Women Empowerment in Agriculture and Children Nutritional Outcomes in Rural Burkina Faso

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Women Empowerment in Agriculture and Children Nutritional Outcomes in Rural Burkina Faso

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Abstract

Women play a great role in agriculture activities as they are producer of the major part of food crop in developing countries and empowering them enable household nutrition. This study aims to assess the effect of women's empowerment in agriculture on the nutritional status of children, particularly in rural Burkina Faso. Based on data from the 2014 Multisectoral Continuous Survey (EMC), the study uses variables such as sales income control, access to land, autonomy in production decisions, access to credit and the level of education of women as empowerment measures. For the robustness check, the study adopts a dual measurement approach that first uses the variables of empowerment to identify their isolated effects and builds a composite index of empowerment in a second time. The estimation technique addresses different possibilities for the identification of parameters and the results indicate that women's empowerment has a beneficial effect on children's nutrition.

Keywords: *women; empowerment; Agriculture; children's nutrition; household*
JEL Codes : *D13 ; I12 ; Q12*

1. Introduction

Policies aimed women status improving and inequalities reduction hope to improve not only the women well-being but also that of their children. Because women are caring for children, they have a great responsibility and role in their nutritional status (Malapit & Quisumbing, 2014). As a result, they make up almost two-thirds of the agricultural workforce and produce most of Africa's food. However, studies have shown that women hold about 2% of the world's land or that they own 15% of the land in sub-Saharan Africa (Doss et al., 2013). These figures show that women still have unequal access to land compared to men. This is a handicap for them, especially in areas where agriculture is the main activity. As they are not often owners of agricultural lands, women in agricultural production areas are limited in their production decisions. In such a context, the land has a cultural, religious and legal significance. Because there is strong correlation in many societies between decision-making power of an individual and the quantity and quality of property rights held by the individual (FAO, 2002).

Women's lack of power over land indirectly leads to loss of resources in land use. Ultimately, a better integration of women in agriculture could have beneficial effects on food availability and thus improve nutrition at the household level. Historically, land is considered as the primary source of wealth, social status and power. It is the basis of protection, nutrition and economic activities and is the most important source of employment opportunities in rural areas and an increasingly scarce resource in urban areas (FAO, 2002). Investment in agriculture is generally seen as an important opportunity to reduce malnutrition (Webb, 2013). According to Doss (2011), there is evidence that if women held land in the same proportions as men, they would do as much as they did in terms of production. But they often do not have access to essential inputs such as land, credit, fertilizer, new technologies, and other resources or equitably. As a result, they are limited in agricultural production, which reduces the nutritional availability for the family.

According to Herforth et al., (2012), the burden of malnutrition is threefold. The first is the lack of energy and protein in the diet leading to starvation, reduced learning abilities, illnesses and premature death. The second aspect is micronutrient deficiency causing deficits, physical and cognitive impairments, anemia, blindness and poor resistance to various health risks. Finally, the last aspect is energy excess in diets causing overweight, obesity and chronic diseases. For these authors, malnutrition

continues to be an important aspect of public health problems and a major contributor to the reduction of economic growth, poverty differentials and the explanation of high rates of morbidity and mortality in developing countries.

Studies have shown that reducing gender inequality is a significant step forward in addressing the famine problem and shows that the status of women significantly affects children's nutrition (Njuki et al., 2016). The reason is that women with better decision-making status are more likely to eat better themselves and thus take better care of their children by subjecting them to a higher quality diet. The empowerment of women and especially their empowerment in agricultural activities is therefore a lever of action to target reduction of child malnutrition problems. Thus, for Bold et al., (2013), women's empowerment is considered crucial for improving nutritional outcomes. For these authors, studies using direct and indirect measures of women's empowerment have largely demonstrated the importance of the link between women's empowerment dimensions and their own nutrition and that of their children.

The issue of good nutrition is related to others such as the household poverty status and decision-making issues. In the case of poverty, what is primarily involved is the level of household income. In rural areas specifically, the main source of income remains agricultural activities. As such, it is a question of examining how farm income can affect the nutritional status of the household and especially that of children. But considering income alone is not enough to grasp the complexity of the problem since one can have a large income and misuse it. And that's where the issue of decision-making comes in. By following Becker's (1981) analysis, women are more willing to use part of their time to care for children because of the reproductive function that gives women the burden of childbirth. They are therefore better able to provide adequate care for children. It appears that if women control, or failing that, are involved in household decision-making, the nutritional status of children would certainly improve. Studies have shown that an improvement in the decision-making power of women is accompanied by more favorable allocation of household resources to the benefit of children (Smith et al., 2003, Seebens, 2011, Nordman & Sharma, 2016). Pandey et al., (2016) report that women's empowerment and dietary knowledge play a crucial role in establishing the relationship between agriculture and nutritional status. The analysis of children's nutrition is then linked to the simultaneous consideration of the level of income and the distribution of decision-making powers in the household. In the case of this work, we are specifically interested in rural households. In this sense, we consider the inclusion of women in agricultural activities through their level of autonomy in the management of agricultural activities and the food crops productivity.

The objective of this study is to assess the impact of women's empowerment in agriculture on the nutritional status of children, particularly in rural areas in Burkina Faso. Specifically, the first step is to construct an empowerment index in terms of women's capacity as decision making unit in agricultural activities and to assess the effect of this index on children's nutrition in a second time. As a result, we assume that better involvement of women in agricultural production decision-making will improve the nutritional status of children. The desirability of this study is justified by

the dynamics of malnutrition among children in Burkina Faso. Half of the Burkinabe population lives in extreme poverty and has limited access to basic services and health care. Structural food insecurity is exacerbated by high food prices and the recurrent indebtedness of the most vulnerable families. Despite good harvests in 2014, nearly half of households fail to meet their cereal needs in 2015. According to the government, some 939,000 people are affected by food insecurity in 2015, and for the same year, it is estimated that 149,000 children under the age of five were suffering from acute malnutrition[1].

In addition, agriculture is a major industry in Burkina Faso, and most of the agricultural production is for self-consumption. The involvement of women in agricultural activities in Burkina Faso is so important that they are the backbone of the rural economy, and hence of the national economy. Women play a leading role in agricultural production. Despite this important role performed by women, they have limited access to land, credit facilities, agricultural inputs, equipment, extension services, market for their produce, education as well as training facilities compared to their male counterpart (Wekwete, 2014).

The government of Burkina Faso adopted the National Gender Policy (Politique nationale genre: PNG) in 2009, which addresses and promotes gender equality. The overall objective of the National Gender Policy is to "promote equitable and participatory development of men and women, as well as ensure access, equal control, equal access to resources, and equal access to the decision-making process, in respect to fundamental rights."

There is also an ingrained division of labor in agriculture in Burkina Faso. Indeed, women's main job is to produce food for the family in the family fields, which are owned by men. According to the PNG, 75% of food production for household consumption is produced by women.

This study is important in Africa countries context and specifically in Burkina Faso as women empowerment is not only crucial in achieving gender equity but also in increasing agriculture productivity as well as hunger and poverty reduction in Africa.

Assessing the impact of women empowerment on children nutrition is very important for developing countries like Burkina Faso where women are major players in the agricultural as they are the major labour force in crop production. The study makes also an empirical contribution to the literature on women empowerment specifically in agriculture in Burkina Faso and in developing countries in general. Thus, this study will light up the role of women in fighting hunger and poverty in agricultural household where children and themselves are the most vulnerable.

The rest of the study is organized in five sections. The second section reviews the state of nutrition policies in Burkina Faso; the third section presents the literature review; the fourth presents the data and methodology of the study; the fifth presents and discusses the results while the last concludes the study.

2. Women's empowerment, nutrition policies and agriculture

This section focuses on two points. The first is an overview of nutrition policies in Burkina Faso and the second is a synthesis of link between women's empowerment and agriculture.

Nutrition policies in Burkina Faso

Burkina Faso, like most African countries, is dominated by agriculture that provides the bulk of household income and contributes to the food and population nutrition security (PSSAR_BF, 2017). As a result, the various development policies and strategies have always given pride of place to the growth of this sector and to the improvement of the living conditions of the rural populations living in this activity. However, the country is facing recurring food crises and permanent food insecurity, even though agriculture occupies more than 80% of the population and contributes to 30% of GDP.

In Burkina Faso, as in most developing countries, the causes of these food crises are both structural and cyclical (Destombes, 2003). In addition, poverty is the main cause of food and nutrition insecurity among populations. In 2014, poverty affected 40.1% of the population of Burkina Faso, with an incidence of 47.5% in rural areas (INSD, 2016).

To meet the challenge of recurrent food insecurity, at the national level, it was adopted and implemented in 2007, the National Nutrition Policy (NNP). This NNP enabled the country to make significant progress in reducing malnutrition with the establishment in 2009 of a system for monitoring the nutritional situation by the government, by regularly organizing national nutrition surveys called a rapid assessment survey of the nutritional status of children under 5 years old[2]. Indeed, according to data from the 2009 and 2012 nutrition surveys, the prevalence of acute malnutrition increased from 11.3% in 2009 to 10.9% in 2012 and chronic malnutrition increased from 35.1% in 2009 to 32.9% in 2012 (ENN, 2012).

However, if the management of acute malnutrition or emaciation (severe and moderate) has been a priority for the NNP, the prevention of chronic malnutrition or stunting has always been a challenge for Burkina Faso. In 2013, the country adopted a complementary policy, the National Food and Nutrition Security Policy (PNSAN), which aims to achieve sustainable food and nutrition security by 2025 (PNSAN, 2013). PNSAN aims to be a contribution to the fight against malnutrition globally and more specifically chronic malnutrition and this in a context of recurrent food

crises, aggravated by the vagaries of the climate often forcing the country to seek help provided by development partners, civil society organizations and humanitarian actors.

Thus, a Program of Support to Food and Nutrition Security for Sustainable Agriculture and Resilience in Burkina Faso (PASANAD) was set up for the period 2017-2021 in the form of sectorial budget, support and one-off projects aimed improving the nutritional practices of poor households through a national strategic plan for infant and young child feeding (IYCF)[3]. This will result in actions and investments in favor of irrigated agriculture, small livestock, nutrition education and the provision of local nutritional inputs, to improve food security and incomes of vulnerable households. The overall goal of PASANAD is to contribute to poverty reduction in Burkina Faso, through improved governance in food area and nutrition security and strengthening resilience.

At the international level, since 2011, Burkina Faso joined the SUN (Nutrition Enhancement) movement based on the principle of the right to food and good nutrition for all. Created to end global under nutrition following the 2008 food crisis, the Scaling up Nutrition or Scaling Up Nutrition (SUN) movement is a global movement of 60 countries around the world to end malnutrition in all its forms. Launched in 2010 as a one-of-a-kind movement, SUN, according to its initiators (43 countries of the world), unites people in a collective effort to improve nutrition and is committed to understanding that good nutrition is the best investment of the future. Governments in different countries set priorities and plans that are supported by different stakeholders - including civil society, the United Nations system, development partners, business enterprises and researchers[4].

Empowerment of women and agriculture

A considerable number of studies show that women in developing countries are at a disadvantage compared to men in terms of land ownership rights (FAO 2010). Evidence shows that in many African countries and about half of Asian countries, women are disadvantaged by statutory and customary laws regarding access and ownership of land and other types of property (UN, 2010). The gender gap is particularly important in sub-Saharan Africa and four key factors have been highlighted by recent studies to explain this gap: male preference for inheritance, male privilege in marriage, male bias in community programs, and state distribution of land, and men's bias in the land market (UN, 2010).

The right to land ownership remains completely closed to women. In Côte d'Ivoire, for example, women own only 5% of the total land. This is often a consequence of the prevalence of customary traditions and practices in land management, which impede women's economic empowerment and their full participation in economic development. In Togo, ownership of land and means of production in the agricultural sector is also a prerogative of men. Men are the first owners of land. Women do not own or inherit land (Sraboni et al., 2014).

Burkina Faso, like many developing countries, is a patriarchal and gerontocratic society under the influence of sociocultural constraints (customs, religions, forbidden). Women occupy a secondary place and are victims of discrimination and social injustice such as excision, levirate, and forced marriage. Indeed, because of patriarchal ideology and socio-cultural practice, parents give priority to sons in all aspects. These cultural and social norms create a situation where women and girls are discriminated and age, education, caste, religion, marital status, family income, housing conditions are the main factors that affect women in their empowerment and development. Indeed, there is a tradition for early marriage in Burkina Faso and the issue of early pregnancy and birth resulting from the early marriage poses many problems, such as problems in women's health, education, and the promotion of women's social and economic position. Also, the tradition of levirate, which requires widow to marry her belated husband's brother, is still practice in rural areas. It is recognized that the division between men's and women's work is a deeply ingrained concept in Burkinabe society. Like other African countries, fetching water and other household chores are considered to be a woman's job. In addition, women are engaged in growing crops for the family, and they have a heavy work load, which prevents girls' education and women's social advancement.

In many customary systems in Africa, women often have indirect access to land (for example, with their husbands, brothers or fathers), which means they can access and use the land but do not have access to it and generally have no property rights (Kevane and Gray, 1999). The authors find that in western Burkina Faso, women often worked on land controlled by men, but rarely exercised direct control over their land (except in exceptional circumstances). However, while married women from certain ethnic groups (for example, the Mossi) cultivated plots independently of their husbands, exercising considerable control over what was planted as well as the income from these plots, women from other groups ethnic groups such as Bwa and Lobi had very few access rights, showing significant differences between ethnic groups in the country (Kevane and Gray 1999).

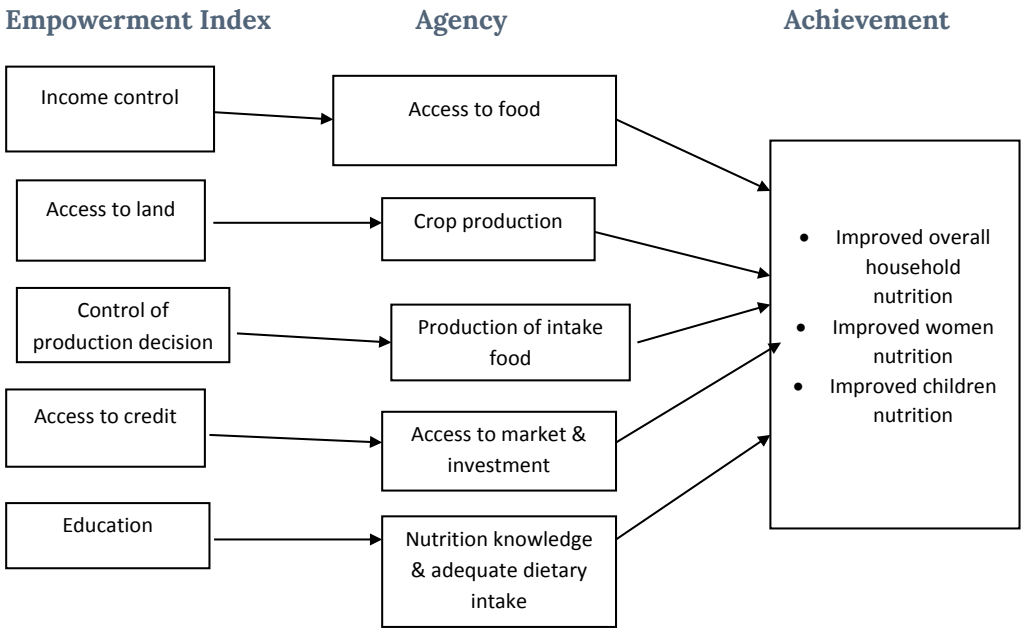
The empowerment of women in agriculture leads to innovative farming practices. Indeed, there is a direct link between empowerment and agricultural and household decision-making within the household, but empowerment gives women the ability to influence the decision to buy seed varieties that would lead to at a higher yield and thus increasing household income. This helps to create well-targeted policies that will help women farmers to increase yields and feed more hungry people.

Several empirical studies have shown that redistribution of inputs between men and women in the household can potentially increase productivity (Kilic et al., 2013, Peterman et al., 2010, Udry, Hoddinott, Alderman and Haddad, 1995). There is also considerable evidence that increased maternal control over resources improves children's outcomes, particularly in nutrition and education (Quisumbing 2003, Quisumbing & Maluccio 2003). Overall, agriculture to support better nutrition and health has been recognized and has been reflected in discussions at the United Nations in the 2030 Agenda for Sustainable Development (United Nations, 2017). Sraboni et

al., (2014) find that improvements in women's empowerment are positively associated with caloric availability and dietary diversity within the household.

For some authors, empowering women is one of the ways in which agriculture impacts nutrition. Indeed, Ruel and Alderman (2013) identify 6 ways in which programs or interventions in agriculture impact nutrition. These are: (1) agriculture as a source of food for own consumption, (2) agriculture as a source of income, (3) the impact of agricultural policies on prices, (4) the impact of women's social status and empowerment on access to and control over resources, (5) the impact of women's participation in agriculture on their allocated time, and (6) the impact of women's participation in agriculture on their own health and nutritional status. A key factor affecting the impact of agricultural interventions on nutrition is whether agricultural intervention improves women's control over assets.

Conceptual framework on women empowerment



Source: Authors compilation

Women's empowerment is defined and measured in numerous ways. Many authors conceptualize empowerment less as an outcome and more as a process, i.e. a progress from the state of gender inequality to the state of gender equality (Kabeer 1999, 2005; Kishor 2000). As such, empowerment is composed of elements that enable or limit it: income, control, access to land, education, access to credit. This framework shows that women access to land and credit, their control over income and production enable them to acquire nutrition knowledge and access to safe food. As a result, this will improve women personal nutrition, their children nutrition and the overall nutrition of the household members.

3. Literature review

This literature review focuses on three points. The first point presents the relationship between women's empowerment and child nutrition; the second point is the link between agricultural productivity and nutrition and finally the last point presents an overview of the measures of women's empowerment in the literature.

Effect of women's empowerment on children nutrition status

According to Doss (2002), gender often enters into discussions about agricultural development programs either through the distinction between male-headed or female-headed households or the distinction between men's and women's cultures. According to this author, it is often considered that men are responsible for cash crops while women are responsible for subsistence crops. This demarcation shows that women and men do not have the same preferences in terms of crop choice, and this is all the more important to take into account in analyzes when we know that these cultural choices can strongly influence nutritional status of the household. For Gillespie & Bold (2017), malnutrition can be seen as the result of dysfunction in interactions between different systems such as: agro-food, environment, health and, crucially, the decision-making of individuals and households.

Across sub-Saharan Africa, agriculture is the backbone of the economy, accounting for 30 to 40 percent of countries' gross domestic product and major source of employment for more than two-thirds of the population. Improving the productivity, profitability and sustainability of agriculture on the millions of farms that cover the African continent is essential to ending poverty and fostering shared prosperity in the region. Although women make up a large share of African farmers, they are, for the most part, limited in land ownership, in access to credit and productive agricultural inputs (World Bank, 2014). This series of factors means that women, on average, have lower productivity compared to men. This has the effect of impacting their families especially in terms of food availability.

According to Aitatikie (2014), nutritional status is the manifestation of factors such as access to and distribution of food in the household, availability and use of health services, and childcare. Given that women are more willing to take care of children in the household, one might think that they can be an effective lever for achieving good

nutrition for children. Several studies have gone in this direction by demonstrating the crucial role that women can play in the nutritional health of their children. It is in this sense that Branca et al. (2015) note that good health and nutritional status of women are essential for good nutrition of children.

Using Ghanaian data, Malapit & Quisumbing (2014) construct indices of women's empowerment in several aspects of household decision-making. Their results indicate that, in general, women's empowerment is strongly associated with the nutritional practices of children and the youngest and weakly correlated with the nutritional status of younger children. These authors also find that women's power over credit improves the diversification of women's diets, but not their body mass index. The implication of such results is that empowering women in different areas can have various effects on household nutrition.

According to the findings of Aitatikie (2014), differences in the nutritional status of children appear when the areas of residence are taken into account. In this sense, this author found in the case of Ethiopia that children in rural areas suffer more from malnutrition than those in urban areas. This result leads us to question the causes of such disparities when we know that the rural environment is supposed to be better supplied with food. According to Aitatikie (2014), to improve the nutritional status of children living in these areas, it is necessary not only to set up intervention mechanisms but also to aim at empowering women by improving their decision-making power in all aspects. In the same vein, Smith et al., (2003) report that there has been enough interest in the causes of malnutrition and ways to reduce it, but the role of women in the nutritional status of children has often been ignored recently. Thus, these authors show unequivocally that the integration of aspects aimed at improving the status of women in intervention policies against malnutrition produces better results. As a result, improving the status of women is a powerful way to improve the health, longevity, physical and mental abilities and productivity of future generations of young adults.

But the problem of malnutrition is not directly related to decision-making problems in the household. For example, authors like Iannotti et al., (2012) assume that increased poverty and rising food prices could reduce the consumption of high-quality food commodities, leading to a likely mismatch in terms of several nutrients. These authors demonstrate that while income and food prices influence nutrients in diets differently, income remains an important determinant of good nutrition. In such a context of budgetary constraint, one could highlight studies that have shown that an increase in women's income has more effect on the well-being of children. In other words, if the woman has the decision-making power or is involved in making household consumption decisions, she will no longer direct them to more beneficial expenditures for the children. It is in this sense that Schmidt (2012) emphasizes that an increase in the decision-making power of women is accompanied by a shift in spending towards goods that support children's welfare functions. In the same vein, Olney et al. (2016), show that the agricultural and nutritional programs that targeted women mothers of children, have contributed to improving the nutrition of these

women as well as their empowerment. This has the effect of strengthening their abilities to take care of their children.

Table 1: synthesis of some empirical studies

The table presents the methodological approach as well as the main results of some empirical studies about women empowerment in agriculture in the literature.

Studies	Empowerment Indicator	Nutrition Indicator	Nature of effect	Estimation Method	Instruments for women's empowerment
(Malapit & Quisumbing, 2015)	Women's Empowerment in Agriculture Index (WEAI)	Nutrition Diversity Scores, Minimum Acceptable Ration for Child 6-23 Months, Nutrition Scores (height-for-age, weight-for-age and weight-for-height and Body Mass Index (BMI)	Slightly associated with children's nutritional status	OLS	
Bhagowalia et al., (2012)	Participation to decision making; mobilty freedom; attitude towards domestic violence	Prevalence of stunting (height-for-age below -2) and the minimum of dietary diversity	Positive	Logit	
Malapit et al., (2015)	WEAI	Z-scores height-for-age, weight-for-age and weight-for-height	Positivve	OLS and Instrumental Variables	Proportion of sons in total of children in the cluster; distance to market in the cluster

Source: Authors

Agricultural productivity and nutrition

Following the findings of Kiresur et al., (2010), agricultural productivity significantly reduces rural poverty, and rural poverty determines the level of food security. In other words, agricultural productivity affects nutrition through poverty reduction. It is recognized that the relationship between agriculture, health and nutrition is bi-directional (Dury and Bocoum, 2012). As agricultural households are essentially consumers of their own production, agriculture influences members' health and nutrition through products. This effect is observed as much on the quantity, diversity, accessibility of products as on their sanitary quality and nutritional composition. In the other direction, health and nutrition influence agriculture, through the work

capacity of more or less well-fed people. It is in this sense that Haddad (2000) and Hawkes and Ruel (2006) encourage better consideration of these agriculture-health / nutrition relations for the implementation of agricultural or health policies. Thus, sustainable agricultural growth is generally effective in reaching the poor, as most of the poor and undernourished live in rural areas and depend on agriculture as a major part of their livelihoods (UNSCN, 2014).

Baiphethi & Jacobs (2009) point out that smallholder food production could play a key role in reducing the vulnerability of rural and urban households to food insecurity, improving standards of living and helping to control high food inflation prices. As a result, a household's food security will depend on its income and assets, such as land and other productive resources. In their study of Swaziland, Panin and Hlope (2013) find that subsistence agriculture can guarantee food security among farm households at 37%. Ambagna et al. (2012) find a positive impact between food production and food security in Cameroon. However, in their study of Mali, Dury and Bocoum (2012) lead to a parity of the link between productivity and nutritional health. Indeed, while agricultural production has grown and poverty has decreased, malnutrition rates remain surprisingly high. For the authors this is due to inadequate food consumption.

Overview of women's empowerment measures

Empowerment according to Kabeer (2001) is increasing of people's ability to make strategic life choices within their households and communities, especially in contexts where this capacity has been limited. The measures or proxies for women's empowerment most commonly used in the literature include the following among others according to Bold et al., (2013): education (the level of education of women, the enrollment rate of women in secondary school, etc.) - the status of women in the labor market: at this level, we look at labor regulations, wage differentials, the share of women in the labor market - legal framework or legislation: property rights, marriage and family laws, inheritance - marriage and parenthood - land ownership - social norms - political representation.

The previous measures are rather indirect and do not always lead to women's empowerment. Thus, at the level of the individual and the household, there are attempts to measure more directly. It is:

- The participation of women in household decisions (economic, health, social decisions, etc.)
- The share of control of the resources at the expense of the woman
- The ease of movement and mobility of women
- The distribution of power between the wife and her husband
- Spouses' attitudes towards domestic violence

The women's empowerment index in agriculture

In addition to the indicators outlined above, some authors have developed a specific index for the empowerment of women in agriculture. Women play a crucial and potentially transformative role in agricultural growth in developing countries. But they face these persistent constraints and barriers that limit their inclusion in agriculture (IFPRI, 2012). This means that they do not have a priori the same level of decision autonomy as men. Empowerment in agriculture is that a person: (i) has the resources and opportunities to participate in productive agricultural activities; (ii) has a role in decision-making regarding agricultural production management; and (iii) receives and controls the benefits and returns on investment from agricultural efforts.

In order to measure the level of women's empowerment, Alkire et al. (2013) propose a measure within the framework of the priorities of the United States Agency for International Development (USAID) and which is tailored to the agriculture. The different components of this measure are shown in Table 2 below. These components represent 5 different areas that reflect women's involvement, ie their role and influence in the agricultural production process: The Women's Empowerment Index in Agriculture (WEIA). WEIA is a composite measure of women's control over crucial parts of their lives in the household, the community and the economy. This measure helps to identify women who are under empowered and understand how to improve autonomy and decision-making in five major areas. The index is a relevant tool for tracking progress toward gender equality as one of the Sustainable Development Goals (IFPRI, 2012). The WEIA is very practical in that it shows women under empowered in one area, for example compared to others who are empowered in three areas. This property of the index makes it possible to know the key dimensions on which interventions could be carried out.

Table 2: The Components of Women's Empowerment

Domains	Indicators	Weight
Production	Contribution to production decisions	1/10
	Autonomy in production	1/10
Resources	Ownership of assets	1/15
	Purchase, sale or transfer of assets	1/15
	access to and decisions on credit	1/15
Income	Control over use of income	1/5
Leadership	Group member	1/10
	Speaking in public	1/10
Time	Workload	1/10
	Leisure	1/10

Source : Alkire et al., (2013)

The five decision areas are considered by a set of 10 indicators for determining the level of empowerment of women. Alkire et al., (2013) add to these dimensions another sub-index which they have called the gender parity index which assesses the disparities between men and women. This measure has the advantage of not only considering access to land but also aspects intrinsically linked to the production itself. The measurement by scores in the 5 dimensions or domains, (5DE), gives index values ranging from 0 to 1 and the index has two components. The first reflects the percentage of empowered woman (He). The second component indicates the percentage of dimensions in which women who are not yet empowered (Hn) have adequate positions. We thus have: 5DE = He + Hn (Aa), with He + Hn = 100%; Aa is the percentage of dimensions in which empowered women have adequate scores; 0 <Aa <100%. The index construction method uses the weights shown in the table above for its aggregation.

An ongoing international program, The Hunger Project (THP) which is committed to the sustainable end of world hunger aimed to empower people to end their own hunger. In alignment with the United Nations Post-2015 Sustainable Development Goals, THP works by empowering individuals and communities to mobilize and become self-reliant. This program in 1977 but has been working in Burkina Faso since 1997 and is currently serving a population of about 302,668 people in 187 villages (The Hunger Project 2016). THP's works through programs among which Women's Empowerment.[5] The hunger project (THP) (2016) has construct a women empowerment index (WEI) for 8 countries among which Burkina Faso.[6] The WEI measures women's empowerment across five domains: Time, Resources, Leadership, Agency, and Income and the index is built upon the Women's Empowerment in Agriculture Index (WEAI) which was developed by the International Food Policy Research Institute. THP considers a WEI score to be "high" if it is over 80%. WEI indicator scores are on a scale of zero to ten, with ten being the highest level of empowerment. But the WEI scores show that Burkina Faso lagged (The Hunger Project, 2016).

4. Methodology

In order to assess the impact of women's empowerment on child nutrition, we need to have on one hand a precise measure of women's decision-making power and on the other hand a measure of children nutrition.

Measurement of women's empowerment in agriculture index in Burkina Faso (WEAIB)

Several authors have highlighted the fact that empowerment is a multidimensional element and a complex process that can be interpreted differently (Malhotra et al., 2002). The review of the literature on women's empowerment shows that there is no unanimity on the variables to be considered in measuring the degree of women's empowerment. Thus, variables ranging from participation variables to household decisions to variables capturing violence are considered. The framework proposed by Golla et al., (2011) incorporates elements such as women's participation in activities, improving women's level of control over household resources, the degree of mobility, autonomy and responsibilities related to women such as the number of hours devoted to domestic work, the sharing of domestic duties and gender discrimination in relation to jobs. Hunt & Samman (2016) consider education, skills and training, access to quality employment, unpaid work, access to property and financial services, collective action and leadership and finally social protection, as factors directly impacting women's empowerment. These various proposed measures are essentially in the direction of the economic empowerment of women. Considering the work of authors like Lépine & Strobl (2013) and Arulampalam et al., (2016) we can meet factors such as decisions concerning health care, visits, purchases, management of the husband's income, the ability to make independent decisions as a measure of empowerment. This shows the diversity of measures used in the literature.

In this study, we have based our choice on two criteria: the availability of data and the consideration of variables that are common in the literature. Given that the study specifically addresses the rural environment with an emphasis on the agricultural activities that constitute the main occupation, we adopt a measurement approach that is consistent with the Women's Empowerment Index in Agriculture proposed by Alkire et al., (2013). The difference of our approach with this index is that we focus more on the variables of economic empowerment of women. Thus, we consider five

variables as indicators of empowerment. It's about: (i) income control (ii) access to the land (iii) control of production decisions (iv) access to credit through the obtained amount and (v) the level of women's education.

These variables emphasize on the women's responsibility degree not only in agricultural activities but also in the decision-making process within the household. These two components (activities and decisions) provide a broad view of the decision-making power of women and go beyond the mere participation of women in agriculture.

Given the plurality of indicators, we chose to adopt a dual measure of empowerment. The first step was to independently use these indicators to appreciate their isolated effect on children's nutrition. The second measure makes a combination of the different variables into a composite index. Like Lépine & Strobl (2013), the weights used to aggregate the index come from a Multiple Correspondence Analysis (MCA). The aggregation is done by summing up the sub-indexes considering their weights.

Table A (in appendix) shows that, access to land, control over production and access to credit are variables which count the most in empowerment. The MCA results show that the empowerment index corrected from endogeneity varies from 114.513 to 128.2727. Our work is to know how a high level of empowerment affects children nutrition.

Measurement of nutrition

The nutritional outcome of the child is measured by nutritional status, especially if the child suffers from severe under-nutrition. In general, two types of surveys can be used to assess the nutritional status of a population: anthropometric surveys and consumption or food expenditure surveys. Although useful for identifying deficiencies in certain nutrients that may affect children's growth, household food consumption surveys (by weighing) are rarely used because they are tedious and imprecise. In fact, household food expenditure indicates average consumption per household member, which is an abstract figure. This figure does not tell the actual consumption of each individual because the researcher does not know the distribution of food between household members. By contrast, anthropometric measures are simple statistical indicators because they have the advantage of affecting individuals. Indeed, an anthropometric measure is a variable that accounts for changes in the body size of any individual.

Three main anthropometric indicators are commonly used to assess the child's nutritional status: "height-for-age", "weight-for-height" and "weight-for-age". These indicators are calculated using standardized values, each index being expressed in terms of the number of units of standard deviation (SD) relative to the median of the US NCHS / WHO international reference population[7]. Children with severe late growth are those whose weight exceeds three standard deviations below the international reference median for their age. This measure indicates that a child is suffering from

malnutrition and chronic and acute illness. This measure is used because it is a good general measure of child health (de Onis et al., 1993). The study includes all the indicators, namely the weight-for-height (short-term) index, the height-for-age (long-term) index and the weight-for-age index (composite index) to analyze the nutritional status of children under 5 in Burkina Faso. To measure the nutritional prevalence in children, it is used the z-score, the percentage of the median and the percentiles which make it possible to estimate the rates of malnutrition. To determine the nutritional prevalence in Burkina Faso, the choice of the present study concerns the z-score in order to comply with the recommendations of the World Health Organization (WHO). (WHO Child Growth Standards, 2006).

The universal reference threshold value of "-2 standard deviation units (SD)" is used as a delimitation line to separate malnourished children from those who are not malnourished. According to the World Health Organization's (WHO) conventional definition of child malnutrition, when indices are between -2 (-2 SD) and +2 (+2 SD) standard deviations, children are considered not malnourished. But, when indices are below -2 standard deviations (-2SD), children are malnourished and when indices are below -3 standard deviations (-3SD), malnutrition is considered severe. Children are considered obese when the z-score index is greater than +2 standard deviations (+ 2SD).

In this present study, we compute the z-scores based on the intervals recommended by WHO using the minimum value 16.06% and the maximum 0.77 and we do not classify according to the threshold standard deviation (-2SD). So, all z-scores are used by their actual values instead of the threshold.

Estimation and identification strategy

In order to assess the impact of women's empowerment in agricultural activities on the nutritional status of children, we estimate a model of the following form:

$$Y_i = a_0 + A_i\phi + X_i\delta + e_i \quad (1)$$

$$Y_i = b_0 + WEAIB_i\phi + X_i\delta + v_i \quad (2)$$

With: Yi the nutritional status of children measured by weight-for-age, weight-for-height and height-for-age z-scores; A is matrix that takes into account the variables of empowerment; WEAIB, the women's empowerment index in agriculture; a0 and b0 constant terms; Xi a matrix of explanatory or control variables such as the age and sex of the household head, the education level of the head of the household, the type of marital union, the size of the household, the type of birth and the type of birth and e_i and v_i are error terms. Equations (1) and (2) make it possible to test the robustness of the effects obtained with the technique of measuring autonomisation.

These equations will be estimated by Least Ordinary Squares (OLS). But there are chances that the estimate is tainted by bias from different sources. We examine successively some possibilities in two cases.

1st case: cluster effect

It could have unobservable factors common to the strata that will influence the outcome variable which is the nutritional status. As a result, the effect could be biased. In this case it is appropriate just as Cameron & Trivedi (2005) recommended to consider the effect of clusters in the estimation. This procedure is used for the estimation of models in order to have robust estimators.

2nd case: endogeneity of the empowerment measure

This case examines the possibility of an endogeneity bias of women's empowerment. According to Lépine & Strobl (2013), there are at least two explanations for the likely endogeneity of empowerment. The first is that women's great decision-making power could be associated with a healthy context for children if mothers with better intrinsic characteristics are the ones with the most independence. In this case, the effect of empowerment could be overdetermined. In contrast, the second explanation assumes that if we assume that women who are neglected are more autonomous, the high degree of subsequent empowerment may be associated with a context of poor nutritional health for children. In this case, the effect of empowerment would be under-determined.

Given this possibility of occurrence of the endogeneity bias, two solutions can be envisaged. The first is the use of instrumental variables with the risks of validity and robustness of instruments. The second solution is to use the technique used by Strauss (1986) which will consist in this case to build an empowerment indicator that assigns average values of empowerment to all women in the same stratum. This circumvents the endogeneity that would come from an individual measure of empowerment. It is this last solution that we adopted in this study because it remains in the logic of the instrumental variables.

Data

This study uses data from the 2014 Multisectoral Continuous Survey (EMC) conducted by the National Institute of Statistics and Demography (INSD) of Burkina Faso. This survey was conducted in four phases and collected information on aspects such as the characteristics of household members, the economic situation of households, the occupational situation of persons over 15 years of age, the possession of assets, health, education, access to information and communication technologies (ICT), food security, shocks and coping strategies, savings and access to credit, and

anthropometric information. The household draw was done in 905 enumeration areas and covers a total of more than 10,000 households. The sampling technique uses two-stage stratification procedure. A first step concerning the drawing of the enumeration areas and a second with the drawing of the households. These data are representative at all levels of the population.

Descriptive statistics

Table 3 presents the characteristics of all the variables used in the regressions. It describes the modalities, the codifications of the variables, the modalities of reference as well as the standard deviations for the quantitative variables.

Table 3: Descriptive statistics on nutrition and empowerment variables

Variables	Modalities	Std. Dev / proportions
HAZ	Height- for-Age z-score	1.875
WAZ	Weight-for-Age z-score	0.926
WHZ	Weight-for-height z-score	1.423
WEAIB	Women Empowerment in Agriculture Index of Burkina Faso	11.031
Income control	1-Woman controls the sales income	1.52
	0- Otherwise	98.48
Control over Production	1-Woman makes production decision	61.61
	0- Otherwise	38.39
Land control	1-Woman is owner	60.28
	0- Otherwise	39.72
Amount of Credit	Amount of credit	55842.69
Education of Woman	1-No level (reference)	70.21
	2-Primairy	21.35
	3-Secondary and university	8.44
Education of Household Head	1-No level (reference)	80.11
	2-Primairy	17.24
	3-Secondary and university	2.65
Woman Marital Status	1-Single (reference)	84.04
	2-Monogamous union	9.90
	3-Polygamous union	6.07
Household Head Sex	1-Man (reference)	67.26
	0-Woman	32.74
Household Head Age	Age of household head	5.046
Water Procurement Source	1-Potable water	33.10
	0-Other source	66.90

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Table 3 Continued

Variables	Modalities	Std. Dev / proportions
Birth	1-Simple birth (reference)	99.55
	0-Multiple birth	0.45
Age of Child	Age of child in month	17.12
Household Size	Number of individuals living in the household	2.915

Source: authors' compilation

Table 3 shows that women are more empowered on certain variables and less in others. Indeed, the statistics show that such as land control 60.28% are owners of land they are using. Also, Table 3 indicates that 61.61% of women have control over the production and only 1.52% have income control (1.52%). Statistics show that on average, children have 17 months old and only 33% of household have access to clean water, and 70% of women have received no education.

5. Results and discussion

This section presents and discusses the estimation results considering the different possibilities analyzed in the methodology. Thus, Table 4 presents the estimation results that use the empowerment variables separately. Table 5 also identifies the same effects but incorporating the composite empowerment index as a single measure. Finally, Table 6 summarizes the estimates in Table 5 by adopting correction technique for endogeneity bias.

Table 4: Women empowerment and children nutrition

Variables	**(1)**	**(2)**	**(3)**
	HAZ	**WAZ**	**WHZ**
Income Control	0.000***	0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Control over Production	0.029**	0.034	0.367**
	(0.013)	(0.028)	(0.168)
Land Control	-0.023	-0.109	0.018
	(0.022)	(0.083)	(0.020)
Amount of Credit	0.000***	0.000***	-0.000
	(0.000)	(0.000)	(0.000)
Education of woman			
Primairy	0.027	0.198	0.122*
	(0.110)	(0.170)	(0.065)
Secondary and University	-0.206	0.144	0.247***
	(0.129)	(0.106)	(0.069)
Age of Child	-0.092***	-0.040***	0.051***
	(0.008)	(0.011)	(0.003)
Water Procurement (reference: potable water)	-0.630	-0.130	0.409*
	(0.499)	(0.357)	(0.234)
Type of Birth (reference: simple birth)	0.976***	-0.102	-0.706**
	(0.319)	(0.392)	(0.263)
Child Participates to Nutrition program	1.744***	0.295	-1.183***
	(0.226)	(0.175)	(0.079)

continued next page

Table 4 Continued

Variables	(1)	(2)	(3)
	HAZ	WAZ	WHZ
Monogamous Union	0.000	0.164	0.037
	(0.093)	(0.114)	(0.043)
Polygamous Union	0.213	0.289*	-0.040
	(0.173)	(0.146)	(0.067)
Sex of Household Head	0.054	-0.172	-0.513*
	(0.352)	(0.190)	(0.253)
Age of Household Head	0.001	-0.001	-0.002
	(0.008)	(0.008)	(0.005)
Education of Household Head			
Primairy	0.259	-0.140	-0.240
	(0.491)	(0.189)	(0.362)
Secondary and University	-0.455	-0.119	0.239
	(0.533)	(0.379)	(0.259)
Household Size	-0.151**	0.011	0.139***
	(0.070)	(0.054)	(0.018)
Observations	17,834	17,852	17,827
R^2	0.42	0.39	0.45

Robust standard deviations in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Composite Measure of Child Empowerment and Nutrition

Variables	(4)	(5)	(6)
	HAZ	WAZ	WHZ
WEAIB	-0.003	0.004	0.006***
	(0.002)	(0.002)	(0.001)
Water Procurement (reference: potable water)	-0.644	-0.126	0.451*
	(0.511)	(0.352)	(0.258)
Type of Birth (reference: simple birth)	1.000***	-0.182	-0.652*
	(0.319)	(0.386)	(0.320)
Age of Child	-0.092***	-0.040***	0.050***
	(0.008)	(0.011)	(0.003)
Child Participates to Nutrition program	1.792***	0.277*	1.221***
	(0.227)	(0.147)	(0.075)
Marital Status of Woman			
Monogamous Union	0.098	0.153	-0.020
	(0.065)	(0.095)	(0.043)

continued next page

Table 5 Continued

Variables	(4)	(5)	(6)
	HAZ	WAZ	WHZ
	(0.136)	(0.153)	(0.078)
Sex of Household Head	0.057	-0.182	-0.465*
	(0.341)	(0.171)	(0.257)
Age of Household Head	0.003	-0.002	-0.005
	(0.008)	(0.007)	(0.006)
Education of Household Head			
Primairy	0.254	-0.142	-0.262
	(0.461)	(0.193)	(0.338)
Secondary and University	-0.420	-0.148	0.143
	(0.505)	(0.388)	(0.292)
Household Size	-0.152**	0.010	0.135***
	(0.069)	(0.053)	(0.020)
Observations	17,849	17,867	17,842
R^2	0.558	0.49	0.37

Robust standard deviations in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Correction of endogeneity bias

Variables	(7)	(8)	(9)
	HAZ	WAZ	WHZ
WEAIB	0.008***	0.006***	0.006***
	(0.002)	(0.002)	(0.002)
Water Procurement (reference: potable water)	0.656***	0.136**	0.414***
	(0.069)	(0.057)	(0.048)
Type of Birth (reference: simple birth)	0.982***	-0.107	-1.332***
	(0.135)	(0.114)	(0.097)
Child Participates to Nutrition program	1.790***	0.285***	-1.391***
	(0.050)	(0.042)	(0.035)
Age of Child	-0.092***	-0.039***	-0.049***
	(0.001)	(0.001)	(0.001)
Marital Status of Woman			
Monogamous Union	0.172***	0.073***	-0.160***
	(0.028)	(0.023)	(0.020)
Polygamous Union	0.378***	0.167***	-0.255***
	(0.036)	(0.030)	(0.025)
Sex of Household Head	0.045	-0.197***	-0.576***
	(0.085)	(0.070)	(0.059)

continued next page

Table 6 Continued

Variables	(7)	(8)	(9)
	HAZ	WAZ	WHZ
	(0.002)	(0.002)	(0.002)
Education of Household Head			
Primairy	0.259**	-0.123	0.339***
	(0.108)	(0.088)	(0.075)
Secondary and University	0.421***	-0.122	0.012
	(0.116)	(0.095)	(0.081)
Household Size	-0.154***	-0.013***	-0.139***
	(0.006)	(0.005)	(0.004)
Observations	17,865	17,883	17,858
R^2	0.47	0.59	0.60

Robust standard deviations in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Our results show that selected autonomization variables have a positive and significant overall impact on the nutritional status of children. In this sense, variables such as income control, production control, credit and women's education have a positive influence on the level of nutrition of children. This shows the beneficial effect of women's status on children's health. These effects are maintained even when the empowerment measure for women is replaced by a composite measure that integrates the previously used variables. The effect is therefore robust to the extent to which women's empowerment is measured. Our results are in line with those previously found in the literature.

In this sense, Shiwakoti et al., (2017) show on Nepalese data that women with low empowerment have children who are underweight and stunted. This suggests that improving the woman's position in household-level decision-making translates into a significant gain for the nutritional status of the children. It is this result that Ibrahim et al., (2015) highlight by pointing out that there is a positive relationship between women's active participation in decision-making and children's health. These authors incorporate variables such as the decision about health care, visits, shopping, and husband's income management as measures of women's empowerment. The results of Smith et al., (2003a) are even more positive and show that there is no doubt that a better status of women has a positive and significant impact on the nutritional status of children. Scantlan & Previdelli (2013) point in the same direction by indicating that after taking into account the effect of variables such as the household wealth level, characteristics of the mother and children and the place of residence, the effect of women's empowerment on child nutrition remains positive. According to these authors, this result shows that empowerment has an independent effect on nutrition. The consequence is that women's empowerment alone could serve as a lever to target goal of reducing child malnutrition. These authors took into account participation

in household decisions, attitudes towards violence, and experiences with domestic violence to measure women's bargaining power. Authors like Lépine & Strobl (2013) instead take into account variables such as the decision about health of the child and respondent, the education of children, daily purchases, major purchases, visits and meals prepared for children measure the degree of autonomy of women in Senegal. Their results indicate that it is beneficial for children's nutrition when the woman has a better level of decision-making autonomy. Arulampalam et al., (2016), incorporating the ability to think, express, act and make decisions independently, point in the same direction by revealing that women's empowerment is important for the nutrition of women and children especially in the first two years of life which are a decisive period for health and economic opportunities in the lives of individuals. Based on data from Bangladesh, Siddhanta & Chattopadhyay (2017) confirm these previous results.

Following these different results obtained in the literature, two aspects seem particularly important. The first is convergence in empirical results. This convergence demonstrates that women's empowerment is beneficial for the nutritional health of children. The second aspect is that the convergence of results is robust to empowerment measure. In other words, even if there is no consensus on the variables to be included in the measure of empowerment, these convergent results are nevertheless found in several countries with different socio-economic contexts.

The results also show that household size and type of birth have negative and significant effects on the nutritional health of children. The effect of size is consistent with the expected signs in that the increase in the number of members in the household contributes, all other things being equal, to decreasing the availability of resources per member. This can ultimately impact the children who are the most vulnerable in the household. On the other hand, the results show that the effect of birth type is confused on nutritional health. Although it seems more logical to explain the beneficial effect of a simple birth on the nutrition of the child, it is still possible to explain the case where multiple birth positively impacts the children’s nutrition. Indeed, this result could have a logical explanation. This negative result could reflect the fact that multiple birth requires from parents more care than single births. This additional care requirement may lead parents to take better care of children with multiple births than single births.

6. Conclusion and policy implications

This study analyzed the effect of women's empowerment in agriculture on child nutrition in rural Burkina Faso. It assumes that better degree of women's empowerment is beneficial for the nutritional children's status. To do this, we used data from the 2014 Multisectoral Continuous Survey (EMC). We developed two ways of measuring empowerment and explored different estimation techniques to test the robustness of the different effects obtained. Our results show that controlling sales income, controlling or making production decisions, access to land, credit, and women's education levels are factors that have a positive impact on child nutrition. This beneficial effect is maintained even when the level of women's empowerment is measured using a composite index.

The convergence and robustness of the effects highlight the positive and significant effect of women's empowerment on the children's nutritional health. These results have some policy implications which can be formulated as follows: Public policies aimed at mastering infant nutrition should integrate aspects such as (i) measures facilitating women's access to land and other agricultural inputs by updating laws on land property and implementing fertilizers subsidies for women. Indeed, the implementation of national policies and laws are implemented but they are hindered at the local level by socio-culturally rooted norms and practices, and lack of resources. Policies have to sensitize men and women on the importance of equal access to agricultural inputs, so women will have a better ability to make production decisions independently and access and use of land; (ii) greater financial inclusion of women by providing them with easy access to credit through microfinance institutions; and (iii) continued efforts to promote women's and girls' education by including nutrition and agriculture in school curricula and literacy programs. Education will provide women and girls with knowledge and skills that are necessary for nutrition.

Notes

1. European Commission http://ec.europa.eu/echo/files/aid/countries/factsheets/burkina_faso_fr.pdf

2. The survey is conducted according to the methodology named SMART «Standardized Monitoring and Assessment of Relief and Transition»

3. http://eeas.europa.eu/delegations/burkina_faso/index_fr.htm, viewed on December 28, 2017

4. www.ScalingUpNutrition.org

5. THP's works through ten key programs: Nutrition, Education, Women's Empowerment, Environment, Microfinance, Health, Community Mobilization, Agriculture and Food Security, Maternal Health, and Clean Water and Sanitation

6. The eight countries are: Benin, Burkina Faso, Ethiopia, Ghana, Malawi, Mozambique, Senegal and Uganda

7. The reference standards that are most commonly used to standardize measurements have been formulated by the US National Center for Health Statistics (NCHS) and are recommended for international use by the World Health Organization (WHO).

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Appendix

Table A: Ponderation after MCA computation on empowerment score

Variables	Ponderations
Control over income	0.1
Access to land	27.6
Control over production	28.2
Access to credit	28.5
Level of education	15.6
Total	100

Mission

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