

**EVALUATING FACTORS INFLUENCING USE OF MAIZE CROP PROTECTION
EQUIPMENT BY WOMEN IN SHAMVA DISTRICT**

JONGWE MERCY

B1335357



BINDURA UNIVERSITY OF SCIENCE EDUCATION

A DISSERTATION SUBMITTED TO THE FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCE DEPARTMENT OF AGRICULTURAL ECONOMICS, EDUCATION AND EXTENSION IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE IN FOOD SECURITY AND SUSTAINABLE AGRICULTURE (PRODUCTION)

SUPERVISOR: DR R. CHIVHEYA

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RELEASE FORM

Name of Candidate: MERCY JONGWE

Reg Number: B1335357

Degree: Master of Science Degree in Food Security and Sustainable Agriculture in Production.

Project Title: Evaluating factors influencing use of maize crop protection equipment by women in Shamva district.

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The undersigned certified that they have supervised and recommended to Bindura University of Science Education for acceptance of dissertation entitled '**Evaluating factors influencing use of maize crop protection equipment by women in Shamva district.**' submitted in partial fulfilment of a Master of Science Degree in Food Security and Sustainable Agriculture in Production.

Name of supervisor: Dr R. Chivheya

Signature.....

Date.....

DECLARATION

I hereby declare that the research project entitled “**Evaluating factors influencing use of maize crop protection equipment by women in Shamva district.**” submitted to Bindura University of Science Education, Department of Agriculture Economics, Education and Extension is a record of an original work done by me under the guidance and supervision of **Dr Renias Chivheya** and this work is submitted in partial fulfilment of the requirements for the award of a Master of Science Degree in Food Security and Sustainable Agriculture. The results embodied in this thesis have not been submitted to any University or Institute for the award of any degree or diploma.

Author.....JONGWE MERCY.....

Reg Number...B1335357.....

Signature.....

Date.....

DEDICATION

I dedicate this study to my dearest husband Nelson Zinyembe and my children Vanessa, Nelson (junior) and Munenyasha.

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I am greatly indebted to the Almighty God who gave me the ability, strength and endurance to write and finish this thesis. This thesis would also not been a success without the help of my supervisor Dr Chivheya, who has offered professional supervision and unwavering guidance. Much appreciation also goes to the staff at Shamva district, ward 11, 12 and 13 extension officers and village leaders for their support during fieldwork. I also recognise with many thanks all the participants of this study who sacrificed their time answering questions.

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ABSTRACT

The agricultural sector in most developing countries is under performing because the women involved face constraints that reduce their productivity. Women farmers in Shamva District of Zimbabwe are not immune to these constraints and face the challenges of use of crop protection equipment. The study evaluated women's attitude, assessed knowledge, evaluated socio-economic, cultural and institutional factors determining women farmer's use of maize crop protection equipment in Shamva District. Purposive sampling Method was used to select 3 wards that are accessible at district level. Random sampling was used to select 400 communal women farmers who are actively involved in maize crop farming at ward level. Pre-tested structured questionnaires were used to collect data from the farmers. The questionnaires had items for evaluating attitude, assessed knowledge, evaluated socio-economic, cultural and institutional factors determining women farmer's use of maize crop protection equipment. The data was analyzed using descriptive analysis tabulations and chi-square test, mode on a 5 point likert and binary logistic regression analysis. We found out that women farmers in Shamva District have significant positive attitudes ($p < 0.05$) towards manually operated tools such as a hand hoe and negative attitudes ($p < 0.05$) on the use of conventional maize crop protection equipment such as boom sprayer. The results indicated that a significant number (58.6%) of the farmers interviewed have adequate knowledge and skills on the use of traditional maize crop protection equipment which is obtained through field days, demonstration sites and Agritex extension workers. However, most women farmers in Shamva have little or no knowledge and skills on the use of conventional maize crop protection equipment. They also do not know channels to follow when looking for credit lines. The binary logistic regression model revealed that source of income ($p = 0.000$), income from the sale of maize ($p = 0.081$), level of income for the farmer ($p = 0.060$), demonstration ($p = 0.091$), Cultural or traditional beliefs ($p = 0.084$) and advice received from other farmers ($p = 0.019$) have a positive statistical significance in influencing the use of maize crop protection equipment by women farmers in Shamva.

Keywords: Maize Crop Protection Equipment, Knowledge, Attitude, Cultural-Socio-economic-factors, Women.

LIST OF ACRONYMS AND ABBREVIATIONS

AGRITEX	Agricultural Technical and Extension Services
FAO	Food and Agricultural Organisation
KAP	Knowledge Attitude and Practice
MCPEs	Maize Crop Protection Equipment
NGOs	Non-Governmental Organisations
SPSS	Statistical Package for Social Statistics
SSA	Sub Saharan Africa
WB	World Bank
WHO	World Health Organisation

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

In developing countries, women make up around 43 percent of agricultural labor force of which Latin America ranges from around 20 percent and almost 50 percent in Eastern and Southern Asia and Sub-Saharan Africa (FAO, 2011). Ahmed *et al.*, (2012) are also of the view that, rural women contribute significantly to agricultural labor force in many African countries. However rural women, usually produce low yields as compared to their male counterpart due to several factors that include lack of resources, skills, knowledge and norms. FAO, 2011; Mehra and Rojas, 2008; World Bank, 2009; accept that one of the main reasons for the underperformance of agriculture in developing countries is that women do not have equal access to resources and opportunities needed for increased agricultural production. According to Tiruneh *et al.* (2001), in Ethiopia, female-headed households have 35 percent lower value of output per hectare than males. Horrell and Krishnan (2007) noted that in Zimbabwe, households of widows or de jure female-headed households produce lower yields.

In Zimbabwe, agriculture provides livelihoods to more than 70% of the population and services and more than a quarter of the population are in formal employment, (GoZ, 2004). Zimbabwean food security basket is made up of a number of crops which include maize (*Zea mays*), sorghum, finger millet, pearl millet, sweet potato and Irish potato (ZIMVAC, 2014). Maize is the most important grain in Zimbabwe (staple food) and across the sub-continent, contributing over 60 percent of the calorie intake in East and Southern Africa, (Smale and Jayne, 2003).

As a result of urban migration mainly by men, the proportion of women in farming has increased. Some women manage whole farms as female household heads while others manage individual plots within male-headed households. According to the GoZ (2004), Zimbabwe requires about 1.5 million metric tonnes of maize per annual to satisfy human consumption, with extra 350,000 metric tonnes for livestock feed. In order to meet the demand, maize should constitute about 80 percent of the total cereal production, (Davis *et al.*, 2016). Considering the need to produce more maize, farmers have adopted strategies to increase maize crop productivity that include agrochemical usage, intensive use of land, irrigation, disease and pest resistant varieties.

According to Omari (2014), agrochemical is any chemical that is used in agricultural production to improve productivity and control of pest and diseases. Agrochemicals include fertilizers, pesticides such as weedicides, insecticides, rodenticides, and fungicides as well as plant regulators. Agrochemicals can be used in maize production in an attempt to control pests such as stem borers, armyworms, silkworm, and weevils, weeds, and diseases that include downy mildew, maize rust, leaf blight, and leaf spot, in order to enhance maize productivity.

Climate change has also contributed to an increase in pests and diseases mainly due to high temperatures and variable rainfall patterns, (Heisey and Rubenstein, 2015). Due to high prevalence of pests and diseases, most women in rural areas have been limited to the use maize protection equipment to administer agrochemicals for increased productivity. Crop losses due to pests and diseases can be substantial and may be prevented or reduced by crop protection measures. In Zimbabwe some women are using maize protection equipment such as sickles, slashes, hand hoes, hand sprayers, knapsack sprayers, boom sprayers and tractor drawn sprayers of which some of them are not women friendly. According to Khadatkar *et al.*, 2014, different farming tools or equipment are to some extent earlier designed for men workers but not suitable for women. As a result of use of women unfriendly equipment, the output is lower and many occupational health problems also crop up.

Women have been exposed to several health problems which include musculoskeletal problems (arthritis and backache) in the long run due to use of unfriendly equipment. According to Jyotsana *et al.*, (2005), the root cause of suffering of farm women is ignorance, age-old methods of doing work, inappropriateness of technology and attitudinal constraints. Some of the old fashioned methods and use of traditional tools or equipment make women adapt to bending or squatting posture which results in them suffering from back pain, knee pain and injuries while operating them, Khadatkar *et al.*, 2014. This unnatural posture also increases women physiological workload which hence expose them to many types of musculoskeletal problems result in their work decreasing to a greater extent. It is therefore, necessary to make the equipment suitable for women workers and due attention needs to be given, to match their capabilities and limitations, (Gite and Singh, 1997). The present study will evaluate factors influencing use of maize crop protection equipment by women in Shamva District, Mashonaland Central Province of Zimbabwe.

1.2 PROBLEM STATEMENT

The use of proper agricultural equipment and tools for small-scale intensive crop production contributes to the feasibility of the farm by improving production effectiveness. Maize protection equipment are necessary for activities such as plant pest and disease control. In Zimbabwe, women form the majority of rural dwellers and they play an important role in the agricultural sector. Most men are migrating to urban areas in search of jobs in order to increase household income and this has left most women responsible for all farm activities.

Women in the maize production sector use herbicides to control weeds and pesticides to control pests. However, the majority of women in the rural areas fail to use maize protection equipment due to lack of skills or knowledge, low income and norms and values.

1.3 RESEARCH OBJECTIVES

1.3.1 Main objective

To evaluate the factors that influence use of such maize crop protection equipment by women in Shamva district.

1.3.2 Specific objectives

1. To assess women attitude on maize protection equipment used in Shamva.
2. To assess women knowledge on maize protection equipment used in Shamva.
3. To evaluate the factors that influence women practice of maize crop protection equipment in Shamva district.

1.4 RESEARCH QUESTIONS

1. What are the attitudes of women in Shamva on maize crop protection equipment?
2. Do women in Shamva have knowledge on maize crop protection equipment?
3. What are the factors influencing women practice of maize crop protection equipment in Shamva district?

1.5 JUSTIFICATION

Women face a number of challenges such as lack of inputs, land, equipment, capital, skills, knowledge and opportunities which impede their effectiveness in agricultural production (Karl, 2009; Kayarkanni, 2012 and FAO, 2011). Many of the maize protection equipment used by farmers are not women friendly as they pose several physiological effects to them. A closer on the maize protection equipment used by women has to be taken into account in order to reduce these effects and promote increased production. Some of the root cause of suffering of farm women use (missing text) of age-old methods of doing work, inappropriateness of technology and use of unfriendly agricultural equipment such as knapsacks and hand hoes. When conducting some of the farm activities women adapt unnatural body posture which result in their physiological workload increasing. Women face several types of musculoskeletal problems such as backaches at the end and their efficiency to work decreases to a greater extent, (Jyotsana *et al.*, 2005). Moreover, the agricultural tools and equipment available have been predominantly developed for male farm workers and therefore women farm workers had to adapt those whenever required to use. Staudt, 1977; Pala 1980; Ventura Diaz, 1985 and Njiro 1990, are of the view that, subsistence farming which is usually dominated by women, is characterized by traditional farming techniques, rudimentary farm technology and inadequate farm inputs which promote low crop productivity.

Equal access to resources (land, equipment, capital and inputs), skills and knowledge should also be considered in order to increase maize production and reduce poverty. According to FAO, (2011); Mehra and Rojas, (2008) and World Bank, (2009), the other main reason for the underperformance of agriculture in developing countries is as a result of unequal access to resources and opportunities needed for increased agricultural production by women. Women's ability to produce effectively is also subdued by their cultural and social status, (Ester, 1970; FAO, 1995 and Goebel, 2005). Again FAO, (2011), postulates that increasing women's agricultural yields would raise agricultural output in developing countries by 2.5 - 4% and reduce hunger by 12 - 17% worldwide. Therefore the potential in which women friendly maize protection equipment has should not be underestimated as it can increase maize crop productivity thereby alleviating hunger and poverty. Are there any reports on your claims about ill health from the Ministry of Health and Child Care, such data is important for the justification, do more literature search!

1.6 LIMITATIONS

1. Research will be carried out at the peak of the agricultural season hence most farmers will not be available for answering questions.
2. Money to cover research expenses

1.7 DELIMITATION S

1. Only a few wards will be used to represent the entire district because of shortage of resources.
2. The study focuses on only maize protection equipment used by women, leaving out other farming equipment they use for tillage and harvesting.
3. The study only focuses on women because most of the maize protection equipment is women unfriendly.

CHAPTER 2: LITERATURE REVIEW

2.0 INTRODUCTION

Maize crop protection equipment is useful in maize production to promote higher yields by protecting these crops from weeds, insects and pests. The most commonly used maize protection equipment includes hoes, sprayers, dusters, as well as other locally available materials used through the indigenous knowledge systems. This chapter reviews literature on attitudes, knowledge and factors that influence use of crop equipment in maize production by women farmers involved in smallholder production.

2.1.1 Women attitudes on maize protection equipment used in Shamva

Conceptualising attitude: McLeod (2014) defines attitude as a relatively enduring organization of beliefs, feelings and behavioural tendencies towards socially significant objects, events, groups and symbols. Attitude can also be defined as the degree of positive or negative effect associated with psychological objects (Ayoade, 2012). The attitudes of women towards use of equipment in farming includes what these women believe in and feel as efficient and this also involves what they perceive as acceptable psychologically. The attitudes of women towards maize crop protection equipment can be positive or negative.

Reasons for women's attitudes towards maize protection equipment: The attitudes of women farmers towards crop protection equipment can be influenced by the availability of information on crop protection equipment, prices of equipment, size of farms, and difficulty in use of such equipment among others. Attitude is part of the cultural factors which are among the forces that encourage or discourage women from using crop protection equipment (Majali, 2012).

Method of crop protection: Women's attitudes on crop protection equipment in maize production varies from traditionally used equipment to modern crop protection equipment. Nambafu et al (2014) state that traditional methods are amongst the most accepted. This can be attributed to their availability compared to modern equipment which is usually costly. Most women involved in small holder maize production have positive attitudes towards indigenous knowledge system

which makes use of affordable equipment and locally available resources (DeWalt, 1994). According to Behera and Swain (2005), women have accepted manually operated equipment due to their low cost.

Women-friendly equipment: It is important to understand women's attitudes towards crop protection equipment so as to understand its use by small holder female farmers in the rural areas. Women prefer women-friendly equipment which increases work efficiency, reduces drudgery and provides a comfortable working posture (Sharma et al, 2015). The majority of women do weed control to protect crops using sickles, hoes and khurpi among others (ibid). Sims and Kienzle (2006) state that improvements in the design of hand tools could make big difference to productivity and to the health of farm families particularly in the case of women who are bent double for hours and days whilst weeding their crops. Hence women's attitude towards equipment such as twin wheel hoes for weeding is positive as evidenced by empirical studies which revealed that women perform such works as hoeing, and weeding among other (Ani et al, 2004). Positive attitudes in use of mechanical weeders which reduce time and costs spent on weeding is also seen among women involved in manual weeding (Goel et al, 2008).

Gender role attitudes: Women's attitudes towards use of maize crop equipment is also influenced by gender-role attitudes which reflect certain beliefs about roles of men and women. Gender related attitudes tend to discriminate women from accessing certain crop protection equipment (Nakhone and Kabutha, 1998). These lead to negative attitudes by many women towards such crop protection equipment. Gender role attitudes such as the ones which say that women should not complain and must depend on men have affected women's attitudes towards maize protection equipment. A woman from Asella expressed that if she could use machines in her work she will be labelled as someone who is being idle by the society (Eerdewijk and Danielson, 2015). However, Eerdewijk and Danielsen (2015) state that conversations with men and women farmers during a study reflects that there is gradual change of attitudes regarding women's labour roles. This also changes the attitude of women towards maize protection equipment.

The women in Jaipur district of Rajasthan have positive attitudes towards traditional jobs in their order of importance such as gardening, harvesting, seedling raising and transplanting (Yadav, 2017). However, their attitude towards equipment such as sprayers, dusters and tractor-powered equipment used for crop protection may be negative owing to gender role division of labour which has left men as responsible in works such as pesticides and herbicides application (Pritchard, 2012).

Negative attitudes towards extension services: Women's attitudes towards extension services influences their attitudes towards new technologies. Ayoade (2012) argues that women need to show a positive attitude towards extension services to ensure success in the implementation of new technologies which includes new crop protection equipment as demonstrated by extension officers. Hence a positive attitude towards extension services by some women produces a positive attitudes towards crop protection equipment as they will be well informed through trainings and field work offered by extension workers. Majali (2012) notes that basic education is an important factor in changing the attitudes of women in the traditional farming society. Exposure to various fields of agriculture through extension services and basic education help in elimination of negative attitude towards use of farm equipment by women.

However, Eerdewijk and Danielsen (2015) state that in Hawassa, more women are beginning to see ability in use of farm equipment as part of becoming an asset when a girl gets married which has cultivated positive change. A gradual change of attitude is also noted in Laikipia where both men and women have acknowledged this change (Eerdewijk and Danielsen, 2015).

2.1.2 Women knowledge on maize protection equipment used in Shamva.

The European Commission (2019) states that knowledge has a key role to play in helping rural farmers to meet their challenges such as crop protection to improve yields. Knowledge is defined as an awareness or familiarity gained by experience; or a person's range of information as well as an understanding of a subject among other things (The Concise Oxford Dictionary, 1998). Beuchelt and Bastue (2013) argue that most women involved in farming have less knowledge on

how to use herbicides. This affects the use of maize crop protection equipment due to this lack of knowledge.

Knowledge type: Farmers' knowledge on farm equipment varies qualitatively or quantitatively depending on its relevance, environment and interest in the subject. Women's knowledge on maize crop protection equipment can be grouped into indigenous and conventional knowledge. In most rural areas found in the Sub-Saharan Africa, farming is the main occupation for women without any formal knowledge. In Tanzania farmers rely heavily on indigenous knowledge (Mugisha-Kamatenesi, 2004). Hence women in most rural areas use indigenous equipment for plant protection. This is shown by use of ash collected from kitchens or burnt wood which is applied through use of brooms and buckets which they are familiar with and have experience in using such indigenous equipment. Women's indigenous knowledge is also seen through the use of hang torn plastic bags, old plastic buckets in the field to protect plants from birds and large insects (Oben et al, 2015) as shown in figure 2.1.



Figure 1: Indigenous crop protection equipment from indigenous knowledge

In Kenya most rural women producing maize have adequate knowledge on weeding using hoes and slashes since the activity is not gender specific whereas use of more technical equipment in spraying herbicides is very low (Nakhone and Kabutha, 1998). In some regions, farmers have

limited basic knowledge on indigenous crop protection equipment. Robinson-Pant (2016) argues that indigenous knowledge, skills and technology are insufficient to meet the requirements for crop protection equipment. In Buea, high levels of education and the acquired knowledge has led most farmers to lose their indigenous knowledge compared to the farmers in Muyuka (Oben et al. 2015). Less knowledge in conventional equipment has seen some women in SSA preferring equipment that is easy to handle and one they are familiar with. It is also noteworthy that women are aware of most of the equipment used in maize protection such as sprayers and cultivators even though most of them cannot use the equipment.

Pathways of knowledge on maize protection equipment: There are various sources where knowledge on maize protection equipment can be obtained by women growing maize. These information sources include formal education, farmer trainings, field days, demonstration sites and agricultural extension workers. These sources can be facilitated by both public/governmental organisations as well as non-governmental organisations (NGOs) and private companies. In a study by Nambafu et al (2014) on ‘Knowledge, Attitude and Practices Used in the Control of Striga in Maize by Smallholder Farmers of Western Kenya’, the results revealed that farmers in the study sites acquired knowledge on farming skills either at group levels or household level, in village meetings, through neighbours who were good implementers of technologies, through attending free workshops and trainings, field schools, media, extension workers from international and local NGOs, and the Ministry of Agriculture. Traditional agricultural skills and new knowledge on use of crop protection equipment by women can also be learnt from parents, husbands and siblings (Robinson-Pant, 2016). Agricultural research delivers new knowledge yet there is already a substantial amount of knowledge available which is fragmented and insufficiently applied in practice (European Commission, 2019). Debrah et al (1998) echo that the major source of farmers knowledge are informal sources from personal observations, parents, relatives, and other farmers; with only 10% of the farmers getting knowledge from formal sources such as research, extension and media.

Most women in small holder farming have inadequate knowledge in use of maize protection equipment as a result of poor education and limited extension services which delay the adoption

and utilization of technologies such as maize protection equipment (Nakhone and Kabutha, 1998). According to Swiss Agency for Development and Cooperation (2015), women may fail to attend training sessions on farm equipment use when they are in pregnancy. Women knowledge in use of crop protection equipment is also affected by access to agricultural extension workers. In Tanzania few extension workers rarely visited farmers in their areas which deprives them knowledge on crop protection equipment use (Oben et al, 2015). Most women farmers are not well informed about crop protection equipment use. Women knowledge on maize protection equipment is affected by their limited education and access to extension services as they do not get much attention as men (Nakhone and Kabutha, 1998). Furthermore, use of equipment by women is also affected since they have limited contact with extension services (Ng'ombe et al, 2017). Access to platforms that facilitate acquisition of skills and experience in use of crop protection equipment should be acquired from technologies, training and access to information (Nakhone and Kabutha, 1998). Hence women lack basic skills gained from extension workers.

According to Diiro et al (2018), although women in SSA play an important role in agriculture, empirical evidence indicate that they lag behind men due to gender inequalities that persist in education, extension and technology. Women experience in use of crop protection equipment is affected as they spend more time caring for their families and domestic work. Fixed cultural gender roles which has seen men never cooking and women not ploughing has limited women from getting the experience of using crop protection equipment (Nakhone and Kabutha, 1998).

Knowledge uptake: There is slow uptake of new knowledge and innovative solutions in farm equipment mostly by women in small and medium-sized farms. Women headed families are the ones who are mainly involved in small and medium farming. This limits their knowledge in plant protection equipment.

Suggested improvements to existing knowledge on maize crop equipment: There is need to equip women in maize production with adequate knowledge on maize crop protection equipment.

There is urgent need to promote female education, both formal and non-formal (Nakhone and Kabutha, 1998).

2.1.3 Factors influencing use of maize crop protection equipment by women

Various factors affect women involved in maize production on usage of crop protection equipment. These factors can be grouped into social, economic, institutional and technological factors. The social factors are gender, age and religion; economic factors are income or financial capability, access to markets and access to credit; institutional factors are include the farmer's education, trainings, awareness, farmers gatherings for information sharing, media, and technological factors.

2.3.1 Sociological factors

Gender: Singh and Kotwaliwale (2011) argue that the use of such equipment by women in sub-Saharan Africa is constrained by norms and values about culturally appropriate gender roles where women rarely use tractors and other mechanized farm equipment. According to Badstue (2013), gender is an important factor that has influenced use of farm power equipment by women. Plant protection equipment forms part of the farm power equipment which affects women in the production of maize crops. Women forms the backbone of agricultural workforce where they do the most tedious and back-breaking tasks in farming (DARE/ICAR 2004). Yet, Doss (2001) stresses that women face various constraints in use of the plant protection equipment.

Ragasa (2012) suggests that the gender of farmers is said to influence the use of technology in agriculture where women are slow in adopting these technologies. Women's use of maize protection equipment among other agricultural technologies is sometimes influenced by their anticipation of how such technologies may affect their relations, responsibilities and roles (Doss, 2001). Women calculate how the awaited benefits from the use of maize protection equipment will change labour divisions and control within their families or society.

Gender has also affected use of crop protection equipment by women through division of labour. Societies have assigned different roles for males and females in maize farming (Pritchard, 2012).

Women's use of maize protection equipment is undermined by the fact that gender roles have divided labour for men and for women. Eerdewijk and Danielsen (2015) state that women's tasks often include land preparation and post harvesting processes. Leavens and Anderson (2017) maintain that weeding is considered as women's work regardless of the crop type. This influences the use of plant protection equipment such as the hoes during weeding in maize production by women which has health implications such as backaches. However, women in most developing countries in Africa have taken on new agricultural roles such as mixing and application of pesticides which were traditionally perceived to be men's work. These additional roles requires use of crop protection equipment by women (Erbaugh, Kyamanywa and Adipala; 2003). In some cases, pesticides are used through the use of sprayers which is also affected by other various factors. Women in maize production are exposed to pesticides from the equipment they use such as hand hoes, hand sprayers and knapsack sprayers and this has delayed adoption and efficient utilization of the new technologies. Gender stereotyping has influenced women's use of plant protection equipment and other farm technologies by making assumptions on what is culturally acceptable (Ragasa, 2012).

Age: The age of the women involved in maize production is also one of the factors which influences women use of plant crop protection equipment. For instance, in the Tonga culture women of different ages have different roles where for the post menopause women and those of the young girls. The responsibilities of women in different households is affected by age where younger women of child bearing age have more responsibilities compared to older women. About 85 to 90 percent of women's time is spent on household food processing and preparation (Fontana and Natalia, 2008; Wrangham, 2009). The society also considers women responsible for child care and household chores hence less time is devoted to farming activities and their production is lowered. Women have a major role of child caring which has seen many going to fields with their infants and children due to lack of access to or funds for child care services. These responsibilities affects women's use of plant protection equipment as they are forced to use those which the societies perceive as proper equipment for a woman with an infant. For instance, a woman carrying an infant on her back cannot use a tractor-powered sprayer or a knapsack sprayer.

Religion: Religion is defined as a system of faith and worship that provides believers with meaning and purpose in their lives (Mutonono, 2002). Religion is an institution that has helped in civilizing people in different society which also includes how women may operate in agriculture. Major religions in the world include African Tradition religion, Islam, Buddhism, Christianity, Hinduism and Judaism. Kpughe (2018) notes that the insights from indigenous religious beliefs have helped in the development of agricultural technologies capable of ensuring food production. Crop protection as well as the equipment used during this process is a product of agricultural technologies. Hence religion is an important factor that helps in promoting women in the use of plant protection equipment. In most rural areas, the Africa traditional religion still plays a significant role of influencing use of maize crop protection equipment by women through cultural beliefs. Manda and Mvumi (2010) state that cultural beliefs have a strong influence in crop production. The African Traditional Religion has subjugated the thinking of the people in Africa to the extent of shaping their economic activities including agriculture (Mbiti, 1967). For instance, in the Tonga culture and the Shona culture women of different ages have different roles where for the post menopause women and those of the young girls (Dzingai and Bourdillon, 1998). Such traditional roles have also affected the use of equipment by women in most sub-Saharan African societies. Mutonono (2002) argues that religion, tradition and culture are often used to vindicate women's subordinate position in society which has led many women excluding themselves from use of farm equipment which they regard as suited to their male counterparts.

2.3.2 Economic factors

Income/Financial capability: Income is an important factor that determines whether women will be capable of using crop protection equipment. Most of the income in some families is used to pay for hired labor rather than providing plant protection equipment (Doss, 2001). Availability of maize crop protection equipment is limited due to lack of funds to purchase the equipment and draft power. Johansen et al, (2012) state that most women do not have adequate funds to purchase the plant protection equipment and the herbicides. The level of income affects most of these farmers hence they are forced to use small and locally obtained equipment such as buckets, mortars and pestles as maize crop protection equipment. Farnworth (2016) states that most women do not afford to hire man to provide spraying services due to lack of funds. Most women who operate as

communal farmers sell excess grain at low prices which limits their ability to purchase maize crop protection equipment for their plants.

Most women cannot work for a wage as they engage in tasks such as taking care for the elderly and children that require them to stay near the home. As a result of that and shortage of time most women now engage in low income practices that do not give them enough income to purchase maize protection equipment nor herbicides. According to Lanjouw and Lanjouw (2001), due to time scarcity, most women are forced to engage in start-up cottage industries such as handicrafts which are characterized by low income and limited potential for expansion. This as a result reduces their ability to acquire maize crop protection equipment. This as a result reduces their time for maize production thereby reducing productivity. Women have limited ability to afford plant protection equipment. In Africa for instance, most women lack cash to purchase a donkey-drawn cultivator which can halve weeding time (Ashby et al, 2008).

Access to credit facilities: Access to loans or credit facility is a factor that can help women to purchase plant protection equipment in maize production. However, rural women generally receive smaller loans than men (Ashby et al, 2008). Ragasa (2012) notes that women have limited access to credit which limits them on the ownership and use of tractors and draft animals which are also used on tractor-powered sprayers. Lack of larger loans force many women to purchase inferior equipment for plant protection such as hoes instead of cultivators (Ashby et al, 2008). Most rural women in developing countries do not have access to agricultural credit which is an important productive resource for efficient and sustainable production (Nweke, 2001). Odoh, et al (2009) point that agricultural production requires farm credit as one of the most important element that can help farmers to get farm inputs which includes improved plant protection equipment and hired labor. In Nigeria, farm credit has been found to contribute much towards the adoption of farm technologies and has increased income among many rural farmers (Omonona *et al.*, (2008) and Akpan *et al.*, 2013). Therefore farm credit may as well help rural women to access new maize crop protection equipment that promote sustainable agriculture rather than sticking to their traditional equipment that require much time and labor. This may also increase maize production, reduce rural poverty and improve food security.

Access to markets: There are nearly eighty percent women working in the agriculture sector in the sub-Saharan Africa (UNDIESA, 1991). Peterman et al (2010) argue that gender disparities have seen most of these women having poor access to markets and receiving lower prices for their produce. This limits them from using safer plant protection equipment and protective clothing due to lack of funds. In developing countries, most rural women do not have access to markets. They are responsible for most of the farm work and selling of maize is mainly done by men except in the female headed households (de jure and de facto) of which approval from the husband is required. These women are only exposed to local markets where they sell their small amounts of maize and other small grains and the cash that they get is for use at home. In most male headed families, men sell the produce on behalf of the women hence they have less opportunities for decision making even if it involves buying of better maize crop protection equipment.

2.3.3 Institutional factors

Institutional factors such as education, roles of institutions, awareness, trainings, gatherings on information sharing and extension services influence utilization of farming technology by women.

Farmers' education: The farmer's education is also a factor that influences women use of plant protection equipment in maize production. Naidoo et al (2008) state that there are few education opportunities for women in Tanzania; where in rural areas one in every five women have never attended school with others having dropped out of girls due to pregnancy, lack of fees, illness, early marriages or death of parents. High rate of illiteracy in rural women affects their usage of crop protection equipment. This is supported by FAO (1994) that rural women suffer from high illiteracy and poverty rates as they have less capacity in terms of education and training. Limited agricultural education is a factor that limits the opportunities for women to gain new technical knowledge in operations such as in the use of crop protection equipment (World Bank, 2007).

Roles of institutions

Primary and secondary schools need to encourage girls in taking up scientific subjects which will help as a factor in positively influencing use of plant protection equipment by women (World Bank 2007).

Awareness: Raising awareness on the use of plant protection equipment by women is an important factor that may help women improve on the use of these technologies in maize production. Awareness can be raised by agriculture extension agents, Non-Governmental Organization agents, local leadership, focal farmers, schools and other training institutions.

Trainings: Trainings help farmers to acquire new knowledge and skills which make them become more aware of possibilities for more efficient utilisation of new technology such as the plant protection equipment (Bukosheva *et al.*, 2012). Many women involved in small-holder farming have limited knowledge on the use of maize crop protection equipment. Low levels of education on use of plant protection equipment and limited training puts women at high risk during plant protection processes in maize production (Atreya, 2007; Jors et al; 2013). Most women in small-holder farming have received less training in pesticide management which includes the use of different equipment for plant protection in the application of pesticides (London, et al, 2002). The adoption of these technologies is affected by lack of access to complementary knowledge (Peterman et al, 2010).

Farmers gatherings information sharing: Agricultural extension officers have worked with communities in organizing farmers' gatherings such as field days as platforms for information sharing which also includes use of maize crop protection equipment (SDC, 2015b). These gatherings create an opportunity for women to engage in dialogues and interactions with other farmers influencing them on positively adopting plant protection equipment for their maize crops to improve yields.

Access to extension services: Agricultural extension services grew in the twentieth centuries as a way of making agricultural research results available to farmers (World Bank 2007). Extension workers offer important trainings and visits that are critical in influencing women use of plant protection equipment (FAO, 2008). Efforts have been made since the fourth World Congress on Women by the national governments and international agencies to provide agricultural extension to women especially those in rural areas (World Bank 2007). Doss (2001) states that women in sub-Saharan Africa lack access not only to education but to information and extension services. Most women have limited contact with extension services, (Ng'ombe et al, 2017). This may also have contributed to many women opting to use old fashioned crop equipment as they do not have knowledge and skills on new improved and safer plant protection equipment.

Media: Media plays an important role in influencing women use of plant protection equipment. World Bank (2007) states that professional women in agriculture should be more visible in the newspapers, radio and television for women in primary and secondary schools to become inspired to prepare for careers in agriculture and adoption of new technologies. In addition, improvements in cellular network, access to internet and community radios creates opportunities for women to build networks and share information and experiences which includes the use of plant protection equipment.

In addition, the family as an institution has also influenced the use of plant protection equipment by women. In Tanzania, a small proportion of women are involved in the decision making process even in matters concerning their health. This has influenced on the decisions on the type and use of plant protection equipment in agriculture by women.

2.3.4 Technological factors

Tillage method used: Mabasa et al (1999) states that the method used for tillage influences the use of maize crop protection equipment. Various methods such as conventional tillage, planting basins, zero-tillage and digging are used by various farmers. Most of farmers using the basin and

digging methods use hoes for removal of weeds to protect maize crops from competition with weeds and to reduce pests harbouring.

Size of farm operations: The size of the farm also affects the use of maize crop equipment by women. The size and type of maize crop protection equipment is affected by the size of farming operations. Most women smallholders use manually operated sprayers or locally available materials while large scale commercial producers use engine operated or tractor driven cultivators and sprayers for maize crop protection. Also the percent of farmers owning farm machinery and tillage equipment was higher among males than females.

Eerdewijk and Danielsen (2015) note that the farmers in the Ethiopian sites rely on the human muscle for all phases of the maize farming cycle and the usage of draught animal power is primarily for tillage and transportation in some cases. On the other hand, farmers in Kenya in different sites indicated that even though they have seen or heard about the tractor, many maize producers rely on human muscle as the main source of power. In this case, women involved in farming practices in these countries have little or no access to plant protection equipment that is sensitive to their biological and social well-being. Tractors are important in the plant protection process. Misiko et al (2013) state that tractors such as the two-wheeled ones and equipment have multi-functions which include spraying and weeding as plant protection processes. Yet many smallholder farmers in the sub-Saharan African countries are still backward and have not yet fully acquired the plant protection equipment needed by women in maize protection exercises.

2.4 CONCEPTUAL FRAMEWORK

The study is guided by the Social Practice Theory (SPT) which was suggested by Reckwitz (2002) and Warde (2005) among other authors. Although social practices are defined variously by different scholars, they can be understood as practices that involve repetitive behaviours that includes interconnected bodily and mental activities, materials or equipment as well as competencies, knowledge and skills (Reckwitz, 2002; Warde, 2005). The women involved in smallholder maize crop production in Shamva are involved in the practices of maize crop protection year after year in bid to produce more food and ensure food security. The maize crop is an important cereal in most African countries with Zimbabwe included where it forms the staple

food for the majority produced by smallholders (Simiyu, 2014; Woodend, 1995). Africa has the potential to feed its population, eliminate hunger and ensure food security (NEPAD, 2013). However, the maize crop is under threat due to pests and diseases. Pests, weeds and diseases can severely reduce the quality and quantity of the yields (Riley, 2017). According to Matthews et al (2016), about 20 to 40% of crop yields are lost each year as a result of pests where crops compete with thousands of weeds and insects.

Various activities have been put in place to protect the maize crops by women and these have included the interconnection of the three key elements suggested by the SPT. Women's attitudes, knowledge and materials or equipment are critical in maize crop protection so as to safeguard food security after seeds have been planted and the farmers wait for a satisfying harvest. The attitudes of women towards maize crop protection equipment is important as this helps in the practices of protecting the crops. The women's attitudes towards modern equipment and the activities involved in using conventional equipment affects the process positively or negatively. Positive attitudes can be generated when the maize crop protection equipment is women-friendly physically and mentally. Hence the practice of using conventional maize protection equipment by women in Shamva is shaped by their attitudes.

Women's knowledge on crop protection equipment is also important in the practice of protecting maize crop. Knowledge is an important element in the SPT. Women need knowledge on the equipment itself, its uses, as well as the benefits of using maize crop protection equipment to guarantee food security. Most women seem to have more indigenous knowledge than conventional knowledge on maize crop protection equipment. There is need for more knowledge acquisition on crop protection equipment for the women in Shamva since it is an important element in protecting their maize.

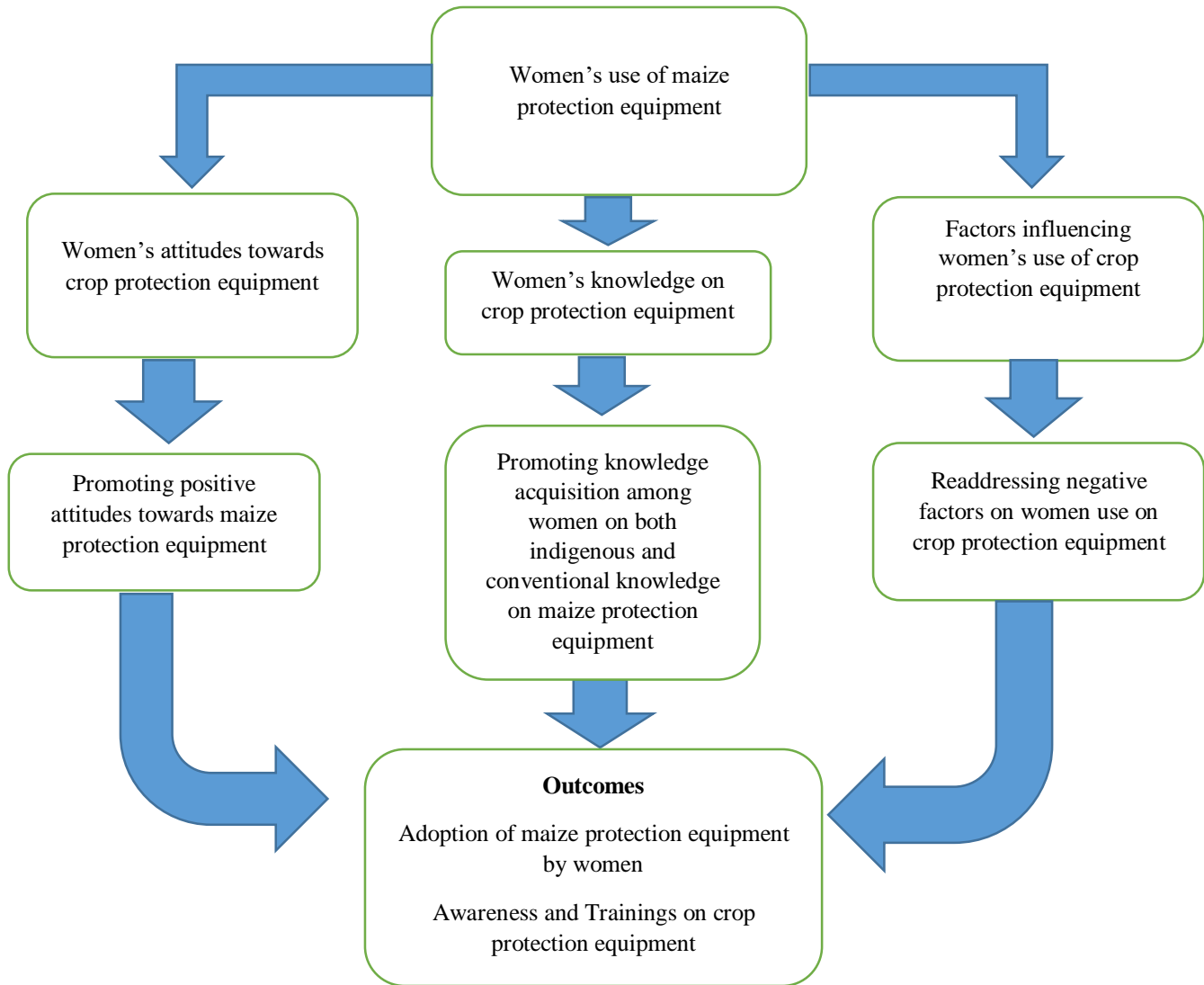


Figure 2: Conceptual Framework explaining women's attitudes, knowledge and factors affecting women's use of maize crop protection equipment

2.5 SUMMARY OF LITERATURE REVIEW

The chapter reviewed literature on attitudes, knowledge and factors which influence use of maize protection equipment by women in smallholder farming. Literature revealed that the attitudes of women towards maize protection equipment are influenced by various factors which can stimulate positive or negative behaviour. Some women have positive attitudes to equipment which is women-friendly, affordable and locally available whilst negative attitudes may be due to some difficulty in use of some machines, expensive, gender roles attitudes which are against use of conventional maize protection equipment by women.

Studies by other scholars on knowledge on crop protection equipment by women reviewed indicate that most women possess indigenous knowledge on crop protection. Knowledge on conventional crop protection equipment is affected by access of information through different pathways such as extension services, formal and informal education, through public and NGOs. Most knowledge obtained by women on crop protection equipment is through neighbours, siblings, parents, husbands and farmers gatherings. This has limited women's knowledge to more of traditional rather than formal trainings.

The chapter also revealed literature on factors which influence use of crop protection equipment by women in smallholder farming. These factors are divided into sociological, economical, institutional or technological factors. Scholarly work reviewed indicates that sociological factors such as gender, age and religion influence use of maize protection equipment. Moreover, economic factors such as access to credit, markets, and financial capability may promote or hinder use of crop protection equipment by women.

Finally, the chapter discussed the conceptual framework which guided this study on how the use of crop protection equipment is influenced by materials, attitudes and various factors. The next chapter gives a description of the study methodology.

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CHAPTER 3

METHODOLOGY

3.0 INTRODUCTION

This chapter will give an outline of the research methods. It will also clearly state the study area, research design, and target population, sampling methods and data analysis methods. It will also look at the ethical considerations as well as the summary on research methodology.

3.1 STUDY LOCATION

This study was carried out in Shamva district. The map below shows the location of Shamva district and the areas around it.

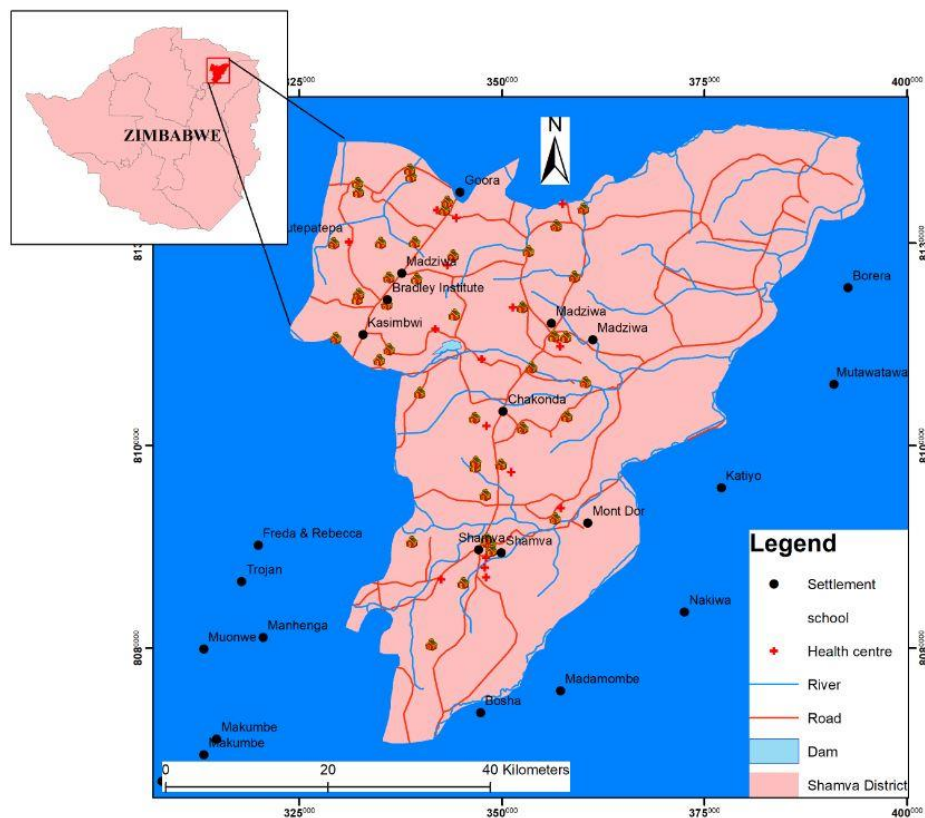


Figure 3: Showing Shamva district and the areas around it

Shamva is situated in Mashonaland Central which is in the north east of Zimbabwe. Its geographical coordinates are 17° 18' 56" South, 31° 34' 14" East and is located in the Mazowe valley which is about 90 km north-east of Harare. The name Shamva is derived from Tsamvi, a

common tree found in that region. According to Zimstat (2013), Shamva has 29 wards with a total population of 119 530 from 27 552 households that comprises of 59 431 males and 60 099 females with an average of 4.3 per household.

Shamva is found in region II, where the soils are fertile hence there is high farming activity. Cotton, maize, tobacco, soybeans and tropical fruits are mainly grown in the area. Expected rainfall ranges from 750 - 1000 mm with an average of 887 mm per annum. The climate in Shamva is warm and temperate with an average temperature of 20.2°C.

3.3 RESEARCH DESIGN

This study used survey research design which helped to obtain information on factors influencing use of maize crop protection equipment by women in Shamva District. A quantitative approach was applied in this research and data was collected from randomly selected women from female headed families in the District.

3.4 TARGET POPULATION

The study targeted communal women farmers from female headed families in Shamva District in Mashonaland Central Province. The target population for this study was 6502 female headed families in Shamva District.

3.5 SAMPLING

According to Zimstat, (2013), Shamva District has a total population of 123 650 people comprising of 61360 males and 62290 females. It is divided into 29 wards which comprise of 21 424 farming households out of which 14 922 are male headed and 6502 are female headed. Simple random sampling was used to select communal women farmers who are actively involved in maize crop farming in Shamva District. Purposive sampling was used to select 3 wards that are accessible to the researcher in order to easy movement during data collection. The formula below is employed to interpret the sample where a simple random sampling method is used (Bryman; 2015);

$$n = \frac{z^2 \times N \times p \times q}{N \times E^2 + z^2 \times p \times q}$$

$$n = \frac{(0.05)^2 \times 6502 \times 0.5 \times 0.5}{6502 \times (0.03)^2 + (0.05)^2 \times 0.5 \times 0.5}$$

$$n = 400$$

Where n = sample size, N = population size, 6502 in this case, z = 95% confidence level, (p = q = 0.5) maximum population variability, and E = 3% sampling error (E).

3.6 DATA COLLECTION METHODS

Quantitative research methods was employed in this study. Data for this research was collected using questionnaires containing questions on the attitudes, knowledge and factors influencing use of maize crop protection equipment by women in Shamva District. They were distributed amongst women who are actively involved in maize crop farming. The questionnaire was translated into vernacular language (Shona) during distribution for the respondents to understand better. It was pre-tested out of the targeted population first (in Domboshava) before collecting the actual data. Table 3.1 below illustrates the tools that will be used to collect data.

Table 1: Research method approaches, data collection methods and description

OBJECTIVE 1	To assess women attitude on maize protection equipment used in Shamva.
RESEARCH QUESTION	What are the attitudes of women in Shamva on maize crop protection equipment?
DATA REQUIRED	<ul style="list-style-type: none"> Attitudes of women in Shamva district on maize crop protection equipment.
MEANS OF DATA COLLECTION	<ul style="list-style-type: none"> Questionnaires distributed to respondents
DATA COLLECTION INSTRUMENT	<ul style="list-style-type: none"> Closed ended questionnaires
SOURCE	<ul style="list-style-type: none"> Female respondents. Key informants
UNIT OF ANALYSIS	<ul style="list-style-type: none"> Female headed households
ANALYTIC TOOL	<ul style="list-style-type: none"> Descriptive statistical methods
OBJECTIVE 2	To assess women knowledge on maize protection equipment used in Shamva.
RESEARCH QUESTION	<ul style="list-style-type: none"> Do women in Shamva have knowledge on maize crop protection equipment?
DATA REQUIRED	<ul style="list-style-type: none"> Knowledge that women in Shamva district have on maize crop protection equipment.
MEANS OF DATA COLLECTION	<ul style="list-style-type: none"> key informants close ended questionnaires
DATA COLLECTION INSTRUMENT	<ul style="list-style-type: none"> Note taking Closed ended questionnaires.
SOURCE	<ul style="list-style-type: none"> Female participants from women headed households key informants Internet source
UNIT OF ANALYSIS	<ul style="list-style-type: none"> Women participants
ANALYTIC TOOL	<ul style="list-style-type: none"> 5-point Likert scale and descriptive statistics
OBJECTIVE 3	To evaluate the factors that influence women practice of maize crop protection equipment in Shamva district.
RESEARCH QUESTION	<ul style="list-style-type: none"> What are the factors influencing women practice of maize crop protection equipment in Shamva district?
DATA REQUIRED	<ul style="list-style-type: none"> Information on the factors influencing women practices of maize crop protection equipment in Shamva district. These are: Sociological factors that include gender, age and religion. Economic factors that include income or financial capacity, access to credit facilities and access to markets. Institutional factors that include education through awareness, trainings, farmer to farmer information sharing, extension officers and media Technological factors that include method used for tillage and farm size

MEANS OF DATA COLLECTION	<ul style="list-style-type: none"> • Close ended questionnaires • Literature review
DATA COLLECTION INSTRUMENT	<ul style="list-style-type: none"> • Closed ended questionnaires.
SOURCE	<ul style="list-style-type: none"> • Female participants
UNIT OF ANALYSIS	<ul style="list-style-type: none"> • Women participants from women headed households
ANALYTIC TOOL	<ul style="list-style-type: none"> • Binary Logistic Regression model

3.6.1 Validity and reliability of survey instrument (questionnaire)

Questionnaire validity was tested with the help of the supervisor, Agritex personnel and the literature that the researcher referred to in order for the research instrument to meet required standards.

3.6.2 Pre-testing

In order to identify questionnaire problems and time needed to complete each questionnaire, seven female respondents out of the target population were randomly selected and the questionnaires were distributed amongst them. This helped the researcher to know the time needed to complete all the 400 questionnaires (100 hours to complete all questionnaires). During pre- testing the researcher found out that the questionnaire was not too long and each responded could answer it within 15 minutes. Respondents could answer the questions without any problems as the researcher helped them by translating into Shona on other questions. Data collection was then conducted by the researcher and three enumerators using the pre-tested closed ended questionnaires.

3.6.3 Assessment of women attitudes on maize protection equipment used in Shamva.

A pre-tested closed ended questionnaire was used for data collection. The questionnaire was administered by well-trained enumerators. A questionnaire was used because it is cheaper and faster to distribute when working with large numbers. A questionnaire also ensures high response rate as the interviewer makes sure that all questions are answered. Data collected using a questionnaire is reliable as it gives a room for the interviewer to ask for more information where there is need for more explanation.

The questionnaire contained all the maize crop protection equipment so that women attitude towards them could be assessed. Cross tabulations and chi-square were used to find the association between use of certain maize crop protection equipment and women attitudes. The variables and the maize crop protection equipment are shown in the table 3.2 below:

Table 2: Women attitudes on maize protection equipment used in Shamva District

Attitude	Broom		Slush		Hand hoe		Hand sprayer		Knapsack sprayer		Boom sprayer		Tractor drawn sprayer		%
	Y ES	N O	Y E S	N O	Y E S	N O	Y ES	NO	YES	N O	Y ES	NO	Y ES	NO	
Efficiency															
Is it an effective maize crop protection equipment?															
Is it labour saving equipment?															
Is it easy to maintain?															
Total															
Design and Drudgery															
Is it women friendly?															
Is it easy to use?															
Does the design of this crop protection equipment provide you with a comfortable working posture when using it?															
Are there any health problems that you think are as a result of using this equipment?															
Do you think that if the design is improved, maize crop production by women can improve?															
Total															
Gender roles															
Are women allowed to use this maize crop equipment in your community?															
Do you own this equipment?															
Total															

3.6.4 Assessing women knowledge on maize protection equipment used in Shamva District.

Assessment of women knowledge on the use of maize crop protection equipment was done using a 5-point Likert scale that ranged from very little knowledge to more than adequate knowledge. Eta was then used to find out the strength of association between use of maize crop protection equipment and knowledge that women had. The table 3.3 below shows the knowledge variables and the assigned points:

Table 3: Women knowledge on the use of maize crop protection equipment and the 5- point Likert scale range

Women knowledge on:	5- point Likert scale range						
	No knowledge	Very little knowledge	Moderate knowledge	Adequate knowledge	More than adequate knowledge	Mode	Total
Maize crop protection equipment?							
Herbicides?							
How to use traditional maize crop protection equipment (broom, slush, sickle, hand hoes etc)?							
How to use conventional equipment (sprayers and cultivators etc)?							
Knowledge from family members?							
Knowledge from formal education?							
Knowledge from farmer trainings?							
Knowledge from field days?							
Knowledge from demonstration sites?							
Knowledge from agricultural extension workers?							
Skills and experience on how to use traditional maize crop protection equipment?							
Skills and experience on how to use conventional maize crop protection equipment?							
Cost of traditional crop protection equipment?							
Cost of conventional crop protection equipment?							
Obtaining subsidy and credit to purchase maize crop equipment?							
Benefits of using conventional maize crop protection equipment?							

3.6.5 Evaluation of factors that influence women practice on maize crop protection equipment.

Data for evaluation of factors that influence women practice on maize crop protection equipment was collected using a closed ended questionnaire that comprised of questions on economic, sociological, cultural, institutional and technological factors. Economic factors included; source of income, level of income, market places and prizes and credit facilities. Sociological factors apprehended included, gender, religion and age. Cultural factors captured included, norms and

values, cultural and traditional beliefs. Institutional factors apprehended include, contribution towards maize crop protection equipment by; Agritex extension officers, government, NGOs and other farmers. Lastly technological factors captured on, maize crop protection equipment care and if arable land size and demonstrations influence their use.

3.7 ORGANIZATION AND IMPLEMENTATION OF THE FIELDWORK

Data collection was undertaken by the researcher and three Agritex extension officers attached to the selected district wards. The researcher could not hire enumerators due to money shortage. Agritex extension officers selected could speak Shona fluently and were trained by the researcher on how to conduct the data collection exercise. The researcher asked for permission from the District Administrator, the councillor and ward traditional leaders before entering the study areas. The respondents were told the purpose of the research before partaking to the exercise in order for them to participate freely. The contribution by respondents was voluntary hence the researcher made it clear that they are free to withdraw if need had arisen during data collection process.

3.8 DATA ANALYSIS METHODS

The purpose of data analysis is to convert information (data) into an answer to the original research question, Durrheim (2006). In this study, both quantitative data collected was quantified and entered as nominal or ordinal data into the Statistical Package for Social Science (SPSS, Version 20) and the results were presented through simple descriptive statistics such as tables.

3.8.1 Objective 1: Assessment of women attitudes on maize protection equipment used in Shamva.

Descriptive statistical methods were used to assess the attitudes of women on use of maize crop protection equipment used in Shamva district. Quantitative data was entered into the Statistical Package for Social Sciences (SPSS, Version 20) and used to find relationship between women attitudes on the use of maize crop protection equipment such as brooms, hand sprayers, knapsack sprayers and boom sprayers. Cross tabulations and chi-square test were used to analyze the association. At 5% significance level of p-value was used as a standard to determine the significance of the relationships. A significant association is denoted by a value of $p \leq 0.05$ and a

value of $p > 0.05$ means that there is no association between the use of a particular maize crop protection equipment and women attitude.

3.8.2 Objective 2: To assess women knowledge on maize protection equipment used in Shamva.

Analysis was done using a 5-point Likert scale then descriptive statistics and Eta test. This was used to find out how much knowledge women in Shamva District have on the use of maize crop protection equipment. Eta was use used to find out the streath of association between women attitudes and use of maize crop protection equipment. A 5-point Likert scale ranged from very little knowledge to adequate knowledge.

3.8.3 Objective 3: Evaluation of factors that influence women practice on maize crop protection equipment

Binary regression analysis was used to evaluate the factors that influence practice of maize crop protection equipment by women in Shamva district. The respondents answered on whether they use crop protection equipment or not. Those who do not use the crop protection equipment were denoted by zero and those that use them were denoted by one. Respondents who do not use crop protection equipment also gave the reason(s) why. The binary logistic model implemented by Bigsten and Shimeless (2003), is econometrically quantified clearly as:

$$P_i = F(Z_i) = \frac{1}{1 + e^{-(\alpha + \sum \beta_i X_i)}} \tag{1}$$

Where P_i = probability for women who do not use crop protection equipment.

X_i = 1st explanatory variable.

α and β = regression parameters to be estimated

e = the base of the natural logarithm.

The logistic model could be written in the form of the odds and log of odd for ease interpretation of the coefficients, a . The odds ratio is the ratio of the probability of women who do not use crop protection equipment ($1 - P_i$). Thereby yielding:

$$\left(\frac{P_i}{1 - P_i}\right) = e^{Z_i} \tag{2}$$

Taking the natural logarithm of equation (2) yields

$$\ln \left(\frac{P_i}{1-P_i} \right) = Z_i = \alpha + \beta_1 X_1 + \dots + \beta_n X_n + E \quad (3)$$

If the disturbance term U_i is taken into account, the logit model becomes:

$$Z_i = \alpha + \sum_{i=1}^n \beta_i X_i + U_i \quad (4)$$

Where α and β are parameters of the model and can be estimated using the Maximum Likelihood (ML) method.

Where Z_i = factors that influence use of maize crop protection equipment by women in Shamva district. (1 = women who use maize crop protection equipment, 0 = women who do not use maize crop protection equipment) and β_i is the slope of the equation in the model.

3.9 EXPECTED RESULTS

1. Women are using traditional maize crop protection equipment such as knapsacks and hand hoes.
2. Women do not have enough income to buy advanced maize crop protection equipment and they lack knowledge and skills on how to use them.
3. Women will have positive and negative perceptions on the maize crop protection equipment that they use.
4. Women will recommend production of more women friendly maize protection equipment and the need to improve on their skills and knowledge.

3.10 ETHICAL CONSIDERATIONS

This study was conducted after approval has been granted by the Bindura University of Science and Education. The researcher highly prioritized the welfare and dignity of the participants in this study. The Shamva rural district officers, councilors and the village leaders in which the study was undertaken were contacted to seek permission before the study commenced. Participants were asked for their permission to participate in the study and the aim and purpose of the study was conveyed to them.

All participants in this study did it at their own will and their real names were not used in the final report. They were informed that if there is any deception in any way during the study, they have every right to withdraw their participation at any stage. Equal and fair treatment was given to all participants during the whole period of the study and they were assured that no harm will come as a result of this study. The researcher respected all the values and traditional practices of the selected wards in Shamva district. Confidentiality on all collected information was also guaranteed.

3.11 CHAPTER SUMMARY

This chapter looked at the research methodology. The chapter is comprised of the study area (Shamva District) description, research design, sampling procedures, data collection and analysis of each of the objectives. Moreover the chapter broadly looked at the data analysis methods for each of the three objectives. Statistical package used to analyze data and the logistic regression model used to analyze factors that influence use of maize crop production equipment by women in Shamva District were also outlined in this chapter. Findings and discussion of results for all objectives will be discussed in the following chapters.

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CHAPTER 4

WOMEN'S ATTITUDE TOWARDS THE USE OF MCPEs (MAIZE CROP PROTECTION EQUIPMENT) IN SHAMVA DISTRICT

ABSTRACT

Women's attitude towards maize crop protection equipment has remained a global concern for the past decades. This chapter aims to evaluate women's attitude on the use of maize crop protection equipment. Purposive sampling Method was used to select 3 wards that are accessible at district level. Random sampling was used to select 400 communal women farmers who are actively involved in maize crop farming at ward level. Pre-tested structured questionnaires were used to collect data from the farmers. The questionnaires had items for evaluating attitude, assessed knowledge, and evaluated socio-economic, cultural and institutional factors determining women farmer's use of maize crop protection equipment. Tabulations and chi-square test were used to analyze the relationships. At 5% significance level, p-value was used as a standard to determine the significance of the relationships. The researcher found out that women farmers in Shamva District have significant Positive attitudes ($p < 0.05$) towards manually operated tools such as a hand hoe and Negative attitudes ($p < 0.05$) on the use of conventional maize crop protection equipment such as boom sprayer . These results are vital in finding key strategies and solutions that may promote positive attitude towards the use of conventional maize crop protection tools by women farmers in study area. Excessive awareness campaigns and demonstrations on modern maize crop protection equipment are encouraged.

4.1 INTRODUCTION

In Zimbabwe, maize is the staple crop used for income generation and household consumption (Mugabe and Etienne, 2016). However, the production of maize production is steadily declining (ibid). Doss (2011) states that agriculture is a primary economic activity for about 79% of women in the least developed countries. In Zimbabwe, agricultural production is a primary economic sector which represents the livelihoods of many people (Mugabe and Etienne, 2016). The agriculture sector has become the most important sector in the country especially after many industries have closed down. This has left women with a big challenge of producing the staple food crop to ensure food security within their households. ILO (2016) supports that women in Southern Asia and Sub-Saharan Africa make up about 60% of the agricultural labour force. The agricultural sector in developing countries is underperforming because the women involved face

constraints that reduce their productivity (Doss, 2011). A positive attitude towards crop protection equipment by women would help in guarding the maize crop from both the weeds and pests which reduce grain yields. Hence the attitude of women towards maize crop protection equipment is important in enhancing productivity and guaranteeing food security.

The use of maize crop protection equipment is important in ensuring increased production of the maize grain in Zimbabwe. According to FAO (2011), women tend to have lower access to agricultural resources which includes crop protection equipment. In most cases, the resources owned by women tend to be of smaller size (Moore, Moore and Onugu, 2015). Production in maize crops may be low due to overreliance on traditional methods of crop protection. This is supported by Nambafu et al (2014) who state that most women still favour the traditional methods. Small holder women farmers make use of indigenous methods and locally available resources in protecting their crops (DeWalt, 1994). There are innovations which reduce burdens and improve production such as mechanised farm equipment and use of draught animals (Huyer, 2016). Nevertheless, such equipment tend to benefit men as heads of households and have greater access. This has led women to regard maize crop equipment as more suitable for men than women.

Research efforts in the world over have inclined more on investigations on women representation in agriculture, land ownership or titles as well as gender roles which affects their agricultural production. Less efforts have been made towards women's attitudes on maize crop protection equipment. There is a research gap in understanding the attitudes of women towards crop protection equipment. The objective of this study is to identify the attitudes of women towards the use of maize crop protection equipment in Shamva.

4.2 MATERIAL AND METHODS

Chapter 3 Detailed and described the study area and methodology .The detail focused on questionnaire design, sampling procedures, methods of data collection and data analysis. A summary is given in this chapter.

4.2.1 Description of study area

The research was done in Shamva District, Zimbabwe. For a detailed description of the study area refer to Chapter three.

4.2.2 Research Design

This study used survey research design which helped to obtain information on factors influencing use of maize crop protection equipment by women in Shamva District. A quantitative approach was applied in this research and data was collected from randomly selected women from female headed families in the District.

4.2.3 Sampling procedure

Simple random sampling was used to select communal women farmers who are actively involved in maize crop farming in Shamva District. Purposive sampling was used to select 3 wards that are accessible to the researcher in order to easy movement during data collection.

4.2.4 Data collection procedure

Data for this research was collected using questionnaires containing questions on the attitudes, knowledge and factors influencing use of maize crop protection equipment by women in Shamva District. They were distributed amongst women who are actively involved in maize crop farming. More details concerning data collection procedure are given in Chapter 3.

4.2.5 Data analysis procedure and methods

The quantitative data collected through questionnaire method were coded into binary, entered, cleaned and run in Statistical Package for Social Sciences (SPSS Version 20) software to find the association between the use of a particular maize crop protection equipment and women attitudes. More detail on data analysis is given in Chapter 3

4.2.6 Challenges encountered during data collection

Location of respondents in the study area were challenging since most of them were at a distant of one another. Some desired areas were not accessible due to physical, political and cultural barriers. The other challenge was financial constrain, the dispersed spatial distribution of respondents in the research means that the researcher needed more money transport and communication. Some respondents were not free to be interviewed in the absence of their male household heads, hence male households were preferred to be present but were not allowed to respond to the questions.

4.3 RESULTS AND DISCUSSION

4.3.1 Results

The attitude of respondents towards the use of a MCPE as a function of four variables (Efficiency, Gender, Design and Drudgery) in Shamva District is shown in tables 5.1 below. The significance of each variable is given at different levels in parenthesis. Attitude attribute characterizes farmers' feelings and inclination regarding the utilization of MCPE as described under each variable.

Table 4: Results showing association of women's attitudes and MCPEs

	Variable	Attitude N=400		Level of Significance X ²
		Positive	Negative	
Hand Hoe?	# Efficiency			
	Is it an effective MCPE?	354	46	0.000***
	Is it labour saving?	240	160	0.066*
	Is it easy to maintain?	368	32	0.000***
	# Design and Drudgery			
	Is it women friendly?	244	156	0.005***
	Is it easy to use?	378	22	0.000***
	Does it provide a comfortable posture?	348	52	0.000***
	Any health problems from using it?	363	37	0.000***
	Improved design improves production?	395	5	0.800 ^{ns}
	# Gender variables			
	Are woman allowed to use it?			constant
Slush?	# Efficiency variables			
	Is it an effective MCPE?	397	3	0.027**
	Is it easy to maintain?	384	16	0.001***
	Is it labour saving?	348	52	0.000***
	# Design and Drudgery variables			
	Is it women friendly?	208	192	0.000***
	Is it easy to use?	275	125	0.000***
	Does it provide a comfortable posture?	379	21	0.000***
	Any health problems from using it?	249	151	0.000***
	Improved design improves production?	348	52	0.000***
	# Gender variables			
	Are woman allowed to use it?			constant
Hand Sprayer?	# Efficiency variables			
	Is it an effective MCPE?	211	189	0.000***
	Is it easy to maintain?	288	112	0.000***
	Is it labour saving MCPE?	14	386	0.019**
	# Design and Drudgery variables			
	Is a hand sprayer women friendly?	167	233	0.000***
	Is it easy to use a hand sprayer?	277	123	0.000***
	Does it provide a comfortable posture?	39	361	0.000***
	Any health problems from using it?	69	331	0.000***
	Improved design improves production?	347	53	0.000***
	# Gender variables			
	Are woman allowed to use it?	4	396	0.055*
Knapsack Sprayer?	# Efficiency variables			
	Is it an effective MCPE?	58	342	0.002***
	Is it easy to maintain?	65	335	0.000***
	Is it labour saving MCPE?			
	# Design and Drudgery variables			
	Is a knapsack sprayer women friendly?	28	372	0.038**
	Is it easy to use a knapsack sprayer?	119	281	0.000***
	Does it provide a comfortable posture?	71	329	0.000***
	Any health problems from using it?	20	380	0.083**
	Improved design improves production?	12	388	0.184 ^{ns}
	# Gender variables			
	Are woman allowed to use it?	1	399	0.008***

Note: *** is significant at p<0.01; ** is significant at p<0.05; * is significant at p<0.1; ^{ns} is not significant

Positive attitude: Results show that women in Shamva district generally have a significant positive attitude for the following variables towards the use of a hand hoe, slush and broom. Hoe significantly positive ($p < 0.05$) for all the variables under description except for improvement of production ($p > 0.05$). For the use of slush, the respondents exhibited a significant positive attitude ($p < 0.05$) for all of the variables under study leaving out gender variable which reviewed neither positive nor negative attitude. According to results in table 5.1, women in the study area have a significant positive attitude on the use of a hand sprayer for only four of the variables tested, that is effectiveness, maintenance, improved design and easy to use variables ($p < 0.1$). All women in Shamva district do not own boom and tractor drawn sprayer.

Chi-square analysis on factors reviewed that efficiency, design and drudgery variables significantly influenced positive attitude on women toward use of these MCPE. The observed positive attitude might be due to the fact that the MCPEs in question are user friendly, effective and cheap to buy. Most women involved in small holder maize production have positive attitudes towards indigenous knowledge system which makes use of affordable equipment and locally available resources (DeWalt, 1994). According to Sharma et al, (2015) Women favours women-friendly tools which increases work efficiency, reduces drudgery and provides a comfortable working posture. This notion is consistent with findings of this study. However, there is need to keep on improving the designs of these tools in order to work easier and boost productivity in the process. Sims and Kienzle (2006) reported that women spend a lot of time doing manual jobs using these tools hence improving the tools results in positive impacts on health of farm workers and productivity.

Negative attitude: Results revealed a significant negative attitude by women in Shamva district towards the use of knap sack sprayer for all variables at $p < 0.1$ not including improvement of production variable which was insignificant ($p > 0.1$). A significant negative attitude were also found towards the ownership of a hand sprayer for four of the variables under spotlight ($p < 0.05$). The variables are labour saving cost, women friendliness, comfortability of posture and health problems.

4.3.2 Discussion

This is probably due to health dangers associated with herbicides and pesticides .In addition , Women's attitudes towards use of knapsack sprayer MCPE is also influenced by gender-role attitudes in Shamva where most woman are discriminated from using a knapsack sprayer. The fact agrees with the findings that gender related attitudes discriminate women from accessing certain crop protection equipment (Nakhone and Kabutha, 1998). Hence, their attitude towards equipment such as sprayers and tractor-powered equipment used for crop protection may be negative due to gender role division of labour (Pritchard, 2012). Results further reviewed that conventional crop protection tools such as boom sprayer and a tractor drawn sprayer are not accepted by women in Shamva District. The reasons may be lack of capital to buy the equipment, lack of knowledge on how to operate them and land size. Women have accepted manually operated equipment due to their low cost (Behera and Swain 2005).

4.3.3 Conclusion

The chapter focused on determining women's attitude towards the utilization MCPEs in Shamva District .Analysis was done using cross tabulations and Chi-square test. Attitude variables characterized farmers' feelings towards the utilization of MCPEs. On average, the attitude variables analyzed revealed that women in Shamva District had positive attitudes towards traditional manually operated MCPEs and negative attitude towards conventional MCPEs.

4.3.4 Recommendations

Based on the results, the study recommends that, the government through the department of Agritex and NGOs into agricultural farmer extension:-

- To do excessive awareness campaigns and demonstrations on modern MCPEs
- Extension officers should plan and organize women in to small groups of 10 to 15 members and cascade new technologies information aimed at addressing women challenges in the utilization of conventional MCPEs

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CHAPTER 5

WOMEN'S KNOWLEDGE ON THE USE OF MAIZE CROP PROTECTION EQUIPMENT IN SHAMVA DISTRICT

ABSTRACT

Knowledge has a key role to play in helping rural farmers to meet their challenges such as crop protection to improve yields world over. The purpose of this chapter was to assess knowledge of small scale women farmers on maize crop protection equipment in Shamva District. Purposive sampling Method was used to select 3 wards that are accessible at district level. Random sampling was used to select 400 communal women farmers who are actively involved in maize crop farming at ward level. Pre-tested structured questionnaires were used to collect data from the farmers. The questionnaires had items for evaluating attitude, assessed knowledge, and evaluated socio-economic, cultural and institutional factors determining women farmer's use of maize crop protection equipment. The reseacher used mode on a 5 point likert scale to model the level of knowledge for use of maize crop protection equipments by women farmers. Results showed that most women farmers in Shamva have little or no knowledge and skills on the use of conventional maize crop protection equipment and channels to follow when looking for credit lines. The results further indicated that a significant number of the farmers interviewed have adequate knowledge and skills on the use of traditional maize crop protection equipment which is obtained through field days, demonstration sites and Agritex extension workers. Results from this chapter are key in formulation of better strategies to be used in promoting use of maize crop equipment by women farmers in Shamva District. Awareness campaigns by government are recommended to improve the adoption of plant protection equipment by women in Shamva.

5.1 INTRODUCTION

Agriculture plays an important role in the economy of most African countries, which includes Zimbabwe. In Cameroon it is the major contributor to the Gross Domestic Product (GDP) and the main source of employment (Oben et al, 2015). Hence knowledge in agriculture plays a key role in helping rural farmers to improve yields and contribute meaningfully to the economy (European Commission, 2019). The importance of agriculture for the economy coupled with the fact that women play an important role in this sector makes it critical to find out women's knowledge on maize crop protection. Various studies have researched on knowledge of pests and weeds that destroy the maize crop and the amount of yield losses. A study by Van den Berg (2010) provides knowledge on how stem borers limit maize yields by infesting the crop from seedlings to maturity; other studies provide knowledge on species that reduce maize yield in Central and West Africa (Ndemah, 1999; Chabi-Olaye et al, 2005). The researchers do not take into consideration women knowledge on crop protection equipment. The designers and fabricators of new technologies for crop protection equipment also tend to forget the disadvantaged groups which include women (Affognon *et al.*, 2015 and FAO, 2015a).

Women as an important resource in agriculture need to be equipped with adequate knowledge on crop protection. Most women involved in smallholder maize crop production have knowledge on indigenous methods of crop protection (Mugisha-Kamatenesi, 2004; Oben et al, 2015). Nakhone and Kabutha (1998) point that the use of hoes and slashes is common among women in crop protection whereas use of sprayers and other modern crop protection. There is need to understand women's knowledge on maize crop protection equipment. Women usually get agricultural knowledge through informal sources which may not provide adequate knowledge on maize crop protection equipment (Debrah et al, 1998). The European Commission (2019) argue that agricultural research delivers new knowledge and there is already substantial knowledge available.

However, the understanding of women's knowledge on crop protection equipment in Shamva has not been studied widely. There are limited studies in related issues on women and technology in

agriculture done Shamva District. Hence this objective focused on women's knowledge on maize crop protection equipment in Shamva.

5.2 MATERIAL AND METHODS

Chapter 3 Detailed and described the study area and methodology .The detail focused on questionnaire design, sampling procedures, methods of data collection and data analysis. A summary is given in this chapter.

5.2.1 Description of study area

The research was done in Shamva District, Zimbabwe. For a detailed description of the study area refer to Chapter three.

5.2.2 Research Design

This study used survey research design which helped to obtain information on farmer's knowledge on use of maize crop protection equipment in Shamva District from randomly selected women.

5.2.3 Sampling procedure

Simple random sampling was used to select communal women farmers who are actively involved in maize crop farming in Shamva District. Purposive sampling was used to select 3 wards that are accessible to the researcher in order to easy movement during data collection.

5.2.4 Data collection procedure

Data for this research was collected using questionnaires containing questions on the attitudes, knowledge and factors influencing use of maize crop protection equipment by women in Shamva District. They were distributed amongst women who are actively involved in maize crop farming. More details concerning data collection procedure are given in Chapter 3.

5.2.5 Data analysis procedure and methods

The quantitative data collected through questionnaire method were coded into binary, entered, cleaned and run in Statistical Package for Social Sciences (SPSS Version 20) software. Analysis was done using a 5-point Likert scale. This was used to find out how much knowledge women in Shamva District have on the use of maize crop protection equipment. A 5-point Likert scale ranged

from no knowledge, very little knowledge, moderate knowledge,adequate knowledge and more than adequate knowledge.More detail on data analysis is given in Chapter 3

5.2.6 Challenges encountered during data collect

Location of respondents in the study area were challenging since most of them were at a distant of one another. Some desired areas were not accessible due to physical, political and cultural barriers. The other challenge was financial constrain, the dispersed spatial distribution of respondents in the research means that the researcher needed more money transport and communication. Some respondents were not free to be interviewed in the absence of their male household heads, hence male households were preferred to be present but were not allowed to respond to the questions.

5.3 RESULTS

Table 5: Assessment of women's knowledge on the use of maize crop equipment

Variables on Women's knowledge on the use of maize crop protection equipment	5-point Likert Scale Range										Totals N (%)	
	No knowledge		Very little knowledge		Moderate knowledge		Adequate knowledge		More than adequate knowledge			Mode
	n=391	%	n=391	%	n=391	%	n=391	%	n=391	%		
Knowledge on MCPE	2	0.5	15	3.8	120	30.7	223	57.0	31	7.9	Adequate knowledge	391 (100%)
Knowledge on herbicides	131	33.5	89	22.8	108	27.6	59	15.1	4	1	No knowledge	391 (100%)
Knowledge on the use of traditional MCPE	0	0	2	0.5	73	18.7	229	58.6	87	22.3	Adequate knowledge	391 (100%)
Knowledge on the use of conventional MCPE	201	51.4	84	21.5	73	18.7	32	8.2	1	0.3	No knowledge	391 (100%)
Knowledge from family members	13	3.3	38	9.7	100	25.6	135	34.5	105	26.9	Adequate knowledge	400 (100%)
Knowledge from formal education	64	16.4	112	28.6	134	34.3	72	18.4	9	2.3	Moderate knowledge	391 (100%)
Knowledge from farmer trainings	127	32.5	94	24.0	95	24.3	66	16.9	9	2.3	No knowledge	391 (100%)
Knowledge from field days	22	5.6	22	5.6	238	60.9	106	27.1	3	0.8	Moderate knowledge	391 (100%)
Knowledge from demonstration sites	32	8.2	54	13.8	164	41.9	133	34.0	8	2.0	Moderate knowledge	391 (100%)
Knowledge from Agric extension officers	7	1.8	50	12.8	236	60.4	98	25.1	0	0	Moderate knowledge	391 (100%)
Skills and experience on the use of traditional MCPE	7	1.8	38	9.7	85	21.7	184	47.1	77	19.7	Adequate knowledge	391 (100%)
Skills and experience on the use of conventional MCPE	195	49.9	103	26.3	64	16.4	26	6.6	3	0.8	No knowledge	391 (100%)
Cost of traditional MCPE	105	26.9	179	45.8	63	16.1	34	8.7	10	2.6	Very little knowledge	391 (100%)
Cost of conventional MCPE	320	81.8	63	16.1	6	1.5	2	0.5	0	0	No knowledge	400 (100%)
How to obtain subsidy and credit	369	94.4	21	5.4	1	0.3	0	0	0	0	No knowledge	391 (100%)
Benefits of using conventional MCPE	55	14.1	70	17.9	159	40.7	103	26.3	4	1.0	Moderate knowledge	400 (100%)

Source: Field Survey, 2020.

5.3.1 Knowledge on the use of traditional MCPE

It is noteworthy that 57% of the women in Shamva have adequate knowledge of the term Maize Crop Protection Equipment. Majority of women farmers (33.5 %) do not have knowledge on herbicides. Generally the respondents (58.6%) knew better for questions administered focusing on traditional MCPEs. A further look at results reviewed that 51.4 % of women in study area have no knowledge on the use of conventional MCPEs. Findings show that with 60.9 % have acquired moderate knowledge on MCPE from field days, 41.9% got it from demonstration sites and 60.4 from the Agritex extension officers deployed in their area. In addition most of the women (40.1%) are skilled and experienced when it comes to the use of traditional MCPEs. A quite number of women respondents (49.9%) have no skills and idea on how to use conventional MCPEs. When asked on the issue of costs of conventional MCPEs, 81.8% of the women reviewed that they do not have knowledge. According to findings of this study, about 94.4 of women farmers in Shamva District are not familiar with formalities involved in acquiring credits and subsidies. However, some (40.7%) of the women indicated that they are moderately aware of the benefits associated with the use of conventional MCPEs. (see table 6.1).

5.4 DISCUSSION

Results implies that most women in Shamva District are more familiar with indigenous MCPEs such as hoes, slush and hand sprayers. This could be due to the fact that they are cheap, locally attainable and easy to use (Oben et al, 2015). In Kenya most rural women producing maize have adequate knowledge on weeding using hoes and slashes since the activity is not gender specific whereas use of more technical equipment in spraying herbicides is very low (Nakhone and Kabutha, 1998). Bastue (2013) also argue that most women involved in farming have less knowledge on how to use herbicides. The women also own relatively small pieces of land hence use of conventional MCPEs such as tractor drawn sprayer becomes irrelevant because there will be no economies of scale to enjoy leading to losses. Mugisha-Kamatenesi, 2004 reported that, Farmers' knowledge on MCPEs depends heavily on its relevance, environment and interest in the subject. In addition most women have negative attitude towards some of the equipment hence they become ignorant. There is slow uptake of new knowledge and innovative solutions in farm equipment mostly by women in small and medium-sized farms.

Access to loans or credit facility is a factor that can help women to purchase plant protection equipment in maize production. However, rural women generally receive smaller loans than men (Ashby et al, 2008). Ragasa (2012) notes that women have limited access to credit which limits them on the ownership and use of tractors and draft animals which are also used on tractor-powered sprayers. Lack of larger loans force many women to purchase inferior equipment for plant protection such as hoes instead of cultivators (Ashby et al, 2008). Most rural women in developing countries do not have access to agricultural credit which is an important productive resource for efficient and sustainable production (Nweke, 2001). Odoh, et al (2009) point that agricultural production requires farm credit as one of the most important element that can help farmers to get farm inputs which includes improved plant protection equipment and hired labor. In Nigeria, farm credit has been found to contribute much towards the adoption of farm technologies and has increased income among many rural farmers (Omonona *et al.*, (2008) and Akpan *et al.*, 2013). Therefore farm credit may as well help rural women to access new maize crop protection equipment that promote sustainable agriculture rather than sticking to their traditional equipment that require much time and labor. This may also increase maize production, reduce rural poverty and improve food security.

Results emphasized on the importance of demonstration sites, field days and extension officers. These are key in disseminating important information such as benefit of using conventional maize protection equipment. Traditional agricultural skills and new knowledge on use of crop protection equipment by women can also be learnt from parents, husbands and siblings (Robinson-Pant, 2016). In a study by Nambafu et al (2014) on ‘Knowledge, Attitude and Practices Used in the Control of Striga in Maize by Smallholder Farmers of Western Kenya’, the results revealed that farmers in the study sites acquired knowledge on farming skills either at group levels or household level, in village meetings, through neighbours who were good implementers of technologies, through attending free workshops and trainings, field schools, media, extension workers from international and local NGOs, and the Ministry of Agriculture. Nakhone and Kabutha (1998) found that most women in small holder farming have inadequate knowledge in use of maize protection equipment as a result of poor education and limited extension services which delay the adoption and utilization of technologies such as maize protection equipment.

5.5 CONCLUSION

The chapter has assessed woman in Shamva district on knowledge in the use of MCPEs. Variables with a lag were identified. Generally women in Shamva District have limited knowledge on use of conventional MCPEs and on procedures to obtain loans and subsidies. The farmers are adequately knowledgeable and skilled on use on trraditional MCPEs. Their knowledge mostly come from field days, demonstration sites and extension offices. Gender partisan, ignorance, small farming space and high costs of conventional equipment might explain the lack of information by women in Shamva District on conventional maize crop protection equipment. The government and NGOs into agriculture are encouraged to divulge information on how to use conventional tools in maize crop protection and also how to obtain loans or even provide the equipment on credit to these women famers

5.6 RECOMMENDATIONS

Based on the findings of this chapter, we recommend the following:-

- Raising awareness on the use of plant protection equipment by women to help them improve on the use of technologies in maize protection.
- Agricultural extension officers should work with communities in organizing farmers' gatherings such as field days as platforms for information sharing which also includes use of maize crop protection equipment .These gatherings create an opportunity for women to engage in dialogues and interactions with other farmers influencing them on positively adopting plant protection equipment for their maize crops to improve yields.
- Women in Shamva District are encouraged to consolidate their farmland and work in teams so as to enjoy benefits that comes with use of conventional farming materials.

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CHAPTER 6

FACTORS THAT INFLUENCE WOMEN PRACTICE OF MAIZE CROP PROTECTION EQUIPMENT IN SHAMVA DISTRICT

ABSTRACT

Socio economic, cultural and institutional factors are key in determining women's practices of maize crop protection equipment. The objective of the study was to evaluate the factors determining women's practice of maize crop protection equipment in Shamva District. Purposive sampling Method was used to select 3 wards that are accessible at district level. Random sampling was used to select 400 communal women farmers who are actively involved in maize crop farming at ward level. Pre-tested structured questionnaires were used to collect data from the farmers. The questionnaires had items for evaluating attitude, assessed knowledge, evaluated socio-economic, cultural and institutional factors determining women farmer's use of maize crop protection equipment. The data was analyzed using binary regression model. Results show that source of income ($p=0.000$), income from the sale of maize ($p=0.081$), level of income for the farmer ($p=0.060$), demonstration ($p=0.091$), Cultural or traditional beliefs ($p = 0.084$) and advice received from other farmers ($p = 0.019$) had a statistical significance in influencing the use of MCPes by women farmers in Shamva. These findings provide important insights into the drivers of women practice on maize crop protection equipment. Diversification of farmer's agricultural income generating projects is recommended in order to boost their income.

6.0 INTRODUCTION

Women remain important in agriculture. Rural women have played a vital role in agriculture and food security by producing food (Kehler, 2001; Fabiyi et al, 2007). Over 50 percent of agricultural labour are women. Fabiyi et al (2007) state that women account for 70 percent of agricultural workers. These statistics indicate that women contribute significantly in food production through farming activities. However, women in agriculture face various challenges which include sociological, economic, institutional as well as technological issues. Women tend to be invisible in agriculture due to traditional and cultural challenges which limit their access to agricultural input. The use of equipment by women in sub-Saharan Africa is constrained by norms and values about culturally appropriate gender roles where women rarely use tractors and other mechanized farm equipment (Singh and Kotwaliwale, 2011). The use of agricultural technologies is affected

by women's anticipation of how these may affect their relations, responsibilities and roles (Doss, 2001).

In Zimbabwe, women involved in smallholder maize production face challenges in the usage of maize crop protection equipment. There is an interplay of various factors which cripple women access to new technologies that help in protecting crops from pests, weeds and diseases. Maize crop yields have been declining since 2000 after the fast track land reform program which saw many women getting involved in agriculture as commercial farmers were displaced (Mugabe and Ettiene, 2016). This objective for the study therefore was prompted by the need to understand factors which influence use of maize crop equipment by women in Shamva. There is need to understand which key factors are influencing use of maize crop equipment by women in Shamva.

Various studies have focused on challenges facing women in agriculture, but little has been researched on factors which influence use of maize crop equipment by smallholder maize women farmers in Zimbabwe. Researches have concluded that women lack funds to access adequate farm inputs for their agricultural activities (Johansen, et al, 2012; Farnworth, 2016). Lack of access to credit has also been found by researchers to affect women performance in agriculture. Farm credit has been found to contribute much towards the adoption of farm technologies among many rural farmers in Nigeria (Omonona *et al.*, (2008) and Akpan *et al.*, 2013). Hence this study will focus on factors which affect use of maize crop equipment by women involved in smallholder maize production.

6.1 MATERIAL AND METHODS

Chapter 3 Detailed and described the study area and methodology .The detail focused on questionnaire design, sampling procedures, methods of data collection and data analysis. A summary is given in this chapter.

6.1.1 Description of study area

The research was done in Shamva District, Zimbabwe. For a detailed description of the study area refer to Chapter three.

6.1.2 Research Design

This study used survey research design which helped to obtain information on factors influencing use of maize crop protection equipment by women in Shamva District. A quantitative approach was applied in this research and data was collected from randomly selected women from female headed families in the District.

6.1.3 Sampling procedure

Simple random sampling was used to select communal women farmers who are actively involved in maize crop farming in Shamva District. Purposive sampling was used to select 3 wards that are accessible to the researcher in order to easy movement during data collection.

6.1.4 Data collection procedure

Data for this research was collected using questionnaires containing questions on the attitudes, knowledge and factors influencing use of maize crop protection equipment by women in Shamva District. They were distributed amongst women who are actively involved in maize crop farming. More details concerning data collection procedure are given in Chapter 3.

6.1.5 Data analysis procedure and methods

Binary regression analysis was used to evaluate the factors that influence practice of maize crop protection equipment by women in Shamva district. More detail on data analysis is given in Chapter 3

6.1.6 Challenges encountered during data collect

Location of respondents in the study area were challenging since most of them were at a distant of one another. Some desired areas were not accessible due to physical, political and cultural barriers. The other challenge was financial constrain, the dispersed spatial distribution of respondents in the research means that the researcher needed more money transport and communication. Some respondents were not free to be interviewed in the absence of their male household heads, hence male households were preferred to be present but were not allowed to respond to the question

6.7 RESULTS

In this study binary logistic regression model was developed to determine factors affecting the practice of maize crop protection equipment. The dependent variable were whether a farmer use maize crop protection equipment or not and the predictor variables were knowledge of maize markets, GMB as a sole market, closeness of GMB, prices at GMB , alternative maize markets, closeness of alternative maize markets, fairness of alternative maize market prices, access to credit facilities, access to bank loans, documentation for loan acquisition from bank, access of loans from other sources, gender influence, religious practices influence, age influence, norms and values influence, AGRITEX officers visits, MCPE donation from Government, MCPE donation from NGOs, trainings on MCPE from NGOs, warehouse to store MCPE , repairing of MCPE and size of arable land.

Table 6: Results of Logistic Regression Model

Variables	Coefficients	SE	Significance	Exp(B)
Constant.	-5.296	0.022	0.091	0.932
Any source of income	1.213	0.223	0.000***	0.340
Income from selling maize	1.358	0.015	0.081*	0.359
Income from other means	0.306	0.011	0.108	0.509
Level of income influence use of MCPE	3.657	0.133	0.060*	0.908
Do you know where to sell your maize produce	2.915	0.033	0.386 ns	0.713
Sell it to GMB	1.374	0.038	0.444ns	1.322
Is the GMB market place near you	0.636	0.028	0.419ns	1.000
Are the market prices fair at GMB	1.948	0.037	0.999ns	0.223
Sell your maize produce to other markets	3.555	0.100	0.339ns	0.912
Is the other market place near you	0.327	0.212	1.000ns	1.000
Are the prices from other markets fair	0.921	0.219	0.788ns	0.911
Access to credit facilities	1.316	0.166	0.491 ns	0.424
Access to bank loans?	0.800	0.051	0.214ns	0.424
Do you have documents to access loans from the bank	0.082	1.309	0.663ns	0.635
Access loans from other sources	0.554	2.143	0.451ns	0.931
Gender influence use of MCPE	4.112	1.443	0.312ns	1.933
Religious practices influence use of MCPE	0.029	2.388	1.000ns	1.414
Age influence use of MCPE	1.244	3.566	0.411ns	1.709
Norms and values influence use of MCPE	1.219	1.049	0.455ns	1.904
Cultural and traditional beliefs influence use of MCPE	3.224	1.349	0.084*	0.324
AGRITEX officers visit you regularly	0.211	0.069	0.344ns	0.245
Received any MCPE from the Government	2.543	1.222	0.888n	0.135
Received any MCPE from NGOs	0.271	2.911	0.791ns	0.933
Trainings on MCPE from NGOs	2.231	1.00	0.581ns	0.559
Received advice on MCPE from other farmers	1.478	1.019	0.019**	0.109
Do you take MCPE to the warehouse	0.101	0.039	0.661ns	0.955
Do you repair MCPE	1.021	1.181	0.932ns	1.324
Size of arable land influence use of MCPE	0.371	1.023	0.591ns	0.311
Demonstrations influence use of MCPE	3.213	1.054	0.091*	0.834

Source: Field Survey

Cox & Snell $R^2 = 0.810$, Model Chi square = 45.212, Sig = 0.091

Significance $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** not significant =ns

Income is a significantly positive predictor ($b= 1.213$, $s.e.= 0.223$, $p=0.000$) of the probability of use of maize crop protection equipment by women farmers in Shamva. For a unit increase on this predictor variable, the odds of the use of maize crop protection equipment change by a factor of 0.340.

Income from the sale of maize is a positive and significant predictor of the use maize crop protection tools ($b=1.358$, $s.e. =0.015$, $p=0.081$) the odds of use of maize crop protection equipment change by 0.359 times for every one unit increase on the predictive variable.

Level of income for the women farmer is a positive and significant ($b= 3.657$, $s.e. =0.133$, $p=0.060$) predictor of the probability of the use maize crop protection equipment. One unit increase in predictor variable changes the odds of using maize crop protection equipment by 0.908 times.

Cultural or traditional beliefs is significant positive predictor of the use maize crop protection equipment ($b= 3.224$, $s.e = 1.349$, $p=0.08$, increasing the independent variable by one unit has an effect of varying the odds of maize crop protection practice by 0.324 times.

Advice received from other farmers is a significant positive predictor variable in the practice of maize crop protection equipment ($b= 1.478$, $s.e. = 1.019$, $p= 0.019$). The odds changes by 0.109 times for every one unit increase on the predictive variable.

Demonstration is a positive and significant ($b= 3.213$, $s.e.= 1.054$, $p=0.091$) predictor of the probability of the use of maize crop protection tools. The odds ratio indicates that for every one unit increment on the predictor, the odds of the use of maize crop protection tools changes by a factor of 0.834 times.

All other factors (Knowledge of maize markets ($p=0.386$), GMB as a sole market ($p=0.444$), closeness of GMB ($p=0.419$), Prices at GMB ($p=0.999$), Alternative maize markets ($p=0.081$), Closeness of alternative maize markets ($p=0.339$), Fairness of alternative maize market prices ($p=0.788$), Access to credit facilities ($p=0.491$), Access to bank loans ($p=0.214$), Documentation for loan acquisition from bank ($p=0.663$), Access of loans from other sources ($p=0.451$), Gender influence ($p=0.312$), Religious practices influence ($p=1.000$), Age influence ($p=0.411$), Norms and values influence ($p=0.455$), AGRITEX officers visits ($p=0.344$), MCPE donation from Government ($p=0.888$), MCPE donation from NGOs ($p=0.791$), Trainings on MCPE from NGOs ($p=0.581$), Warehouse to store MCPE ($p=0.661$), Repairing of MCPE ($p=0.932$), Size of arable land influence ($p=0.591$) tested in this study were statistically insignificant in influencing use of MCPEs (see table 6.1).

6.8 DISCUSSION

Income

According to results, income is a significant positive predictor ($b= 1.213$, $s.e.= 0.223$, $p=0.000$) that influence woman practice of MCPEs. When income increases so does the practice of MCPE by women maize farmers. This finding is consistent Doss, (2001) who reported that availability of maize crop protection equipment is limited due to lack of funds to purchase the equipment and draft power. This result could suggest that those women farmers with source of income are on a better position in the acquiring and subsequent use of MCPEs due to their ability to buy crop protection tools. However, women's negative attitudes towards use of maize crop equipment may deter the use of these crop protection equipment by women even though the income permits them to buy the equipment. This view is in line with findings by Majali, (2012) who states that attitude is part of the cultural factors which are among the forces that encourage or discourage women from using crop protection equipment.

Income from selling maize

Logistic regression result showed that income from the sale of maize have a significant positive role ($b=1.358$, $s.e.=0.015$, $p=0.081$) in determining women practice of maize crop protection equipment in Shamva District. This means as income from selling maize increases the practice of

maize crop protection equipment also increase. This is in collaboration with finding by Johansen et al, (2012) who states that most women do not have adequate funds to purchase the plant protection equipment and the herbicides. Maonga *et al.* (2013) confirmed this finding also in a study done in Malawi. This could be attributed to the fact that maize is the main crop hence women farmers in the study area depends on the income from its sale for the purchase of MCPES. In contrary, Beuchelt and Bastue (2013) argue that most women involved in farming have less knowledge on how to use herbicides. This affects the use of maize crop protection equipment even if money from the sale of maize is enough for them to buy maize protection equipment.

Level of income

Finding of this study reviewed that level of income of farmers significantly determines ($b= 3.657$, $s.e. =0.133$, $p=0.060$) the practice of maize crop protection equipment in a positive direction. This implies that if the level of income increases the use of MCPE also increases. In a similar study, Farnworth (2016) states that level of income affects most farmers. Most of the income in some families is used to pay for hired labor rather than providing plant protection equipment (Doss, 2001). If the level of income is low then the farmers are forced to use small and locally obtained equipment such as hoes, slush and broom as maize crop protection equipment and those farmers with higher level of income are the ones that are most likely to use MCPES due to their buying power. Most women farmers cannot work for a wage as they engage in tasks such as taking care for the elderly and children that require them to stay near the home. As a result of that and shortage of time most women engage in low income practices that do not give them enough income to purchase maize protection equipment. In a nutshell, Singh and Kotwaliwale (2011) argue that the use of such equipment by women in sub-Saharan Africa is constrained by norms and values about culturally appropriate gender roles .Women rarely use tractors and other mechanized farm equipment even if their level of income is sufficient.

Cultural and traditional beliefs

Community cultural or traditional beliefs are key in influencing women's practices positively ($b= 3.224$, $s.e = 1.349$, $p=0.084$) according to results of this study. This result is in solidarity of the finding by Manda and Mvumi (2010) who reported that cultural beliefs have a strong influence in the crop processing in Zimbabwe. In addition, Maonga *et al.* (2013) reported that culturally there

are certain tasks by men or women when practicing maize crop protection. This might be due to the fact that in Zimbabwe it is believed that some jobs such as spraying using a knapsack sprayer are meant for men.

Advice from other farmers

Results reviewed that advice from other farmers is a vital positive predictor ($b= 1.478$, $s.e. = 1.019$, $p= 0.019$) influencing women farmers to use MCPs. Advice help farmers to acquire new knowledge which make them become aware of new technology in plant protection equipment (Bukosheva *et al.*, 2012). Low levels of knowledge on use of plant protection equipment and limited training puts women at high risk during plant protection processes in maize production (Atreya, 2007; Jors et al; 2013). This result might suggest that few farmers that are ahead in terms of knowledge in use of MCPs are playing a significant role in ensuring that almost everyone is exposed to their advice and counselling. However, gender related attitudes tend to discriminate women from accessing certain crop protection equipment (Nakhone and Kabutha, 1998).this means that even if the advice from other farmers is adequate for these women farmers to use maize crop protection equipment, hindrances always come from the fact that they are women.

Demonstrations

We found out that demonstration is a critical positive factor ($b= 3.213$, $s.e. = 1.054$, $p=0.091$) influencing women practice of maize crop protection equipment in Shamva District. Most women in small-holder farming have received less training in pesticide management which includes the use of different equipment for plant protection in the application of pesticides (London, et al, 2002). The adoption of these technologies is affected by lack of access to complementary knowledge (Peterman et al, 2010). This result suggest that demonstrations are enhancing skills of women farmers in the use of maize crop protection equipment in Shamva district. However, preferences also play a role on top of demonstrations. Women prefer women-friendly equipment which increases work efficiency, reduces drudgery and provides a comfortable working posture (Sharma et al, 2015).

6.9 CONCLUSION

In this study, we found out that the predictor variables, income, level of income, income from sale of maize, cultural or traditional beliefs, advice from farmers and demonstrations are significant in explaining in Shamva District. These findings provide important insights into the drivers of women practice on maize crop protection equipment. Our study could therefore be important in the formulation of hypotheses that seek to further test the key drivers of women practice on MCPes in other areas.

6.10 RECOMMENDATIONS

According to results of this study we recommend that the Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement, under the department of Agritex in Shamva District should:-

- Enhance diversity of farmer' agricultural income generating projects in order to boost their income so that they will practice more on maize crop protection equipment
- Encourage all farmers to attend demonstration sites as a mean of information dissemination on the use of new technologies in maize crop protection
- Arrange programs such as field days more frequently so as to increase chances of farmer to farmer interactions so that more advice on the use of maize crop protection equipment is shared amongst the women to enhance equality.
- Societal cultural or traditional beliefs needs to be re-orientated in order to promote women practice of maize crop equipment
- Similar studies be conducted in different areas in order to generalize findings of this study

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CHAPTER 7

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.0 INTRODUCTION

This Chapter looked at summary of the research proceedings and findings from Shamva District located in Mashonaland central Province, Zimbabwe. The broad objective of the study was to evaluate the factors that influence use of such maize crop protection equipment by women in Shamva district. Descriptive statistics, tabulations and chi-square test, mode on a 5 point likert and binary logistic regression analysis were used to analyses specific objectives of the study. The results, discussion and conclusions of the study are explained in Chapter four, five and six. This chapter summarizes, concludes and recommends according to findings.

7.1 RESEARCH SUMMARY

The first chapter of the study was introduction, problem statement, objectives, research questions, justification and outline of the thesis. Second chapter of the study was on literature review. Third chapter of the study was on methodology which covered study site, research design, sampling procedure, data collection procedure, data analysis produce, ethical considerations and finally the summary of the methodology chapter.

Chapter four, five and six were results chapters for each objective respectively. Chapter four was to evaluate women's attitude on the use of maize crop protection equipment. This was achieved through use of descriptive statistics tabulations and chi-square. Data was analyzed using SPSS software version 20. The results show that women farmers in Shamva District have significant Positive attitudes ($p < 0.05$) towards manually operated tools such as a hand hoe and Negative attitudes ($p < 0.05$) on the use of conventional maize crop protection equipment such as boom sprayer.

After evaluating women's attitude towards the use of maize crop protection equipment, the study proceeded to Chapter five in order to assess knowledge of women farmers in Shamva District on the use of maize crop protection equipment. Four hundred women were randomly selected from three selected wards. Data analysis was done using mode on a 5-point Likert scale that ranged from "no knowledge" to "more than adequate knowledge". Results showed that most women

farmers in Shamva have little or no knowledge and skills on the use of conventional maize crop protection equipment and channels to follow when looking for credit lines. The results further indicated that a significant number of the farmers interviewed have adequate knowledge and skills on the use of traditional maize crop protection equipment which is obtained through field days, demonstration sites and Agritex extension workers.

Chapter six presents results of socio-economic, cultural and institutional factors determining women's practice on maize crop protection equipment in Shamva District. Four hundred women were randomly selected for survey in the study area. Data was analysed using binary logistic regression analysis to determine socio-economic, cultural and institutional factors determining women's practice on the use of maize crop protection equipment in the study area. Statistical significance was measured at $p=0.1$, $p=0.05$ and $p=0.001$. The binary logistic regression model revealed that source of income ($p=0.000$), income from the sale of maize ($p=0.081$), level of income for the farmer ($p=0.060$), demonstration ($p=0.091$), Cultural or traditional beliefs ($p=0.084$) and advice received from other farmers ($p=0.019$) have a positive statistical significance in influencing the use of maize crop protection equipment by women farmers in Shamva. Hence improving source of income, income from the sale of maize, level of income for the farmer, level of income for the farmer and advice from other farmers is key in increasing practice of maize crop protection equipment by women farmers in Shamva District.

7.2 CONCLUSIONS

There is a reduced tendency in the practice of maize crop protection equipment by women farmers in Shamva District which is causing a significant decrease in maize production in the area. The study evaluated women's attitude, assessed knowledge, evaluated socio-economic, cultural and institutional factors determining women farmer's practice of maize crop protection equipment in Shamva District.

We found out that women farmers in Shamva District have significant Positive attitudes ($p < 0.05$) towards manually operated tools such as a hand hoe and Negative attitudes ($p < 0.05$) on the use of conventional maize crop protection equipment such as boom sprayer.

Results showed that most women farmers in Shamva have little or no knowledge and skills on the use of conventional maize crop protection equipment and channels to follow when looking for credit lines. The results further indicated that a significant number of the farmers interviewed have adequate knowledge and skills on the use of traditional maize crop protection equipment which is obtained through field days, demonstration sites and Agritex extension workers.

The binary logistic regression model revealed that source of income ($p = 0.000$), income from the sale of maize ($p = 0.081$), level of income for the farmer ($p = 0.060$), demonstration ($p = 0.091$), Cultural or traditional beliefs ($p = 0.084$) and advice received from other farmers ($p = 0.019$) have a positive statistical significance in influencing the use of maize crop protection equipment by women farmers in Shamva.

7.3 POLICY IMPLICATION AND RECOMMENDATIONS

Government should promote practice on maize crop protection equipment by women farmers in Shamva District through:

On Attitude.

- To do excessive awareness campaigns and demonstrations on modern maize crop protection equipments
- Extension officers should plan and organize women in to small groups of 10 to 15 members and cascade new technologies information aimed at addressing women challenges in the utilization of conventional maize crop protection equipments

On Knowledge.

- Raising awareness on the use of plant protection equipment by women to help them improve on the use of technologies in maize protection.
- Agricultural extension officers should work with communities in organizing farmers' gatherings such as field days as platforms for information sharing which also includes use of maize crop protection equipment .These gatherings create an opportunity for women to engage in dialogues and interactions with other farmers influencing them on positively adopting plant protection equipment for their maize crops to improve yields.
- Women in Shamva District are encouraged to consolidate their farmland and work in teams so as to enjoy benefits that comes with use of conventional farming materials.

On socio-economic, cultural and institutional factors.

- Enhance diversity of farmer' agricultural income generating projects in order to boost their income so that they will practice more on maize crop protection equipment
- Encourage all farmers to attend demonstration sites as a mean of information dissemination on the use of new technologies in maize crop protection
- Arrange programs such as field days more frequently so as to increase chances of farmer to farmer interactions so that more advice on the use of maize crop protection equipment is shared amongst the women to enhance equality.
- Societal cultural or traditional beliefs needs to be re-orientated in order to promote women practice of maize crop equipment
- Similar studies be conducted in different areas in order to generalize findings of this study
- **Areas for further research**
 - Future studies to be done on the same subject but in different geographical set-up in order to generalize findings.
 - Future studies to be done on other maize crop farming equipment used by women.

APPENDIX

MERCY JONGWE B1335357

Questionnaire on the factors that influence use of maize crop protection equipment by women in Shamva District.

Introduction

You have been randomly selected to take part in a study to evaluate factors that influence use of maize crop protection equipment by women in Shamva district. The responses that you will provide will be strictly used for academic purposes and you are kindly asked to provide honest answers for all questions when filling this questionnaire. There is no promised reward for taking part in this study though your thoughts will contribute to the body of knowledge of maize protection equipment. All the personal information provided will be kept confidential during the course of the study.

1: HOUSEHOLD CHARACTERISTICS

Date: _____ **Village:** _____

Ward _____ **name** _____ **and**
No _____ **District** _____

—

Respondent's information

Age: _____ **Sex:** _____ **Marital status:** _____

A. Women attitudes on the use of maize crop protection equipment

Attitude	Broom		Slush		Hand hoe		Hand sprayer		Knapsack sprayer		Boom sprayer		Tractor drawn sprayer		%
	Y E S	N O	Y E S	N O	Y E S	N O	Y E S	N O	Y E S	N O	Y E S	N O	Y E S	N O	
Efficiency															
Is it an effective maize crop protection equipment?															
Is it labour saving equipment?															
Is it easy to maintain?															
Total															
Design and Drudgery															
Is it women friendly?															
Is it easy to use?															
Does the design of this crop protection equipment provide you with a comfortable working posture when using it?															
Are there any health problems that you think are as a result of using this equipment?															
Do you think that if the design is improved, maize crop production by women can improve?															
Total															
Gender roles															
Are women allowed to use this maize crop equipment in your community?															
Do you own this equipment?															

Total															
-------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

B. Women knowledge on the use of maize crop protection equipment and the 5- point Likert scale range.

Women knowledge on:	5- point Likert scale range				
	No knowledge	Very little knowledge	Moderate knowledge	Adequate knowledge	More than adequate knowledge
Maize crop protection equipment?					
Herbicides?					
How to use traditional maize crop protection equipment (broom, slush, sickle, hand hoes etc)?					
How to use conventional equipment (sprayers and cultivators etc)?					
Knowledge from family members?					
Knowledge from formal education?					
Knowledge from farmer trainings?					
Knowledge from field days?					
Knowledge from demonstration sites?					
Knowledge from agricultural extension workers?					
Skills and experience on how to use traditional maize crop protection equipment?					

Skills and experience on how to use conventional maize crop protection equipment?					
Cost of traditional crop protection equipment?					
Cost of conventional crop protection equipment?					
Obtaining subsidy and credit to purchase maize crop equipment?					
Benefits of using conventional maize crop protection equipment?					

C. Factors influencing use of maize crop protection equipment by women in Shamva District.

FACTORS	YES	NO
Economic factors		
Do you have any source of income?		
Income from selling maize produce?		
Income from other means eg job/ selling of other farm produce?		
Level of income has influence on the use of maize crop protection equipment?		
Do you know where to sell your maize produce?		
Do you sell your maize produce to GMB?		
If yes is the market near you?		
Are the market prizes fair?		
Do you sell your maize produce to other markets other than GMB?		
If yes, is the market near you?		
Are the prizes fair?		
Do you have access to credit facilities?		
Do you access loans from the bank?		
O you have easy access to requirements needed by the bank to obtain a loan?		
Do you access loans from other sources besides the bank?		

Are the requirements needed to access a loan easy to meet?		
Sociological factors		
Does gender have any influence on the use of maize crop protection equipment?		
Do religious practices have influence on the use of maize crop protection equipment?		
Does age have any influence on the use of maize crop protection equipment?		
Cultural factors		
Do norms and values in the household or community influence use of maize crop protection equipment?		
Do cultural and traditional beliefs have any influence on the use of maize crop protection equipment?		
Institutional factors		
Do Agritex extension officers regularly visit your households?		
Have you ever received any maize crop protection equipment from the government?		
Have you ever received any maize crop equipment from the NGOs?		
Have you ever received any training on maize crop protection equipment from the NGOs?		
Have you ever received advice from other farmers on maize crop protection equipment?		
Technological factors		
Do you take the maize crop equipment to the warehouse?		
Do you make any repairs to the broken maize crop protection equipment?		
Does size of arable land has influence on the use of crop protection equipment?		
Do demonstrations have influence on the use of maize crop equipment?		

Any comments..... other
.....
.....

Thank you for your time

Enumerator's name _____ Signature _____

Date _____