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Research Paper

Are Agricultural Women Empowerment Programmes Climate Smart? Insights from Siavonga, Southern Zambia

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Abstract
Crop production, fish farming and goat production are promoted among women as empowerment projects by both governmental and non-governmental development actors implementing Women Empowerment Programmes (WEPs). The aim of this study was to ascertain how agricultural WEPs' activities are affected by climate variability in Siavonga. Data was collected through questionnaires administered to 49 WEP participants and from eight key informants. The data was analysed using thematic analysis, descriptive statistics and Climate Smart Agriculture Indicators.All the respondents (n=16) engaged in crop production reported prolonged droughts while 87.5 percent mentioned extremely high temperatures, leading to lower crop yields. For fish farming, 50 percent of the respondents(n=18) reported that prolonged droughts and high temperatures led to high mortalities of fingerlings and low fish production. The study revealed that lack of irrigation systems, water storage facilities, fish coolers, inadequate financial capital in the fish WEP contributed to the programme not being climate smart. For goat farming WEP, all the respondents(n=15) reported that prolonged droughts very severely affected their project while 53-60 percent cited extremely high temperatures, late onset and early offset of rainy season. The goat empowerment project was quite climate smart as it exhibited resilience to the effects of climate variability despite suffering from poor access to fodder and water during the dry season. The crop production and fish farming WEPs were arguably not climate smart. The study recommends that agricultural WEPs implementation should emphasise enhancement of agency and self-reliance among project participants, which would drive the participants to increase collective action efforts around accessing finances and knowledge and skills in climate smart agricultural activities
Keywords: *climate variability, smallholder agriculture, crop production, fish farming, goat production*

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I. INTRODUCTION

In efforts to reduce challenges faced by women in meeting household food and income needs, development actors implement what are commonly known as Women Empowerment Programmes (WEPs). WEPs are conceptualised in numerous ways, all dependant on how women's empowerment is defined. Women empowerment definitions from literature include: the expansion in women's ability to make strategic life choices in a context where this ability was previously denied to them[1]; the process of challenging existing power relations, and of gaining greater control over the sources of power [2]; a process whereby women become able to organize themselves to increase their own self-reliance, to assert their independent right to make choices and to control resources, which assists in challenging and eliminating their own subordination [3-5]: and the process of increasing women's access to control over the strategic life choices that affect them and access to the opportunities that allow them fully to realize their capacities[6]. Such definitions of women's empowerment have informed development interventionists' formulation of WEPs, which largely include increasing income earning, asset owning, and access to information for women premised on the belief that enhancing women's spirit of entrepreneurship is a precondition for their social and political emancipation [7].

WEPs include activities whose main objective is to integrate women into the development process, thereby uplifting their standard of living in all areas of human endeavours. Promotion of WEPs in Zambia draw roots from colonial times [(8].Colonial authorities attempted to empower indigenous women in various skills such as sewing, childcare and homecare [9, 10]. Empowerment efforts were spearheaded by European women, especially missionaries, who mobilized both rural and urban women into the so called clubs and focused on women's roles as mothers and wives [8]. After Zambia gained independence in 1964 and up until the 1980s, activities of women empowerment programmes included poultry, livestock, craft making, maize and vegetable production [11]. These empowerment programmes aimed at income generation, improved household nutrition and food security, and reduced dependency on men folk by women. Since then, successive ZambianGovernments have promoted various empowerment programmes among women across the country. Currently, activities such as crop and honey production, fish and livestock farming, group saving and lending, and financial literacy which are framed as empowerment programmes are routinely promoted among women[12, 13].

Over 20 years ago, Sen [14] had cautioned against women's empowerment programmes shifting focus from empowerment or creating space for women to build confidence and self-esteem to provision of access to external resources, and assets or services. More recently, Cornwall [15] observed that empowerment programmes had shifted from methodologies that engaged critical consciousness, quested norms and unequal power relations to programmes that begin and end with increasing women's access to resources. We contend that WEPs that superficially engage with women through provision of access to resources run the risk of enhancing their economic vulnerability by promoting activities that are susceptible to external risks such as climatic events. In the face of climate variability, agricultural WEP activities such as fish farming, crop production and livestock production are particularly vulnerable [16] as they are susceptible to climatic parameters such as extreme temperatures, low and excessive rainfall. Given the rain fed nature of crop production in sub-Saharan Africa[17], below and above normal, as well as intra-seasonal drought incidences adversely affect crop yields and results in lower incomes and household food and nutritional insecurity[18-20]. Livestock production is affected via reduced access to fodder and water, and increased incidences of disease [21, 22]. Fish farming suffers from high mortality of fingerlings due to extreme temperatures and increased fish production costs and lack of support systems to recover from climate change effects[23, 24]. Without, adaptation to such climate change/variability effects through use of practices that enhance resilience, agricultural WEP could have the counter effect of increasing women's vulnerability and essentially, dis-empowering them. Thus, promotion of agricultural WEPs should integrate climate smart agricultural practices if the intended objectives are to be achieved. A climate smart agricultural activity is said to one which is not affected by climate change and climate variability. It is an activity that builds resilience against effects of climate variability and is able to return its normal structures and functions after a climate related calamity occurs [25].

Since the concept of climate smart agriculture was launched in 2009[26]there are a number of practices espoused to build resilience of agriculture against the effects of climate variability and some climate change indicators have since been developed. These are presented in Figure 1.

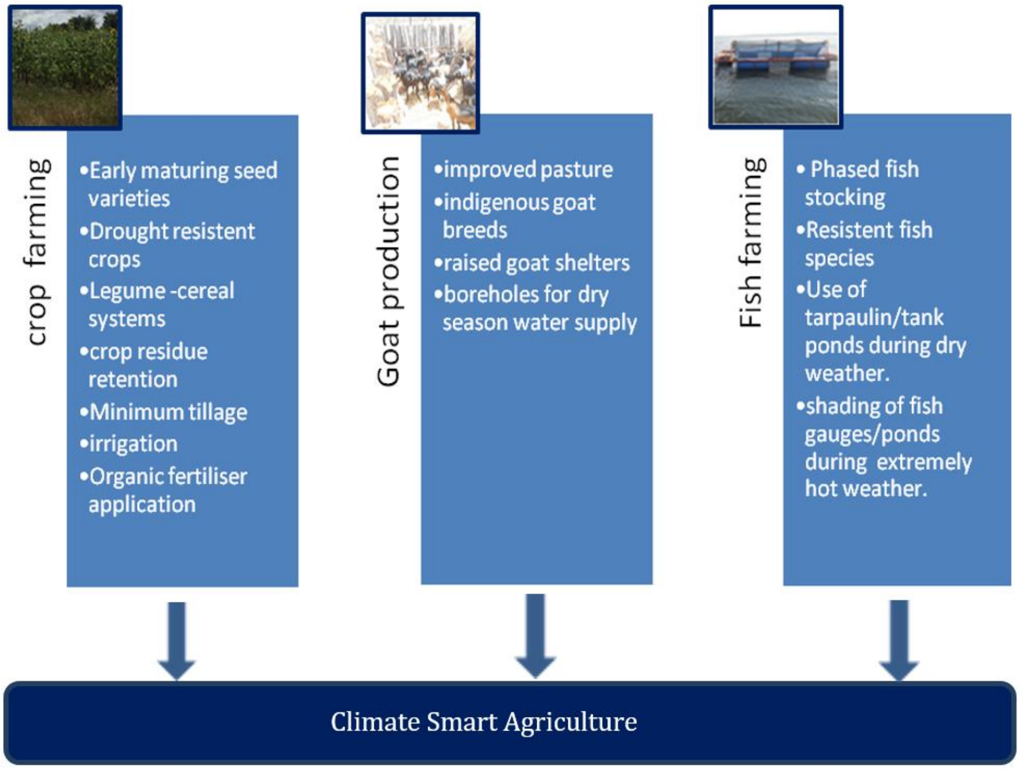

Figure 1: Climate Smart Indicators for Agricultural Women Empowerment Programmes

The thrust of this study was to assess how climate variability affects fish farming, crop production and goat farming in Siavonga District of Southern Province, Zambia and to determine whether or not programme activities WEPs consider activities to address vulnerabilities resulting from the identified climate risks. The overarching research question for the study was are agricultural WEPs in Siavonga climate smart? Empirical evidence and improved understanding of the extent to which agricultural WEPs are climate smart has policy and practice value. Development actors integrating climate smart agriculture in their empowerment programmes would minimize the vulnerability of programme participants to climate risk. Women's susceptibility to climate risk has the potential to hinder their empowerment through reduced choices and access to resources engendered by climatic disasters.

II. METHODS

This study employed a cross sectional design to investigate three women's groups engaged in crop production, fish farming and goat farming in Siavonga District. The goat farming group was located in Hajuma village, the crop farming group in Kabyobyo village while the group for fish farming was in Kariba Township (Figure 2).

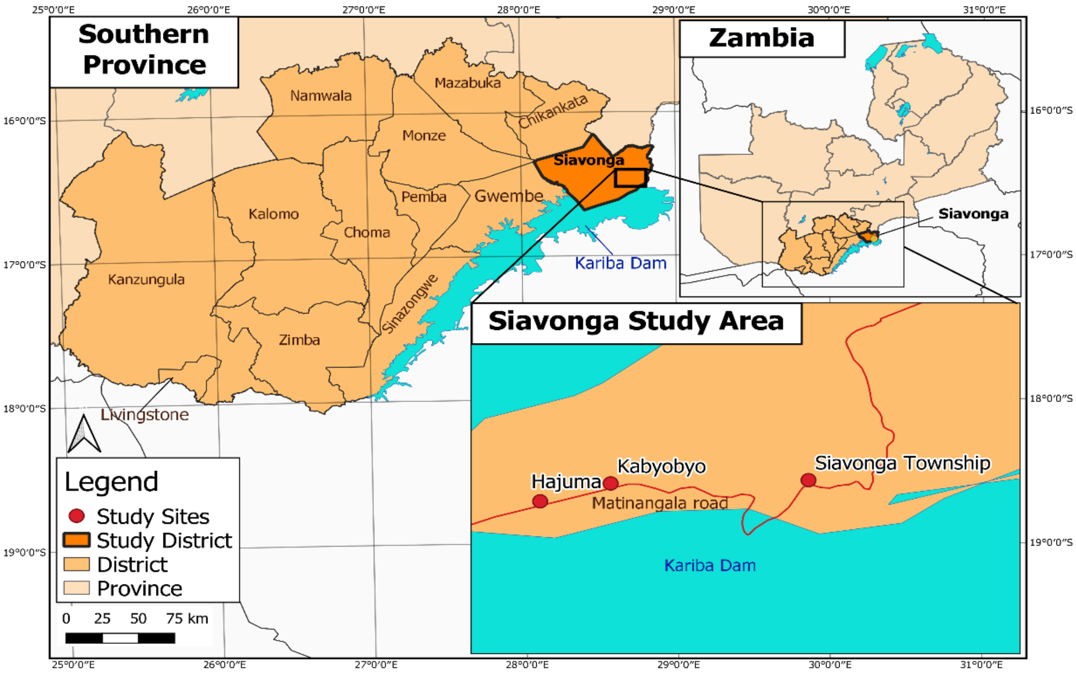

Figure 2. Location of Siavonga district

Siavonga is home to Lake Kariba, the largest man-made lake in Southern Africa and one of the largest in Africa. Rainfall in Siavonga district is generally erratic and prolonged drought periods are frequent. The temperature in the area is hot and dry due to its relatively low altitude [27].

2.1 Data collection

A questionnaire was administered to all the 49 women participating in WEPs at the time of the study, which was in August 2019. The respondents were segregated as 16 (32.7 percent) engaged in crop production, 18 (36.7 percent) in fish farming and 15 (30.6 percent) in goat farming. The questions were read out to the respondents and their responses written down by the interviewer, who is the first author. This approach was employed as there was an expectation that some of the respondents were not literate. The questions were asked in *ChiTonga*, the language commonly spoken in the study area. The questionnaire comprised questions on activities that respondents were engaged in and how the activities were affected by climate variability. The questions were asked to respondents in the same way so as not to change their meaning and to increase validity. Similarly, the researcher administered interview guides to the eight key informants by reading out questions to them and writing down their responses. The researcher probed where necessary and added follow-ups questions where necessary.

Key informants were purposively sampled; that is, two from Ministry of Agriculture, two from Ministry of Fisheries and Livestock, two from the Department of Community Development and two from Siavonga Nutrition Group (SNG). The goal of purposive sampling is to sample cases, participants in a strategic way so that those sampled are relevant to the research questions that are being posed[28]. Therefore, the rationale of the key informant interviews was to access expert knowledge on climate variability and agricultural WEPs. The reason for drawing key informants from the Ministry of Agriculture was that it is the Ministry responsible for agricultural matters in the District. Key informants from the ministry were asked about the types of crops promoted by public extension agents, how these crops were affected by climate variability and climate smart agricultural practices promoted among smallholder farmers. Key informants from the Ministry of Livestock and Fisheries were interviewed on livestock production and fish farming activities in the District, and how climate variability was mediating these. In addition, the researchers wanted to get information on adaption measures put in place to counter climate variability effects on livestock and fish farming. The Department of Community Development is the Department responsible for the identification of vulnerable women, formation and registration of women's groups, supervision and monitoring of WEPs. Therefore, key informants from the Department were asked about the WEPs and activities promoted therein. The Siavonga Nutrition Group is an organization whose core responsibility is to sensitise women on nutrition and HIV/AIDS in Siavonga District. In addition, it was responsible for monitoring of the fish farming WEP in collaboration with the Ministry of Fisheries and Livestock.

Interview guides were used in conducting the key informant interviews. Interview guides consist of a list of questions or specific topics to be asked by the interviewer, but the interviewee has a great deal of leeway in how to respond and they allow for the inclusion of other questions [28]. Some of the questions asked were how climate variability may affect the three WEPs, what type of technical assistance was provided to women engaged inWEPs and how climate smart agriculture practices were incorporated in crop production, fish farming and in goat farming.

Secondary data on rainfall and temperature from Zambia's Meteorological Department was obtained for the period 1980 to 2013 to determine rainfall and temperature trends for the study area, and triangulate with the perceptions of the respondents on climate variability.

2.2 Data Analysis

Responses to some questionnaire questions were captured using a Likert scale. A Likert scale is a rating scale used in surveys that measures how people feel about something. It includes a series of questions that are asked to respondents to indicate their level of agreement or disagreement on a seven-point scale running from 'Yes, I strongly agree' to 'No, I strongly disagree' [28]. Responses on the perceptions of women engaged in crop production, fish farming and goat farming empowerment programmes was recorded using a 5-point Likert scale on the questionnaire. The Likert scale had 5 perceptual statements on prolonged droughts, extreme temperatures, low rainfall, late onset of rainfall and early offset of rainfall. The statement was 'how' each of these affected empowerment programmes. The option responses were (i) very severe (ii) severe (iii) not severe (iv) not at all and (v) I do not know. Further, a nominal scale with values 5, 4, 3, 2 and 1 was used. These were attributed to the responses; very severe, severe, not severe and not at all, respectively. Scores for each respondent under each respective WEP were summed up. The total score was then used to assess the extent to which each WEP was affected by climate variability and compared to the climate smart practices under each WEP. The quantitative data on climate smart practices for crop, fish and goat farming WEPs was analysed using the Climate Smart Agriculture Indicators (Figure 1) which provided a list of possible options of climate smart practices for the three WEPs. The purpose was to examine the extent to which the WEPs were climate smart. Qualitative data was analysed by pooling similar responses under one theme. The number of times a response was given was noted to give an indication of the prevalence of the view. Data on rainfall and temperature was analysed for mean estimates and long term trends.

2.3 Ethical considerations

Approval to conduct the research was obtained from the University of Zambia's Natural Sciences Research Ethics Committee. Before interviews, the purpose of the study was explained to research participants. Further, they were informed that participation was voluntary and they were free to opt out of the interviews at any point. Research participants were assured that their identities would not be revealed and confidentiality would be upheld. Informed consent was obtained verbally from all research participants, all of whom were adults above the age of 21 years. Research data was stored in password protected folders on the personal laptops of the authors.

III. RESULTS AND DISCUSSION

The socio-economic and demographic characteristics of the respondents are presented in Table 1. The study revealed that married women were being helped by their spouses to carry out certain activities in WEPs such as tillage of the land, constriction of grain storage facilities and improved goat shelters among others, while unmarried women usually paid for such labour. With regards to number of years lived in the study area, all the respondents had lived for more than 4 years in the area with the majority (55.1 percent) having lived there for than 25 years. Close of half (48.9 percent) of respondents reported that their household size ranged from 6-10 persons with 4 percent reporting household sizes of more than 10 persons. In terms of education level, most (67.4 percent) of the respondents had only obtained primary education with 4.8 percent having attained secondary education while the rest did not have any formal education. Low education levels among women engaged in WEPs was reported to be a constraint in the acquisition of climate information through radios, televisions and cell phones. This is because climate information is usually packed and disseminated in English. All the respondents said that they were self-employed and ventured into various businesses which included stone crushing, fish trading, selling of vegetables and shop trading.

Table 1. Socio-economic and demographic characteristics of respondents

Demographic Characteristics			
Age group	**Frequency**	**Percentage**	
21 – 30 years	3	6.0	
31 – 40 years	15	30.6	
41 – 50 years	18	36.7	
Above 50 years	13	26.5	
Level of Education			
None	14	28.6	
Primary	33	67.4	
Secondary	2	4.8	
Tertiary	0	0.0	
Marital Status			
Single	3	6.0	
Married	39	79.6	
Divorced	1	2.0	
Widowed	4	8.0	
Separated	2	4.8	
Household Size			
5 persons or less	23	46.9	
6 persons - 10 persons	24	48.9	
More than 10 persons	2	4.0	
Number of Years Lived in the District			
Less than 5 years	0	0.0	
4– 10 years	6	12.2	
11 – 15 years	4	8.2	
16 – 20 years	9	18.4	
21 – 25 years	3	6.1	
Above 25 years	27	55.1	
Monthly Cash Income	**Mean**	**Maximum**	**Lowest**
WEP Type			
Crop Production	ZMW 519.38	ZMW 1,200.00	ZMW 180.00
Goat Farming	ZMW 358.67	ZMW 700.00	ZMW 700.00
Fish Farming	ZMW 747.22	ZMW 1,600.00	ZMW 150.00

1USD = ZMW 13.20 (30/09/2019)

3.1 Perceptions on Climate Variability

This study, follows the IPCC's (2014) definition of the perception of climate variability as an individual's mental picture of local climate variability, changes and variations in seasonal changes using individual and cultural experiences. Figure 3 highlights that all of the respondents interviewed indicated that they had experienced extremely high temperatures. This concurs with climate change studies on Zambia that noted that Zambia has over the past few decades experienced increased temperature variations [29, 30] and this trend is predicted to continue into the future [31, 32]. In her study of fishers (n=90) in Siavonga, Kabisa[33] reported that almost half of her respondents perceived a decrease in rainfall but could not say if temperatures had decreased.

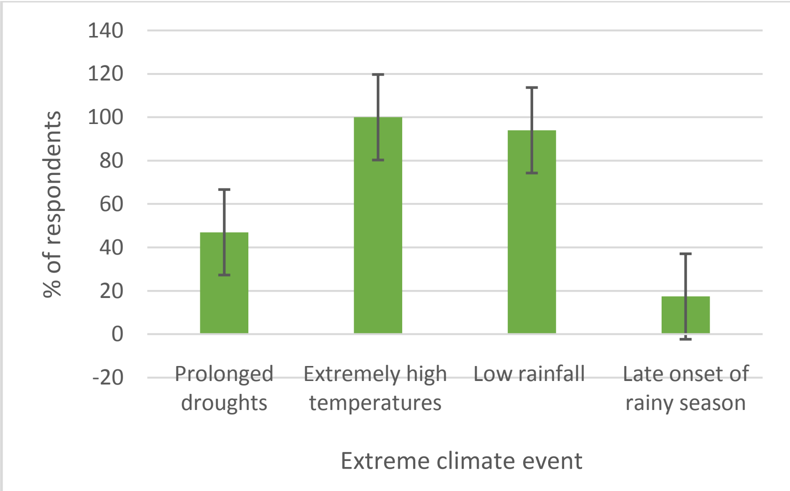

Figure 3. Perceptions of climate change in Siavonga among survey respondents

Drought periods commonly occur when a false start of rain in November is followed by a long dry period which can be fatal to crop establishment, and catastrophic for a smallholder farmer[25].

Analysis of rainfall data for the study area for the period 1980 to 2013 shows variation from one season to the next and a declining trend from 2004 (Figure 4).

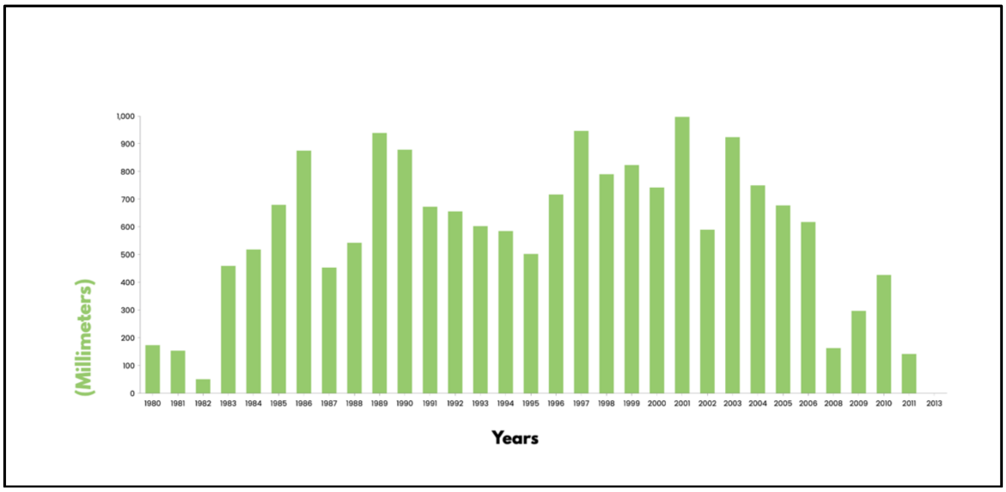

Figure 4. Rainfall data for Siavonga, 1980 to 2013. (Source: Meteorological Department, 2014).

Total annual rainfall dropped to as low as 200mm, and averaged around 600m over the three decades. While this is typical for the agro-ecological region in which the study area is located (AERI), it is considered to be challenging for rain-fed crop production. Categorising the rainfall data by agricultural season, with a season start baseline of 2ndNovember reveals variability in the start of the rainy season between 1980 and 2011(Figure 5).

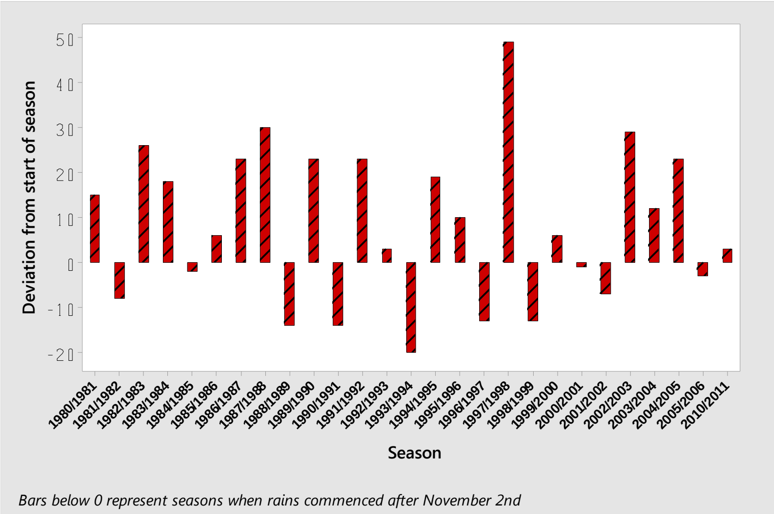

Figure 5. On-set of rainy season in Siavonga, 1980/1981 to 2010/2011.

Late on-set of the rainy season in most years was preceded by early onset the previous year. This tends heighten the perception of very late start of the rainy season reported by some respondents. Between 1986 and 2011 the mean temperature of Lake Kariba rose by 0.7 °C, with a maximum rise of 1.5 °C in March [34].

3.2 WEP Activities

The activities for WEPs focused on crop production, fish farming and goat farming varied as shown in Table 2.

Table 2: Activities undertaken in women empowerment programmes in Siavonga

Crop Farming	% of respondents	Fish Farming	% of respondents	Goat Farming	% of respondents
Land preparation	100	Fish harvesting	2	Construction of improved goat shelters	5
Construction of improved storage facilities for grains	4	Fish stocking	3	Goat vaccination	55
Crop rotation	50	Fish feeding	58	Pasture preservation	14
Nutrition Education Demonstrations	27	Fish marketing	2	Goat management trainings	17
Legume production		Group saving	100	Replacement of ear tags on goats	13
Production of drought resistant crops.	100	Dairy farming	56	'Pass on' programme	100
Crop residue retention	26	Chicken rearing	100	-	-
-	-	Purchase of fish feeds	100	-	-
-	-	Purchase of fingerlings	100	-	-

3.2.1 Crop Production

Activities under crop production WEP were leguminous crop rotation, planting in basins, nutrition education, use of organic fertilizers, growing of drought resistant crops such as sorghum (*Sorghum bicolor*) and finger millet (*Eleusinecoracana*), and crop residue retention, which entails retaining crop residues in the fields after harvest. All the respondents from the WEP engaged in crop production reported that prolonged droughts adversely affected their crops, 87 percent reported that extreme temperatures led to poor germination of seed and wilting of crops while 31 percent said early offset of rainfall led to lower crop yields. A key informant from the district office of the Ministry of Agriculture similarly noted that farmers in Siavonga experienced crop failure largely due to extreme temperatures and low rainfall. He cited the 2018/2019 agricultural season as having been exceptional in having extremely high temperatures and low rainfall, which resulted in very low crop yields. He advised that in view of the high temperatures and prolonged dry spells in Siavonga District, growing of drought resistant crop such as sorghum and finger millet was ideal. This view echoes that by [35] that in view of extreme climate variability, growing of drought resistance crops was an adaptation strategy especially in low rainfall regions because such crops are able to withstand prolonged droughts. Conversely some scholars have asserted that no agricultural sector activity is completely immune to the impacts of climate variability and that what matters is the extent to which the agricultural activity is affected by climate variability [36].

Undoubtedly, climate variability adversely affects crop production activities in Siavonga, particularly as the District is located in a valley that historically receives low rainfall of approximately 650mm per annum. Sichingabula[29] and Christensen *et al*[32] projected increased temperatures and reduced rainfall across Zambia in the coming decades. They predicted that temperatures and rainfall would vary widely as a result of climate change and climate variability, particularly in AER I of Zambia that covers the Southern region, Siavonga inclusive. Generally, low rainfall and shorter growing season negatively impact crop production. Shorter growing seasons coupled with extreme temperatures, imply that crops do not mature, resulting in crop failure and consequently leading to reduced crop yields.

3.2.2 Goat Farming

Goat farming WEP activities suffered from the effects of extreme climate variability with close to half (48 percent; n=15) of respondents narrating that it led to dying of kids while 52 percent of them noted that it led to water shortages. The majority (94 percent) of respondents observed that prolonged drought posed a great threat to the goat project as it led to shortages of pasture and water. A key informant from the Ministry of Fisheries and Livestock district office noted that livestock in Siavonga faces a great threat due to pasture and water shortages especially during the dry season. Other studies have further shown that climate variability in Southern Africa leads to pasture shortages for livestock, resulting into deaths and diseases due to weakened immune system [16, 37]. Noteworthy however are the reports from 94 percent of the respondents that goats were thrivingdespite their exposure to the harsh climatic conditions. A key informant from the Ministry of Fisheries and Livestock suggested that '*with the declining availability of pasture due to prolonged droughts and high temperatures, keeping goats rather than cattle is ideal.*' It is further reported that in Southern Africa, men who had owned cattle but had lost them due to diseases, began rearing goats as an adaptation strategy. Goats can be produced in small areas, require less feed and little water for drinking, making them ideal for women and youths who are often landless or not supported to own land to use as an entry point for income generation [16].

3.2.3 Fish Farming

Under the fish farming WEP, activities included harvesting, stocking, feeding and marketing of fish, purchase of fish feeds and fingerlings.All the respondents engaged in fish farming produced Tilapia (*Oreochromisniloticus*). The major effect of climate variability on fish farming was the high mortality rate of fingerlings in fish cages due to extremely high temperatures, as reported by 56percent of the respondents. Furthermore, they narrated that high temperatures lead to poor growth and low production of fish. Close to half (44percent) of the respondents narrated that as a coping strategy to climate variability effects, they had changed the stocking of fingerlings to between November and April when temperatures are lower, as it is during the rainy season. Despite this shift, all respondents still reported low fish production due to high temperatures. A key informant from the Ministry of Fisheries and Livestock buttressed that high temperatures affect the feeding habits of fish which leads to its low reproduction.

Responses from the respondents and the key informant are bolstered by studies which found that fish farmers of Tilapia species of the Nile River were severely affected by both extremely high temperatures and very cold weather [38] Further, the same study found that the most effective temperatures for rearing Tilapia juveniles ranges from 27 – 32^{0} C**.** It was also found that temperatures above 32 ^{0} C resulted in reduced feeding efficiency, slowed growth and increased mortality.This suggests that fish farming in Siavonga is negatively affected by extreme temperatures which are often experienced there.

3.3 Are the three WEPs climate smart?

3.3.1 Design of the Crop Production WEP

According to the policy document for the crop production WEP, its primary objective was to generate income, to improve household food security and to combat malnutrition among vulnerable women, children and youth in Siavonga. It outlinesprogramme activities as training women in conservation agriculture, crop diversification, construction of improved grain storage facilities, nutrition education, and sensitisation on HIV/AIDS. The programme intended to support the growing of maize (*Zea mays*), sorghum, cowpeas (*Vignaunguiculata*), groundnuts (*Arachishypogaea*) and finger millet [39].

We argue that the crop production WEP was designed with some elements that are climate smart as can be deduced from the activities under it. One such element is conservation agriculture. Conservation agriculture is a sustainable agriculture production system comprising a set of farming practices adapted to the requirements of crops, local conditions and soil management techniques that are aimed at protecting the soil from erosion and degradation [16]. The practice of conservation agriculture is governed by three principles namely leguminous crop rotation, minimum soil disturbance, and permanent soil cover[40]. The crop farming WEP also promoted the growing of finger millet and sorghum, and use of organic fertilisers. Millet and sorghum are drought tolerant crops and are suitable in areas with low rainfall while using minimum tillage practices enhances the capture and retention of rainwater. Further, retaining crop residues in the fields reduce evapotranspiration and lowers temperatures around seedlings and soils. These aspects are deemed to be potentially climate smart. However, the production of rain fed hybrid maize is not climate smart asthe low rainfall conditions experienced in Siavonga are not favourable for maize production. Furthermore, women engaged in the crop production WEP mostly used recycled hybrid seeds. These seeds have low yields and few similarities with the original seeds in terms of early maturity and drought tolerance.

Crop production WEP includes all the climate smart agricultural indicators except irrigation and the use of early maturing crop varieties. These are important omissions. Inclusion of irrigation would mitigate climate risk associated with low availability of water for crop production. The WEP was limited to getting women to participate in income generating and homecare activities and did not extol any transformative strategies to achieve empowerment in its conceptualisation as enhancing their independent right to decision making and challenging existing power relations, or being able to self-organise and become self-reliant.

3.3.2 Design of Goat Farming WEP

The policy document for the goat farming WEP surmised its objectives as to improve nutritional status of the targeted vulnerable women through intake of goat meat and milk and to improve their income security through sustained goat production. Activities under this project included goat management trainings with topics covering advantages of goat farming, common goat diseases, pasture preservation and vaccination. Other activities were construction of improved goat shelters, ear tag placement, and distribution of goats to beneficiaries, project supervision and monitoring. The goat farming WEP provided for climate smart practices such as pasture preservation, construction of improved goat shelters and disease control. For instance, in times of pasture shortages, goats could be fed on preserved fodder. The improved goat shelters are constructed about one metre from the ground, with an enclosure. A key informant from the Ministry of Livestock and Fisheries elaborated that such shelters were meant to protect goats from wet ground during the rainy season and from exposure to high temperatures during dry seasons. Exposure to wet and very hot ground surfaces make goats very susceptible to diseases.

Figure 6. Improved goat shelter, Siavonga.

A key informant from Siavonga Nutrition Group explained that each household was given two goats and was linked to another household which it was supposed to "pass on" the gift by giving the kid from its goat to this household. The receiving household would do the same until all households that were members had received a goat. This is what is essentially known as a 'pass on project'. The women that received goats were constantly monitored by programme staff until they had 'passed on' the goats to other beneficiaries. Thus, in an event that a HE goat was produced, it was sold and a SHE goat was bought to 'pass on' and so forth. All the respondents reported that group members bought medicines for routine vaccination from Lusaka while the Ministry of Livestock and Fisheries provided medicines for what they deemed 'complicated' livestock diseases.

All the respondents observed that the construction of improved shelters for goats was done by men at a fee ranging from ZMW 200 to ZMW 350 per shelter depending on the size. If the shelter was constructed by a husband or male relatives, it was free. We note that due to cultural norms on division of labour and skills acquisition, male labour is called upon for this task, which is an added cost for women without recourse to free household male labour.

It is worth noting that the project had from inception supported farming of indigenous goats which are more resilient to higher temperatures and local disease than exotic goats. A number of studies have shown that climate variability and climate change are associated with livestock diseases[40].Therefore, disease control measures for goat WEP in project design is an element of climate smartness. The goat farming WEP was affected by inadequate pasture and water especially during the dry season. Of the climate smart indicators under goat production, the use of boreholes for dry season water supply was conspicuously missing. If implemented, this activity would mitigate all the challenges related to irregular and low access to water that characterized the goat production WEP. However, boreholes were too expensive for the WEP participants. The inability to purchase high cost farming implements by women farmers' constraints their ability to practice climate smart agriculture, and consequently sustains or in some cases, increases their vulnerability to climate risk. Essentially, making WEPs climate smart demands an expansion on access to and control over resources by women.

3.3.3 Design of Fish Farming WEP

The policy document for fish farming WEP notes that the objectives of the project are to generate income, and to combat malnutrition among identified vulnerable mothers, youths and school going children so as to enable them meet their daily nutritional requirements. In particular, the project was designed to provide women with a stable source of income, access to markets, and to increase consumption of fish by households. The project additionally hoped to enhance women's decision making and envisioned to give women more control over their income. It was also hoped that this type of empowerment would result in more money being spent on food, children's health care and schooling [41]. Activities under this project included fish cage management, fish harvesting, purchase of fingerlings, fish feeding, nutrition education and sensitisation on HIV/AIDS.

The survey revealed that women engaged in this programme were incurring costs on security as they hired guards to watch over the fish cages on the lake. Other routine costs which were also deemed to be high werethe cost of feed and transportation. The project was further constrained by low production of fish due to high mortality rates of fingerlings. Guarding of fish cages was done by men who were contracted by the group. This implied that the activities that could not be done by women due to cultural norms had cost implications on the income of the group. In addition, low fish production coupled with high cost of fingerlings, fish feed and transportations critically constrained the group's profit. As reported by respondents, the group opted to diverse to other activities such as group savings, poultry, and dairy farming. These income generating activities were reported to have enhanced their livelihoods and sustained the fish farming project. The income generated by the other activities was partially re-invested in the fish farming project. The diversification of income sources was further motivated by the fact that harvesting of fish was only done twice in a year.

We contend that the fish farming WEP was not climate smart as it did not take climate variability into account. Rather, focus was on combating malnutrition among women, youths and children, improving household food security and income generation. A study conducted in the Niger-Delta region of Nigeria found that about 70 percent of fishers had adopted/integrated climate smart fishing methods which made the community and fisheries ecosystems resilient to climate variability [38]. Their practices included use of tarpaulin, tank and ponds during dry weathers. Other practices employed were alteration of periods of fish stocking in fish cages/ponds, making of fallows to avoid flooding of ponds and provision of cover over the fish cages/ponds in times of extreme temperatures. These practices are also part of climate smart indicators for fish farming, in addition to the selection of resistant fish species and phased stocking of fish. The aforementioned practices are climate smart as they built resilience of fish farming against climate variability effects. In our study of fish farming WEP, no such climate smart practices were included.

IV. CONCLUSION

The study found that the three WEPs were all adversely affected by climate variability/change. The degree of inclusion of climate smart practices, as guided by climate smart indicators, varied across the three programmes. Noteworthy is that all the three WEPs had limited responses to extremely high temperatures and droughts due to financial constraints by the members which hindered their ability to adopt climate smart practices that required the purchase of external resources. Moreover, the three WEPs placed emphasis on income earning and women's home care roles, rather than utilizing gender transformative approaches that would have challenged gender relations and norms that limited their ability to adopt climate smart agricultural practices. The WEPS were therefore unlikely to significantly contribute to women's empowerment and only partially to the practice of climate smart agriculture. Therefore, despite the continuous support to such programmes by several partners, they may not actualize the intended objective of empowerment of vulnerable women. If such activities continue in their current situation, it could make women engaged in them to become even more vulnerable to climate risk. Therefore, promotion of agricultural WEPs in climate stressed regions should consider that integration of climate smart practices may require interrogation of structures that limit women's access to and control over productive resources and formulate approaches to address them if such programmes are to be effective.

The study recommends that women engaged in crop production WEP should increase production of drought and high temperature tolerant crop varieties while fish farming WEPs should adopt critical climate smart practices that build resilience of the fish farming.Development interventionists funding agricultural WEPs should provide financing options for the acquisition of resources that enable the practice of climate smart agriculture. The study further recommends that agricultural WEPs implementation should emphasize enhancement of agency and self-reliance among project participants, which would drive the participants to increase collective action efforts around accessing finances and knowledge and skills in climate smart agricultural activities.

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