likely to have technological inputs, where additional education may be needed. The same level of education may not be as beneficial in sectors practicing traditional agriculture (Asadullah and Rahman 2009).

Besides general education, access to extension services and training programs may positively impact agricultural production. The adoption of improved technologies is often influenced by access to technological information through extension programs. For instance, Doss and Morris (2000) found that differences in access to extension services (and access to other inputs) resulted in gender differences in the adoption of beneficial technologies on maize plots in Ghana. Information about farming practices and new technologies may not be fully shared within the household. As such, ensuring women's equal access to agricultural training and extension services in addition to improved access to beneficial technologies could have a positive impact on agricultural production at the household level. Increased access to beneficial technologies may also be advantageous in other ways that may positively impact a household's well-being, such as through more efficient processing or a reduction in required work time.

Although it is not the focus of this paper, the linkage between nutrition and agricultural productivity is worth noting. Literature in economic development has long contended that improved nutrition can ensure better health (which is part of a broader definition of human capital), and as a result increase overall labor productivity. Because the causality could go either way—better health increases productivity and greater productivity allows for greater investments in health—the direct causation between nutrition and productivity is difficult to empirically measure (see Strauss and Thomas 1997; also see Strauss and Thomas 1995 for a discussion of other empirical challenges). Nonetheless, the empirical literature suggests that like women's empowerment as defined by the Feed the Future (FTF) Gender Integration Framework, improved nutrition and health in the long term is an essential pathway to greater agricultural productivity at the household level (see,



for example, Deolalikar 1988; Strauss 1986; Haddad and Bouis 1991).

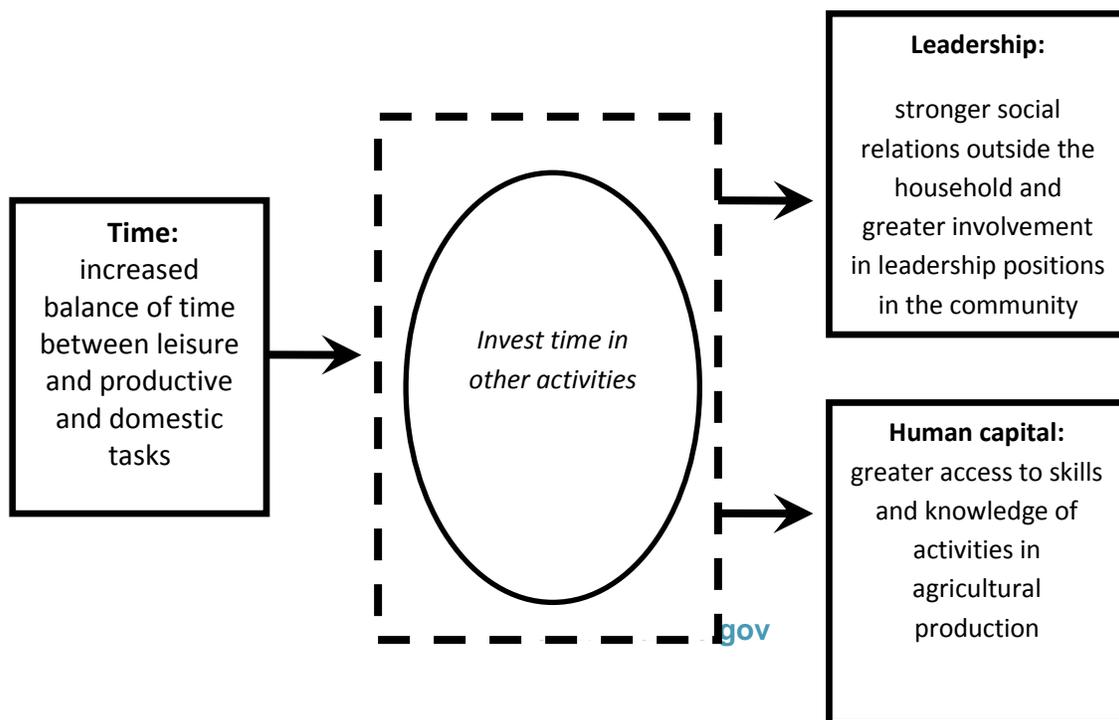
The other three empowerment dimensions: Income, Leadership, and Time

There are not any studies within this literature that directly link women's increased engagement in household decisions around the use of household income (income dimension), women's greater social relations outside the household and involvement in leadership positions in the community (leadership dimension), and women's greater control over their time (time dimension) to agricultural productivity. Broadly, there are indirect links from these three dimensions to greater agricultural production through their interconnections with the other dimensions (production, resources, human capital, and technology dimensions). For instance, women's greater engagement in household decisions around the use of household income allows for women to have the potential for greater influence over the investment of productive assets (resource and technology dimensions), which, as discussed above, could improve agriculture productivity.

Women's increased access to income relative to men (through greater earning potential) could link to agricultural productivity through improving women's bargaining position in the household, and thus influence women's decision-making power within the household over agricultural production (production dimension). This, in turn, could improve the allocative efficiency of agricultural inputs in the household and, thus, improve agricultural productivity within the household. Women's greater access to income (the income dimension) could also allow women to invest in time-saving household technologies, which could reduce women's time spent on domestic chores.

Likewise, women's stronger social relations outside the household and involvement in leadership positions in the community could improve agricultural productivity. Stronger relationships and social positions allow for the potential of greater access to markets and information about agricultural production including extension services (human capital dimension). Greater participation and 'voice' in community groups (the leadership dimension) may influence availability of community resources (e.g. improved access to water) that are important to agricultural production and that could improve agricultural productivity (resource and technology dimensions).

Similarly, being less burdened by work and having greater control over one's own time could allow women the time needed to improve their skills in agricultural production (human capital dimension) as well as the time needed to invest in social organizations and leadership positions (leadership dimension). As discussed in the



studies above, greater human capital could potentially contribute to improved agricultural efficiency and, thus, productivity at the household-level, all else being equal.

CONCLUSION

In summary, although there are nuances, the empirical literature from agricultural economic and socioeconomic journals that incorporate gender as part of its analysis provides an evidence-based foundation for the FTF Gender Integration Framework. The literature suggests that empowering women by increasing their control over decisions in agriculture (production dimension) and by increasing their access over the resources needed for agricultural production (resources, human capital, and technology dimensions), has the potential to greatly increase household agricultural productivity. Although the literature does not directly link the income, leadership, and time dimensions to increased agricultural productivity, these dimensions support the other dimensions, especially human capital, to contribute to agricultural productivity.

Increasing agricultural productivity at the household level is not the only benefit to increasing women's empowerment through the seven dimensions of gender integration in Feed the Future programming. Empirical evidence suggests women's greater control over income (the income dimension) and assets (the resource dimension) positively influences children's' health, nutritional, and educational outcomes. Similarly, greater social capital and participation in leadership roles (the leadership domain) has positive impacts on the household's well-being. A review of these studies is forthcoming.

Notes

¹ The Women's Empowerment in Agriculture Index (WEAI) was developed jointly by United States Agency for International Development, International Food Policy Research Institute, and Oxford Poverty and Human Development Initiative. All Feed the Future countries have conducted initial data to measure the WEAI.

² Gender is defined by scholars from differing disciplines in different ways. However, at a basic level, the term gender suggests the social construction of male and female, dividing society into two elementary categorical constructions: men and women. As social rather than natural or biologically determined constructs, gender dimensions within society change as well as differ across culture, race, and class (Jackson and Scott 2002). Gender is different from sex in that the term 'sex' refers only to the biological differences of men and women.

³ The decisions in this study are around what to cultivate and what inputs to use in production.

⁴ A study that compares decision-making over agricultural production of women land owners in non-land owners in India is forthcoming.

⁵ The countries are Afghanistan, Bhutan, Burkina Faso, Dominican Republic, Fiji, India, Indonesia, Liberia, Moldova, Papua, New Guinea, Peru, Poland, Serbia, South Africa, Sudan, Tanzania, Togo, Vietnam, West Bank and Gaza, and Yemen.

⁶ Being comfortable with speaking in public is used as a measure of individual-level leadership in the WEAI as it is an indication of an individual's empowerment in being able to voice his or her values to the community.

⁷ Individuals in wealthy households may choose to work long hours, but their reasons for working long hours differ from those individuals in low-income households, who are more likely to work long hours out of necessity. 'Choice' in this context captures the difference between an individual who does not need to work long hours but chooses to do so and an individual who works long hours out of necessity.

⁸ MK150 = US\$1 for the period the data was collected.

⁹ For instance, Quisumbing and Maluccio's (2003) study of Bangladesh, Ethiopia, Indonesia, and South Africa find that the relative level of assets brought into marriage by men and women is correlated with decisions made over expenditure shares of food, education, health, children's clothing, alcohol, tobacco, and the educational attainment of the children in the household.

¹⁰ Allocative efficiency in this context means that a household is maximizing its agricultural output across plots given all its possible input combinations.

¹¹ Technological inefficiency means that the household is not maximizing its agricultural output given its level of agricultural inputs.

¹² This assumes all other inputs, such as labor contribution, do not change.

¹³ Only two studies that estimate technical efficiency reviewed in Quisumbing (1996) estimate differences in productivity based on the sex of the farmer. These studies are Mook (1976) and Saito, Mekonnen, and Spurling (1994). The others estimated gender differences in productivity based on the sex of the head of household. In my search, I did not find papers on gender productivity and agricultural productivity prior to the 1970s.

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