Driving women empowerment through agricultural mechanization: Think womechanization

ABSTRACT

Many developing countries have been expected to mechanise their agricultural sector. Yet, the number of tractors in Africa remains the lowest compared to other regions and tractors are operated by men. A project in Ghana is changing this by training women in tractor operation. Consequently, the study aimed to assess the potential role mechanisation has in empowering women by drawing lessons from the project. A gap exists in the literature in this area, as previous studies have considered women empowerment and mechanisation separately, and from a smallholder access not occupational perspective. The four quadrants of change model was used to analyse the influence of mechanisation on women empowerment. Furthermore, the design thinking approach was used to evaluate the extent to which the practitioner(s) was able to apply its processes in the project. The quantitative data was collected purposively from 24 women and 2 practitioners using in-depth semi-structured individual questionnaires. The findings reveal that mechanisation encourages women to challenge themselves and offers a new self-identity. It provides them with employment opportunities to diversify their income sources and broadens their social networks. Moreover, it shifts the mind-set about women for practitioners and society. The use of design thinking processes by the practitioner made this possible. Having a supportive management and organisational culture, flexible timeline and budget that does not stigmatise failure was critical. Hence, there is a need to scale up mechanisation projects with women in the forefront and to engage stakeholders in increasing youth and women employability in agriculture.

Key words: Women empowerment; agricultural mechanisation; four quadrants of change; design thinking; tractor operation; Ghana.

1. INTRODUCTION

Over 50-85 % of the women in different parts of Africa continue to farm without the support of animals or machinery (MMP, 2018). In 2018, the African Union Commission (AUC) in collaboration with the Food and Agriculture Organization (FAO), launched the Sustainable Agricultural Mechanization Framework for Africa in order to respond to the Zero Hunger Vision of the Malabo Declaration of 2014, the African Union's (AU's) Agenda 2063 and the Sustainable Development Goals of the United Nations (AU, 2018). This was a result of the potential that mechanization has in improving the livelihoods of people. The idea is that mechanization will help improve agricultural productivity for most smallholders and will help reduce hunger in Africa by 2025 or 2063 in the case of the AU's Agenda. In addition, the AU Summit addressing mechanization, technological innovation, education and skills development for women was held in June 2015 (FAO & ECOWAS, 2018). Consequently, 2015 was declared as the year of women empowerment and development. This led the AU to launch a campaign to confine the hand-held hoe to the museum. The AU member states have been encouraged to ensure that the

developments of agricultural value chains in mechanization, technological innovation and skills development are inclusive of women. Ghana, which is the focus of this study has been part of these developments.

Mechanization is defined by FAO (2006) as the tools, implements and machinery used to improve farm productivity of land and labor. In most developing countries, particularly in Sub-Saharan Africa (SSA), agricultural mechanization has been used interchangeable with tractorization (FAO, 2008; Benin, 2015). A similar approach is followed in this study. The lack of tractors in Africa relative to other regions has been the major influence for the AU to push for tractorization in the continent. Figure 1 below shows the use of tractors in the world over the years 1961-2000. Adding to the challenge of women access to tractors and mechanization related careers. According to TWB et al. (2009), poor access to training and technical skills remains the key constraint for women to be able to use technologies. It is no surprise that in the plant and machine operators and assembler's profession, only 16% are women (WGB, 2019). Since women are the ones that affected the most by this gap, it makes sense to push for their inclusion in the transformation agenda to mechanize agriculture. Therefore, this study is going to explore the potential of using mechanization amongst other approaches in empowering women. From this point forward 'womechanization' will refer to the use of mechanization to achieve women empowerment. According to WBG (2019), mechanization of agriculture in emerging economies represents the largest global shift in work.

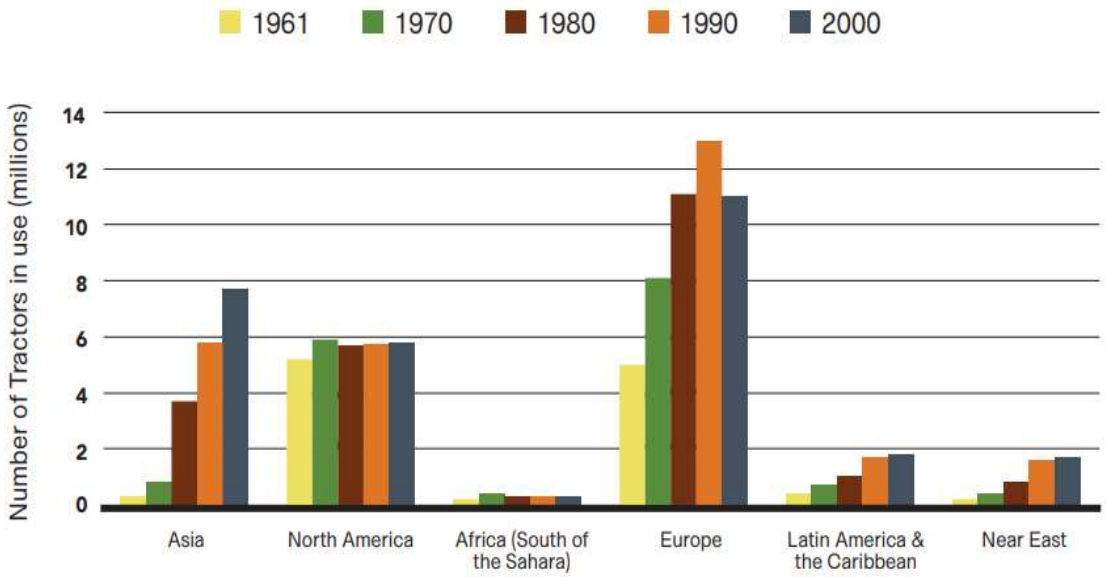

Figure 1. Number of tractors used in the regions from 1961-2000.

Source: FAO & AUC (2018)

Ghana has a huge potential for agricultural mechanization, out of 8 million hectares of suitable land for mechanization, only 20 percent (1.6 million hectares) of this land had been mechanized as of 2007 (Houssou & Chapoto, 2014). This potential carries an opportunity for inclusion of women and youth in agriculture. Yet, based on the study by FAO and ECOWAS (2018), Ghana still lags in terms of gender empowerment and

currently has no gender policy for the agriculture sector, even though there is a gender strategy. In 2001, the Ghana Ministry of Food and Agriculture (MoFA) established a Gender and Agricultural Development Strategy (GADS) and it was reviewed in 2015 to GADS II. However, this strategy has not led into policy due to limited relevant, reliable and timely quantitative and qualitative gender data for policy-making among other things. Therefore, it is critical to capture gender-sensitive evidence to improve policies, programmes and investment plans for agri-food systems and food security which respond to women and youth aspirations, needs and challenges (FAO, 2018). This study is a step towards that direction.

2. LITERATURE REVIEW

In the literature, many studies have explored mechanization in agriculture but not through the gender lens (Binswanger, 1986; Houssou et al., 2013; Diao et al., 2014; Houssou & Chapoto, 2014; Benin, 2015; Takeshima, 2015; Akter et al., 2017). This study differs from previous studies as it looks at agricultural mechanization as a sector for boosting women empowerment (womechanization) not in relation to its use by smallholders or its effects in the farms. The idea is that improving women access to occupations and businesses in the agricultural mechanization sector can lead to women being able to acquire/own the machinery which is important for women empowerment. Most studies that have investigated women empowerment have not linked it with mechanization (Mosedale, 2005; Alkire et al., 2013; Sharaunga & Mudhara, 2016; Cornwall, 2016; Bayissa et al., 2018; FAO, 2018; Bishop, 2019). Only one study was found to have analysed the link between mechanization and women empowerment in agriculture (Fischer et al., 2018). However, all previous studies have focused much of their attention on agricultural productivity/intensification, profitability and on the adoption rate of mechanization by smallholders, all of which are beyond the scope of this study. None of the studies have paid attention to the involvement of women in the mechanization value chain i.e. as operators and how that could drive women empowerment.

For example, in Ghana, FAO and ECOWAS (2018) found that training on machine operation was mainly targeted at men and the machines were not gender-sensitive. This meant that most women could not participate in mechanization occupations. Consequently, they are not able to participate in the subsidized Agricultural Mechanization Services Centres (AMSEC) established by government between 2003-2007 where qualified private-sector companies are given an average machinery package (on credit) of five tractors and matching implements at a subsidized price and interest rate (Diao et al., 2014; Benin, 2015) because they don't have capacity. Therefore, the import, machines and parts, and maintenance and repairs businesses are often run by men with support from government. Responding to this, the MoFA established a Directorate of the Women in Agricultural Development (WIAD), which promotes gender inclusiveness in all programmes and projects. A study by Diao et al. (2014) indicated that most smallholders in Ghana preferred hiring tractors at market prices than owning one. Thus, there is an opportunity for smaller low-cost tractor imports and mobile hiring service businesses. Furthermore, Houssou et al. (2013) reported delays in repairs of

tractors due to shortage of spare parts and qualified mechanics in Ghana. Figure 2 below shows the phases in mechanization which women can take part in.

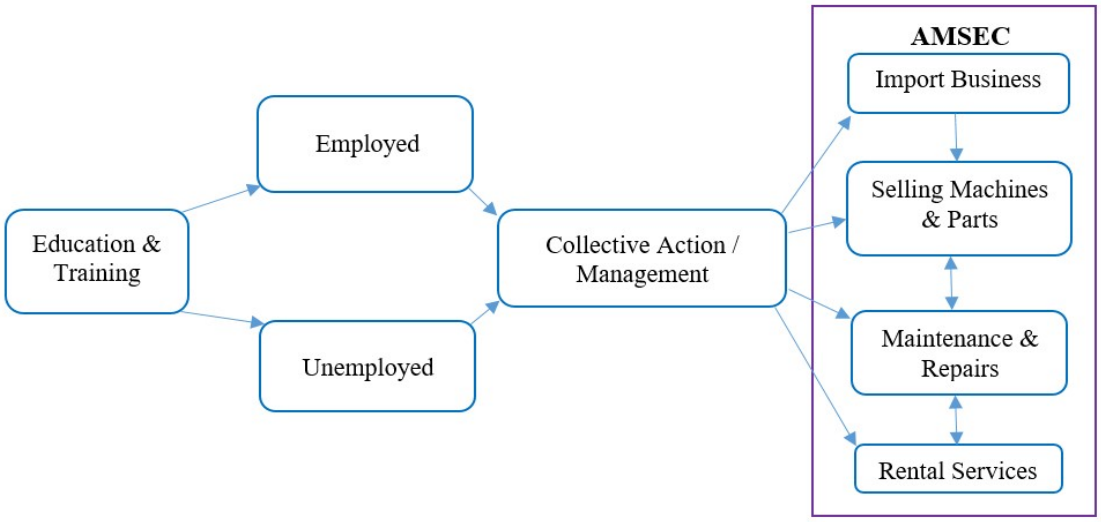

Figure 2. Opportunities for women in agricultural mechanisation value chain in Africa

Source: Author's own creation

There are many phases where women involvement could be improved in the mechanization value chain. So how can mechanization lead to women empowerment? In order to respond to this question. It is important to first unpack what women empowerment means. Women empowerment is a broad concept and the definitions for it differ in the literature depending on the sector (Kabeer, 1999; Akter et al., 2017). However, there are common themes which have emerged and are used by many researchers to measure/explain women empowerment (TWB et al., 2009). These themes mainly include economic, financial, human, physical, psychological, social, information, political and legal capital (Sharaunga & Mudhara, 2016; Bayissa et al., 2018). All these themes are what makes the concept of women empowerment complex and multidimensional, and as a result difficult to measure. Even though the economic component often gets preference from researchers, the other components are equally important on their own (Bayissa et al., 2018). Therefore, there is a need to unpack the other components of women empowerment, particularly psychological and social empowerment (WBG, 2015), so that they can also be evaluated and incorporated in policy.

In this study, women empowerment is viewed as a process which removes gender-based barriers preventing women to achieve their goals or aspirations using existing resources. Women empowerment enables women to gain a new self-identity. Building on the studies by Kabeer (1999), Mosedale (2005) and Cornwall (2016), this study will analyse the processes that help change the culturally embedded normative beliefs and understandings about gender and power (within, to, with and over) in relation to mechanization. It is important to gain a sense of the perceptions that women in mechanization have about their foreseen future possibilities and to critically assess the social or other dimensions that act as obstacles in their lives. Based on the authors'

knowledge, no study has looked at mechanization and women empowerment from this lens.

According to Fischer et al. (2018), low education levels and lack of technical skills limit women from using farm machinery. This then acts as a limitation in terms of how women frame their social realities (Cornwall, 2016). Certain cultural/traditional beliefs limit women from pursuing careers in mechanization, especially young women. It was for this reason that the Women in the Driving Seat (WiDS) project was created. WiDS project is a good example of a project that contributes to women empowerment in a sense that it challenges the gender stereotypes that are against women in mechanization. Therefore, this study will further capture the role of development practitioners in creating women empowerment projects. TWB et al. (2009) argue that one of the key constraints in implementing gender strategies is shifting staff perceptions who often think they know the problems of women. According to WBG (2015), it is important to have mechanisms that help to check and correct biases that the development professionals have in project design and implementation. These biases include the use of shortcuts in the face of complexity, selective gathering of information and continual support of dying projects. The design thinking approach offers a framework of how these biases can be mitigated.

Design thinking is a human-focused, systematic and collaborative approach for identifying and creatively solving problems (Luchs et al., 2016). It is generally used when tackling problems that have never been addressed before by gaining more insights on the needs of the people affected by the problem and involving them in solution design and implementation which is not a linear process. The design thinking approach has been championed by progressive companies and design consultancies in various disciplines including software development, engineering, anthropology, psychology, business (Luchs et al., 2016) and social services (Davis et al., 2016). The design firms like IDEO and frog, and academic institutions like Stanford's d.school, and the Rotman School of Management have advocated for its use. Consequently, the Deutsche Gesellschaft für Internationale Zusammenarbeit or German Development Cooperation (GIZ) has recently adopted the approach for development of new projects. However, it has not been used in designing agriculture women empowerment projects. According to Warnecke (2016), design thinking can be used to develop gender-sensitive programs. Therefore, this study will make a contribution in literature.

3. CONCEPTUAL FRAMEWORK

The four quadrants of change model developed by Ken Wilbur provides a framework that is suitable for this study (Walters, 2013) as it looks at the question of, (i) individual perceptions and capacity through personal development of mastery via courses and apprenticeships, (ii) how people understand and interact with each other through group encounters of exploration, (iii) collective values and beliefs through collective goal-setting, strategy creation and on-going media programs, and (iv) processes, institutions and power through building political structures, agreements, frameworks and systems. Similarly, the World Bank framework for understanding human decision making (WBG, 2015) corresponds well with the four quadrants of change model. For example, it proposes that the choices people have influence their behaviours (think automatically), people are influenced by the social norms and networks in their communities (think

socially) and exposing people to new experiences improves the mental models they use to aspire for positive change (think with mental models). Therefore, the four quadrants of change model fits well with what the study aims to achieve and has not been used in a similar context in the literature.

The design thinking approach consists of four (Warnecke, 2016; Luchs et al., 2016) or five (Plattner, *undated*) non-linear processes or stages, in practice and theory, respectively. The first stage is discover/empathise, which is an effort to identifying diverse voices and understanding the way they do things and why, how they think about the world or themselves and what is meaningful to them. The second stage is define, which is about providing a meaningful and actionable problem statement that describes the customer type, an unaddressed need, and the insight that explains why the identified need is especially worthy of addressing. The third stage is ideate, which is an idea generation process that provides the source material for building prototypes and getting innovative solutions into the hands of the users. The fourth stage is prototype/create and testing, which assesses whether a particular service or method of service delivery is better than other options, whether it addresses expressed concerns, what type of payment is most effective, and what means of communicating is ideal in order to come up with the best solution through iteration. The last stage is evaluate, which uses indicators to measure progress of the project. This study will evaluate the extent to which the practitioner was able to consciously or unconsciously apply these processes in the WiDS project.

4. PROJECT OVERVIEW

The selected case study is part of the GIZ Comprehensive Africa Agricultural Development Programme (CAADP) under Agricultural Technical Vocational Education and Training for Women (ATVET4W) module. ATVET4W was launched in 2016 with the aim of amplifying and transforming women's roles in agricultural production, processing and trade through skills development and gender-transformative approaches. The WiDS project was established by a GIZ staff member (project leader) based in Ghana in 2018 with the aim to sustainably drive women participation and leadership in the operation of agricultural machinery. It is being run in collaboration with MoFA and the focal person (agricultural engineer) is the coordinator of the project. The project has three main objectives, that is, (i) to improve skills and knowledge of beneficiaries in modern agricultural machinery available and their usage, (ii) to strengthen local support networks for breaking the barrier and myths surrounding the usage of agricultural machinery by women, and (iii) to improve socio-economic status of beneficiary women. These project goals are in line with the overall gender goals for a project proposed by TWB et al. (2009), namely, social balancing through awareness and sensitization, economic empowerment of women through their livelihood improvements, and promotion of village-level initiatives toward social issues.

From 06 September 2018 to 02 November 2018, the first pilot project trained 62 young women coming from 6 regions in Ghana, even though 133 women applied. About 42 of the women were later placed in 3 months internships to acquire a hands-on skill in operation, maintenance and management of the farm tractor and other agricultural machineries. The women that were selected in this project were selected based on the

following criteria: (i) must have access to a tractor (not compulsory), (ii) must be between 18-40 years, (iii) must be able to speak and write in English, and (iv) must have passion and interest for agriculture. In 2019, two pilot projects (phase 2 and 3) will be run and 120 more women (60 per phase) will be trained. GIZ is committed to sharing its experiences with the wider community and through this research which utilises qualitative data from the project, that objective will be achieved. This is a unique case study which got an Award for best skills development project at the Chamber of Agribusiness Ghana in 2018 and the selected theories have never been used in this field.

5. RESEARCH METHODOLOGY

5.1. Data collection methods

In order to address the research questions, the study makes use of the qualitative data which records people's judgements and perceptions about a given subject (TWB et al., 2009) instead of the quantitative data (i.e. the Women Empowerment in Agriculture Index-WEAI) which has been used to measure women empowerment in agriculture. Moreover, the WEAI was developed for farmers and in this case the young women that were trained don't necessarily come from a farming background or have farms. Essentially, the idea is to get the perceptions that participants have about issues concerning women empowerment (or womechanization), quantitative data falls short in capturing such information. Nonetheless, the study uses the variables captured in the quantitative studies or models to guide the qualitative approach taken.

According to TWB et al. (2009) and Akter et al. (2017), qualitative methods are the best approach to gathering data to improve understanding of socio-cultural norms and values that represent the surroundings of women and other factors that contribute to women empowerment. The primary data was collected using in-depth semi-structured individual questionnaires because insights or experiences, aspirations, processes, beliefs, power dynamics and behaviours that shift or explain consciousness of individuals are best captured qualitatively. The procedure recommended by Petrics et al. (2018) in conducting qualitative data on gender in the rural areas was adopted in this study. This includes explaining the purpose of the study and ethical procedures for the interviews (including right to decline or to withdraw at any time without any repercussions). Ensuring that the time and place was convenient for the participants and limiting their interviews to below 40 minutes. The women seemed happy to participate and eager to share their stories.

The project leader and coordinator were instrumental in locating and arranging meetings with the participants. In addition, they assisted in translating some of the questions and responses from participants. Since the participants were familiar with the project leader and coordinator, they were at ease or cooperative in sharing information with the researcher. Especially since the aim was not to evaluate the project, which might have potentially led to women not answering the questions fully and honestly. Women in the first phase were purposively selected based on their demography,

ensuring diversity of age, region where the participants are from and prior exposure to agricultural sector. This enabled the researcher in consultation with the project leader and coordinator to pick those most likely to share the most valuable data in order to discover patterns that emerge as recommended by Denscombe (2007).

Before conducting the interviews with the women, ethical clearance was obtained from the university Social Research Ethical Committee and the participants provided written consent. Out of 62 women that participated in the first phase, 24 of them were interviewed from 24 June- 04 July 2019. During the data collection period, the researcher was able to meet 6 women who were part of the second phase, as part of the site visits by the project leader and coordinator but these women were not interviewed. However, the researcher was able to make some observations and small conversations which were useful for the study. The 24 women interviewed came from 6 regions, namely, Greater Accra, Central, Ashanti, Bono East and Northern to ensure representativeness of the data, as demonstrated in figure 3 below in the map of Ghana. Some of the women not interviewed came from Savannah and North East, in addition to the already mentioned 6 regions.

Figure 3. Map of the sixteen administrative regions of Ghana

Source: Wikimedia Commons (2018)

5.2. Study limitations

The possible limitation of the findings is that due to the small sample size, they might not be generalizable (Bayissa et al., 2018). However, this limitation does not invalidate the findings of this study or its generalizability (Denscombe, 2007) as there are some measures put in place to mitigate it. In order to address this limitation, the project leader and coordinator were interviewed as key informants to get their perspectives on the project and to validate the results found from participants. According to TWB et al.

(2009), triangulation and consultation with independent or knowledgeable source helps to improve the reliability and validity of the data, especially when the sample size is small. In addition, when it comes to generalizing on the basis of case studies, some of the responsibility falls to the reader. The researcher kept an open mind to the findings and presented the findings to the ATVET4W team to get feedback of any bias observed. Moreover, the use of statistics representing the responses was not used to avoid a deceptive analysis of the findings.

In addition to the limitations and remedies already mentioned, the data collected captures the immediate responses at a point in time from the participants between 6-12 months after their training. Even though it would take years for them to see the real changes or benefits of the training in their lives and communities because change of behaviour takes time. However, this study seeks to capture some of the immediate responses which can later be checked for validity in the long-run. Future research can compare the short-run and long-run responses from participants to check their perceptions on womechanization. Due to time and resource limitations, there was no effort made to see if there are significant differences between the perceptions of participants and non-participants. Therefore, future research can take this into account. Given the small sample size, the findings of this study cannot be translated into policy, nonetheless, there are some insights which might be useful to guide future policy. For policy purposes, extensive quantitative and qualitative data would need to be gathered using gender-lens on mechanization landscape in Ghana. Another area that future research can look into.

6. RESULTS AND DISCUSSIONS

6.1. Women demographic and/ socio-economic status

The 24 participants/women in this study were from different backgrounds. They were between the ages of 20 to 40 years, 22 of them were below and 2 were above 35 years which is the cut-off age for being considered as a youth. The women came from 6 different regions as indicated in figure 3 above and the type of areas they came from were rural, peri-urban and urban. They had to relocate to various rural parts of the country where the commercial farms are based. Amongst the participants, 5 of them were mothers and 2 of them were married. Before the training, the women held various occupations within agriculture as traders of processed agricultural products or cereals and agrochemicals, and some were students. While others outside the agricultural sector were traders or small business owners of clothes and cosmetics, seamstress, secretary for municipality and graphic designer. The women get financial support from doing these activities. Most of the women (7) were working permanently/on-contract as tractor operators after the training and others were still looking for a job as a permanent tractor operator. There were only 2 women that were looking for employment but not participating in any economic activity and they were financially supported by their parents.

6.2. The four quadrants of change approach to women empowerment

6.2.1. Psychological change through personal development

Before the training, most of the women had no prior experience of operating a tractor and they had never seen a woman operate a tractor. The idea of a women operating a tractor was all new to them and because of this, all the women were afraid of operating the tractor. This was expected as new ideas have a lot of uncertainties which lead to people being afraid. For example, one of the women expressed that:

I didn't have any idea about tractor driving and I used to just see it making noise on the road. But after seeing the training advertisement, I decided to try it out. Now I see it as a normal thing which is not hard to do. You just need to encourage yourself and focus.

It was only after the training that the women became more confident in themselves and comfortable with the idea of a women operating a tractor. The fact that they have passion for agriculture enabled this to happen. This is consistent with the human decision-making framework by the WBG (2015) which states that exposing people to new experiences enhances their mental models that help them aspire for positive change and this leads to changes in people's behaviour as it opens new choices or opportunities that they couldn't imagine before. A women who is a graphic designer, for example, said that:

I love agriculture but I was born in a city and didn't get a chance to do agricultural related things when I was growing up but when I saw the advert I was very happy because it was an opportunity for me to participate in agriculture.

Even though women feared the idea initially. There were two reasons why they decided to go through the training, namely, to access employment opportunities and to use the skills gained in the family farms and/ own farms in future. The women indicated that they had the power to make choices for themselves like choosing to participate in the project. In addition, most women saw the training as a good opportunity to diversify their source(s) of income. They have plans of remaining as traders and venturing into other businesses within mechanization like selling spare parts and offering hiring services. Consequently, the training has boosted their confidence and resilience to the extent that they now believe that there is nothing they can't do just because they are women. One of the women even indicated that, '*Tractor operation is a field dominated by men and I wanted to prove that I can do the same work as a man*.' Moreover, the project leader was impressed by the level of commitment and confidence on the machine shown by women, even the fact that they were able to relocate to remote areas and be able to complete the program. Especially since women are generally known to be less mobile.

The project has created a new self-identity for women as tractor operators, particularly those that have been offered employment. All the women were willing to be mentors to other women wanting to do the training. This is consistent with the finding by TWB et al. (2009) that women are willing to share knowledge and information with others. The advice given by most women to women that would like to do the training was that they should leave the mind-set that women are weak, should not be dependent on anyone, should be forceful and pursue opportunities with an open mind, and having children shouldn't hinder them from pursuing their dreams. Currently, all the women now have hopes of one day owning a tractor, some have not made plans on how they

can achieve this, but others have already started looking for sponsors to assist them. This is an indication of the change in women's agency (Mosedale, 2005) which now is moving towards obtaining access or ownership of resources that they were previously not able to get hold of because of their gender (lack of knowledge and skills) and economic status. However, their economic status has a long way to go before it can enable them to acquire machinery and they would need further support in that regard.

6.2.2. Inter-personal change through relationships and personal networks

Without the personal networks, most of the women would have not been aware of the training opportunity. Most of them heard about it mainly from friends and family members, who saw the opportunity on the newspapers and on TV. Often, the same friends and family members are the ones that support the women with advice and encouragements when they pursue their goals. However, in pursuit of their goals, particularly in male dominated fields, women must learn how to cope in the new environments. At times, the women would face the challenge of men who see them as a threat to their positions during the placements, even when they get hired. Especially since the women would have tractor operation licenses and most of the men don't have them, even though they have more experience. One of the women shared that, '*Most men were shocked when they saw women driving tractors and felt intimidated, as a result they were hesitant in giving them the opportunity to drive tractors during placements*.' The women were placed in places where they were the only women in the field/farm. Hence, most of them were placed in pairs for them to give support to each other.

For women to thrive in such environments, they need to learn to build relationships with men so that they can learn from their experiences and share with them duties which need physical strength. Some of the women had to hide things they didn't know to avoid being seen as incompetent by men in the field. One woman emphasised that, '*In the field women should respect the men so that they can learn as much as possible from them which will enable them to get good experience*.' According to WBG (2019), developing socio-behavioural skills such as aptitude for teamwork, grit, empathy, conflict resolution, and relationship management enlarges a person's human capital. Therefore, the fact that the women were able to thrive in such environments was an indication that they improved their human capital during the placements. Especially since they relocated and were in a new place and had to adapt to new people and their cultures.

6.2.3. Social and cultural change through collective values and beliefs

There are many stereotypes that exist in society about tractor operation. It is believed that it is a men's job because of the physical strength required, even though the modernised tractors don't need physical strength. As a result, women are seen as disturbances by some men. Others believe that, if a woman operates a tractor their wombs will be affected. This has resulted in women not being trained in tractor operation. Interestingly, some of the women were encouraged by their male friends or family members to do the training when one would have thought they would also hold the same beliefs. This was interesting because women and youth are often encouraged

to take opportunities outside the agricultural sector in the cities. It was revealed that those men that didn't believe in those stereotypes were coming from an agricultural background. Unexpectedly, a woman in HR for a commercial farm with 700 employees that hired a women tractor operator also shared that she had to convince her father when she decided to move from city to rural area to work for an agricultural company.

Coincidentally, during the data collection phase a husband for one of the married women was met and asked about his views on his wife operating a tractor. He said that:

Initially when she started the application, I was a bit sceptical about it as I had never heard about women operating tractors. But when they started the training and she told me about what was happening. I became comfortable and the attachment boosted my perception about women doing male jobs. I am happy because when she gets a job, she will able to support the household financially as well.

This indicates that involvement of women in mechanization has helped to create two roles for the women, namely, as professionals and homemakers. For most women, having a place that would care for their children during the training would have enabled them to keep a good balance between these two roles. According to TWB et al. (2009), the diverse parts of women's work and lives are intertwined, and it is best to deal with their issues holistically. For examples, some women were bringing their children to the training and the trainers assisted in looking after the children. It is also important for women to have support from their partners.

Nonetheless, for many people, these stereotypes were challenged when they saw the women operating the tractors. All the women indicated that people saw them differently when they knew they could drive the tractor or when they saw them driving the tractor. Others would ask them where they learned to drive and how they got their licenses. When other women saw women operators, they asked them how they could also learn how to operate the tractor. Moreover, the women that had participated in the training were also sending their friends to apply for the training. This finding corresponds with the human decision-making framework by the WBG (2015) which states that people are influenced by the social norms and networks that they are exposed to in their communities. One of the women that had recently got a job shared an interesting story. She said:

In my office they just give me tractor and say I must plough. People are surprised when they see me do it. Now they call me operator, I'm no longer known by name in the office.

Therefore, the choices that women made to become tractor operators have challenged and destabilised some of the social inequalities that existed within the sector and in the society. This is indicative of what women empowerment also means besides just focusing only on quantitative measures of it (Kabeer, 1999).

6.2.4. Structural/systematic change through decision-making processes and institutions

All the women were part of the social group called Women in Tractor Operation Association (WTOA) which aims to create more awareness about opportunities in

mechanization and to encourage more women to participate in it. Also, to mobilise/lobby government for inclusion and support in mechanization opportunities. Only 4 women were part of other social groups like church, school and women groups, in addition to WTOA. The women were encouraged to start the association by the minister and were assisted by him to do the registration. This was done with the support from WIAD. Therefore, with the political will from the political leaders, the women can now be represented and involved in the decision-making processes that have to do with agricultural mechanization in Ghana. This is an indication through involvement of women in mechanization, gender mainstreaming and awareness building in the country have made possible. Moreover, women's equitable participation and benefit sharing which is critical for a gender strategy (TWB et al., 2009) and women empowerment (Cornwall, 2016) has improved. According to most of the women, government supports women in their villages with training, subsidised inputs and financial support. Moreover, they are hopeful that government will ensure their inclusion in future mechanization plans for the country.

The project leader indicated that MoFA is targeting to import about 3,000 tractors in the coming years as part of the 'planting for food and jobs' initiative to commercialise agriculture in the country. However, this number is lower than that which was targeted for Nigerian AMSECs which is about 5,000 (Takeshima et al., 2015) but this indicates the potential that exists for the AMSECs in Ghana. As part of that, MoFA is targeting to train 1,000 women as operators and trainers. In addition, the project coordinator mentioned that the engineering department is currently working on a policy document relating to establishment of AMSEC and the key issue that has been coming up is how women can be involved. While government wants private sector to lead AMSEC. Once they are established, government will connect the women with the AMSEC where they could work as supervisors, managers and operators. All depending on their interests, experience and qualifications. As a result, there is a huge potential for women in the AMSEC and the timing is right for WTOA to ensure that women make the best out of the opportunities that will emerge. Therefore, the increasing demand for training and access to tractor ownership calls for more support needed to ensure women involvement.

AMSEC's have over the years increased from 12 in 2008 to 88 in 2011 leading to about 500 tractors being distributed all over Ghana (Benin, 2015). Therefore, AMSEC's hold a huge potential for young women inclusion in the agricultural mechanization value chain. The training of women to be tractor operators was the beginning of giving women access to this sector as players or service providers not as receivers of services as is the case for smallholders that are fortunate to have access. The next steps would be to ensure that in the AMSEC policy, a certain percentage of women participate in them and are capacitated in areas that they lack in. In this way younger women will be interested in agriculture and will participate in its development. The same way as the training in tractor operation has been able to empower women and increase their interest in the sector. According to Bishop (2019), in order to ensure that rural young women are included in the economy, rural transformation must be made to happen and will not happen automatically. In the case of Ghana, since government is at the core of driving the AMSECs, they have the power to drive this change.

6.3. Design thinking approach for women empowerment projects

The WiDS project was developed with a budget limit of €50,000 in 2018 for 1 year. However, the project led to 2 additional phases due to demand and the need to gain more data about this project. Extension of budget and timeline of the project was due to innovation not poor planning or execution of the project. Iterations are indicative of a project developed using design thinking approach. According to Davis et al. (2016) and Luchs et al. (2016), for design thinking projects with ambiguously defined problems and opportunities to be successful they need supportive management and organizational culture, and flexibility in time and finance. All of which the project leader had from GIZ. Figure 4 below illustrates the timeline and processes of the project. In 2017, the project leader was tasked to develop a project that is gender transformative or empowers women. Consequently, the project leader discovered that there was a huge challenge of access to mechanization, particularly tractor operation profession, by women after reading a World Bank report. In line with the framework by Warnecke (2016) on empathising, the project leader investigated what was known about the problem, identified people to learn from and chose a method of engagement.

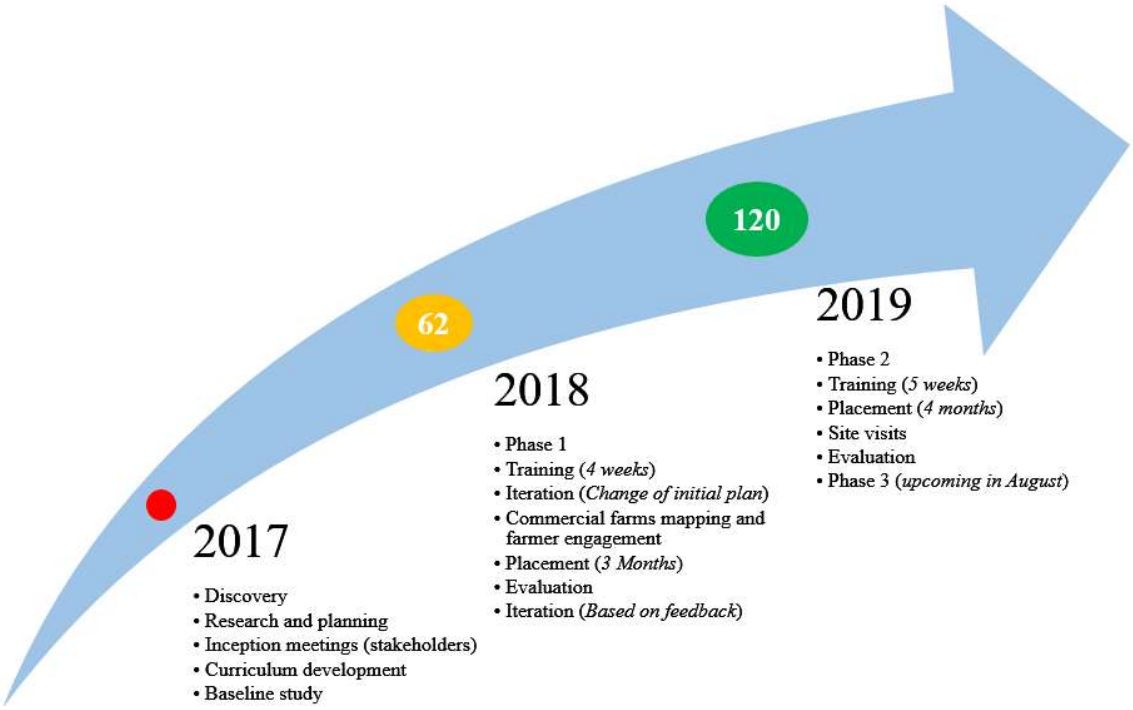

Figure 4. Processes and timeline of the Women in the Driving Seat project

Source: Author's own creation

When the project leader realised this gap, the Engineering Services Directorate for MoFA was running a project funded by Japan International Cooperation Agency that was training tractor operators and it ended in 2018. This was because most of the operators were learning to operate tractors through practice without any theoretical background and this led to shorter lifespan of the machines. According to the coordinator, in about 700 of the operators and farm managers that were trained, 1-3% of them were women who came as farm managers not operators. It was from those trained women that the project leader and coordinator saw it was possible to do a project targeting women. The

plan was to utilise the already existing resources and agricultural mechanization training centres to train the women. According to Warnecke (2016), projects work best when supported by public policy, existing complementary projects and supportive social norms. In this case, even though the gender policy was not there, government does have a strategy and directorate for women. Moreover, a similar project was already being done in terms of training operators but not targeting women. However, the social norms were not in their favour due to negative stereotypes that exist. Hence, the WiDS project was initiated.

After the tentative plan was in place for why the project was important, what the project would do and how it was going to be executed. The idea was presented to the stakeholders during the inception meetings in order to give them an opportunity to make contributions on the project concept. This was one of the key success factors according to the project leader and coordinator. In the stakeholder engagement process, equity and diversity was ensured to allow for co-creation, including the occasional participation of subject matter experts in meetings. As suggested by Davis et al. (2016) and Luchs et al. (2016) for design thinking projects. The selection criteria and monitoring and evaluation (M&E) sheets were developed collaboratively in this process. To ensure ownership by MoFA, the responsibility to select participants', to do M&E and to communicate with stakeholders was theirs. This was important as it prevented the project being seen as an external project by government officials and stakeholders. MoFA was also responsible for providing accommodation, training, institutions and tractors for project participants. While, GIZ was responsible for providing food during training, training materials and driving licenses after the training. It is important for international partners not to be ahead of the national organisations or users but to let them lead in order to ensure sustainability of the projects. An important approach which is critical in design thinking.

Initially, the idea was just to provide training only. However, in the second week of the training, a participant expressed to the project leader that she had a family and hoped that she would find employment after the training. As noted by Warnecke (2016), it is not enough to give women skills/knowledge without providing them with a platform where they can put those skills into action. Especially since women are often perceived in a negative light when it comes to mechanization. Luchs et al. (2016) argue that the user inputs are critical for any service and should not be seen as a disruption to smooth processes but rather, they should be seen as an opportunity to enhance the users' experience. This is what led to the first iteration, as the project leader immediately had to hire a consultant to map and engage the commercial farms that had the potential to place/attach the trained women. This process was a success as all the women got 3 months placements. This was the turning point for the project and it was a highlight for both the project leader and coordinator. It led to some women being fully employed in the farms they were placed in, which was something they never expected when they started. Furthermore, this action opened a space for discussions on women issues in the sector.

Evaluation of phase 1 was done at the end of the placement period and based on the feedback that was received, more iterations were applied in phase 2. As noted by Luchs

et al. (2016), the number of iterations in design thinking depends on the project and is unknowable at the initiation of a project. The feedback came from the participants and farmers. The period of the training was extended from 4 to 5 weeks in order to include training on using a trailer and soft skills. The period of the placements was also extended from 3 to 4 months and the timing of the placements had to be appropriate based on farming activities. This is consistent with the fact that demand for mechanization services can be highly seasonal (Takeshima et al., 2015). Lastly, farmers requested the project leader and coordinator to do mid-placement check-ups to track how the women were doing before the final assessment. In order to pick up challenges and address them before the assessment, and to build relationships with the farm managers. This study was conducted in conjunction with these mid-placement check-ups. The lessons from phase 2 would be applied to phase 3. According to Luchs et al. (2016), it is a project leader's role to decide when to move beyond concept evaluation within the design thinking framework into a more traditional linear product development process once the concept has been sufficiently described and evaluated.

7. CONCLUSIONS

The Malabo plans of reducing poverty by creating inclusive agricultural growth and transformation through increasing youth engaged in agriculture and women participation in agribusiness, can be achieved by using mechanization as one of the driving forces. While there has been a strong push to mechanize agriculture in Africa by the AU. There has not been a conversation on who is going to operate those machines that will largely be imported and how they are being prepared for this change. Though there is a call eradicate the use of the hand hoe, there is a need to change the face of tractor operators and/owners in the continent. This study proposes womechanization as a way to go. Attracting young women from both rural and urban areas to participate in the agricultural sector. Youth shouldn't be painted with the same brush as there are those that still have an interest in agriculture when there are attractive opportunities. Through the WiDS project, women gained new interest in agriculture, it gave them a new dual self-identity as professionals and homemakers, and it dismantled negative stereotypes about women in mechanization. In the case of Ghana, young women now have representation and can contribute in matters relating to mechanization in the country which is shifting the power dynamics. Especially since the country is gradually increasing its tractors.

As the number of AMSECs increases in the country, there is a need to do research on the women participation in them thus far, so that if there are barriers they can be addressed. In tractor operation, women were afraid in the beginning, but through exposure and practice they were able to gain confidence in their newly acquired skills. Which enabled them to want to explore other opportunities within mechanization that will allow them to diversify their income sources. This was in addition to the support they got from personal networks. As a result, a need exists to integrate more women in the mechanization value chain. Womechanization brings about a triple thread mind shift for participants, practitioners and community members. Which is adds to the fact that women empowerment is not just about economic empowerment alone. Development practitioners by themselves cannot fully understand the different challenges that exist

in different contexts, especially for women empowerment projects. The design thinking approach checks and corrects any biases by practitioners in project design and implementation. This is done through stakeholder engagement ensuring equity and diversity, and integrating user feedback to the project through iterations. While also, ensuring that local stakeholders take full ownership of the project. This opens space for discussions on issues that have to do with women empowerment. Therefore, in order to drive womechanization successfully, a design thinking approach is needed.

8. RECOMMENDATIONS

8.1. Government

- There is a need to support women in initiatives that will help them diversify their incomes and improve their family farms.
- Holistic policies that consider dual role of women as professionals and homemakers are needed, especially for training institutions training women and they should have empathetic training when working with women.
- A gender lens is needed in the promotion of the AMSECs, especially in terms of tractor operators (at least 40-60% of imported tractors) and tractor ownership (at least 20-30% of imported tractors). There needs to be a budget allocated to WIAD for this as a commitment from government to women empowerment.
- Campaigns creating awareness on opportunities in agricultural mechanization or agriculture in general are needed (i.e. videos showing women operating a tractor). In addition, to the political will already demonstrated.
- Private sector must be engaged as part of their community support initiatives in the communities they are working in to absorb more women in their agri-businesses.

8.2. GIZ or External partners

- Sustainable exit strategy is needed, to ensure that the project runs without GIZ funding or support. Alternatively, GIZ or external partners, must consider doing a standalone project that will run for 3-5 years to promote women inclusion in the AMSECs which are rapidly increasing. This would change the face of mechanization in Ghana and would serve as an example for other African countries. Think Womechanization!
- Women trainings should cover topics on how to build strong networks and relationships with men in the workplace, how to negotiate with their husbands or fellow employees, how to work in a team and how to deal with conflict or inappropriate behaviour from co-workers.
- Design thinking approach is best for women empowerment projects. A supportive management and organisational culture, and flexible timeline and budget like ATVET4W programme has in its projects is needed. There should be no stigmatisation of failure. Stakeholder and user engagement and contribution in project concept is critical.

9. REFERENCES

Akter, S., Rutsaert, P., Luis, J., Me Htwe, N., Su San, S., Raharjo, B. and Pustika, A. 2017. Women's empowerment and gender equity in agriculture: A different perspective from Southeast Asia. *Food Policy* 69: 270–279.

Alkire, S., Malapit, H., Meinzen-Dick, R., Peterman, A., Quisumbing, A., Seymour, G. and Vaz, A. 2013. *Instructional Guide on the Women's Empowerment in Agriculture Index*. Retrieved from: http://www.ifpri.org/publication/womens-empowerment-agriculture-index (12/07/2019)

AU. 2018. *AUC launches the Sustainable Agricultural Mechanization Framework*. African Union (AU). Press Release №162/2018.

Bayissa, F.W., Smits, J. and Ruben, R. 2018. The Multidimensional Nature of Women's Empowerment: Beyond the Economic Approach. *Journal of International Development* 30: 661–690.

Benin, S. 2015. Impact of Ghana's agricultural mechanization services center program. *Agricultural Economics* 46 (supplement): 103–117.

Binswanger, H. 1986. Agricultural Mechanization: A Comparative Historical Perspective. *Research Observer* 1(l): 27-56.

Bishop, C. 2019. *Enabling young rural women to participate in rural transformation in East and Southern Africa*. Rome, FAO. Licence: CC BY-NC-SA 3.0 IGO.

Cornwall, A. 2016. Women's Empowerment: What Works? *Journal of International Development* 28: 342–359.

Davis, J., Docherty, C.A. and Dowling, K. 2016. Design Thinking and Innovation: Synthesising Concepts of Knowledge Co-creation in Spaces of Professional Development. *The Design Journal* 19(1): 117-139.

Denscombe, M. 2007. *The Good Research Guide: for small-scale social research projects*. Third Edition. Open University Press, McGraw-Hill Education.

Diao, X., Cossar, F., Houssou, N. and Kolavalli, S. 2014. Mechanization in Ghana: Emerging demand, and the search for alternative supply models. *Food Policy* 48: 168–181.

FAO and AUC. 2018. *Sustainable Agricultural Mechanization: A Framework for Africa*. Addis Ababa. Licence: CC BY-NC-SA 3.0 IGO

FAO and ECOWAS. 2018. *National Gender Profile of Agriculture and Rural Livelihoods – Ghana*. Country Gender Assessment Series, Accra. Food and Agriculture Organization of the United Nations (FAO), or of the Commission of the Economic Community of West African States (ECOWAS)

FAO. 2006. *Farm power and mechanization for small farms in sub-Saharan Africa*. Food and Agriculture Organization of the United Nations, Rome. Agricultural and Food Engineering Technical Report 3.

FAO. 2008. *Agricultural mechanization in sub-Saharan Africa: time for a new look.* Food and Agriculture Organization of the United Nations, Rome. Agricultural Management, Marketing and Finance Occasional Paper 22.

FAO. 2018. *Empowering Rural Women, Powering Agriculture*. FAO's work on Gender. CA2678EN/1/12.18

Fischer, G., Wittich, S., Malima, G., Sikumba, G., Lukuyu, B., Ngunga, D. and Rugalabam, J. 2018. Gender and mechanization: Exploring the sustainability of mechanized forage chopping in Tanzania. *Journal of Rural Studies* 64: 112–122.

Houssou, N. and Chapoto, A. 2014. *The Changing Landscape of Agriculture in Ghana: Drivers of Farm Mechanization and Its Impacts on Cropland Expansion and Intensification*. IFPRI Discussion Paper 01392.

Houssou, N., Diao, X., Cossar, F., Kolavalli, S., Jimah, K. and Aboagye, P.O. 2013. Agricultural Mechanization in Ghana: Is Specialized Agricultural Mechanization Service Provision a Viable Business Model? *American Journal of Agricultural Economics* 95(5): 1237-1244.

Kabeer, N. 1999. Resources, agency, achievements: reflections on the measurement of women's empowerment. *Development and Change* 30: 435–464.

Luchs, M.G., Swan, K.S. and Griffin, A. 2016. *Design Thinking: New Product Development Essentials from the PDMA*. John Wiley & Sons, Incorporated.

MMP. 2018. *Mechanized: Transforming Africa's Agriculture Value Chains*. Malabo Montpellier Panel (MMP) Report.

Mosedale, S. 2005. Assessing Women's Empowerment: Towards a Conceptual Framework. *Journal of International Development* 17: 243–257.

Petrics, H., Barale, K., Kaaria, S.K. and David, S. 2018. *The Gender and Rural Advisory Services Assessment Tool*. FAO. Licence: CC BY-NC-SA 3.0 IGO.

Plattner, H. Undated. *An Introduction to Design Thinking: Process Guide*. Institute of Design at Stanford.

Sharaunga, S. and Mudhara, M. 2016. Dimensions of Empowerment Influencing Women in KwaZulu-Natal to diversify away from agricultural-based livelihoods. *Agrekon* 55(1-2): 103-132.

Takeshima, H., Edeh, H.O., Lawal, A.O. and Isiaka, M.A. 2015. Characteristics of Private-Sector Tractor Service Provisions: Insights from Nigeria. *The Developing Economies* 53(3): 188–217.

TWB, FAO and IFAD. 2009. *Gender in Agriculture Sourcebook*. Agriculture and rural development. The World Bank (TWB), Food and Agriculture Organisation (FAO) and International Fund for Agricultural Development (IFAD).

Walters, H. 2013. Making sense of complex multi-stakeholder systems change by using the four quadrants model. *Knowledge Management for Development Journal* 9(3): 153-166.

Warnecke, T. 2016. Capabilities, human development, and design thinking: a framework for gender-sensitive entrepreneurship programs. *Review of Social Economy* 74(4): 420-430.

WBG. 2015. *Mind, Society and Behaviour*. World development report. World Bank Group (WGB).

WBG. 2019. *The changing nature of work*. World Development Report.

Wikimedia Commons. 2018. File:2019 Regions of Ghana.png. Retrieved from: https://commons.wikimedia.org/w/index.php?title=File:2019_Regions_of_Ghana.png&oldid=332717062 (12/07/2019)