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CLIMATE CHANGE ADAPTATION BY FARMERS IN CHINGECHURU WARD, MBERENGWA DISTRICT, ZIMBABWE

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Abstract:
The study sought to assess the impact of climate change on agriculture in Chingechuru ward in Mberengwa District, and the adaptation strategies by the farmers in the study area. A questionnaire, key informant interviews and observation were used in collecting primary data for the study. Quantitative data from the questionnaire were analysed using descriptive statistics presented in tabular form, while qualitative data were analysed narratively through content analysis. Various adverse impacts of climate change on farming were identified including, inter alia, increased incidences of livestock and crop pests and diseases, shorter rainy seasons and insufficient seasonal rains characterised by mid-season dry spells, and more frequent severe floods which often destroy crop fields. The farmers in Chingechuru have adopted various adaptation strategies to climate change such as the growing of drought resistant crop varieties, growing of early maturing varieties, staggering of planting dates and improved grain storage among other adaptation strategies. However, due to various constraints including lack of resources and ineffective extension services, the majority of the farmers in the study area have not adopted the various climate change adaptation strategies. There is need for increasing the number of agricultural extension workers in the study area so as to make extension services more effective. This will raise climate change adaptation knowledge among the farmers as a result of more favourable extension worker to farmer ratios. Government, acting as guarantor, could also facilitate access to low-interest loans by eligible farmers so as to enhance their adaptation capacity to climate change, as lack of capital has also been identified as a major impediment to climate change adaptation. With rains becoming more erratic and

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resulting in increased water stress in the study area, small-scale irrigation schemes could be promoted through the construction of small dams or the drilling of boreholes.

Keywords: climate change, climate variability, adaptation, agriculture, vulnerability, constraints, water stress, food security

1. Introduction

Climate change has been identified as a leading human and environmental crisis of the 21st century (Tadesse, 2010). The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as: "*a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods*" (AMCEN, 2011: 4).

Global mean surface temperature has increased by about 0.07°C per decade in the past 100 years (IPCC, 2007a). The increase in temperature has been more rapid in the last 25 years, with the last decade (2001–2010) being the warmest on record. The average temperature over the last decade was 0.46°C above the 1961–1990 mean, 0.21°C warmer than the previous decade (1991–2000), while the 1991–2000 decade was also warmer than previous decades (AMCEN, 2011). The above is apparently indicative of a long-term warming trend. According to the 4th IPCC Assessment Report, Africa is warming faster than the global average (IPCC, 2007b). By 2100, temperature changes will fall into ranges of 1.4 to 5.8°C increase in mean surface temperature, with such warming being greatest over the interior of semi-arid margins of the Sahara and central southern Africa (AMCEN, 2011). However, the faster rate of warming in Africa is in spite of the fact that studies have shown that African contribution to the increase in greenhouse gases is very small when compared to that of the more developed continents (AMCEN, 2011; AMCEN, 2014). This highlights the fact that the causes and impacts of environmental issues such as climate change have no regard for national or continental boundaries, hence the need for an international approach in addressing them.

Climate change, climate variability and associated disaster risks pose a huge threat to the sustainable development of Africa, and are an additional burden to the survival of already vulnerable populations. This is further compounded by the uncertainties in understanding future climate changes and their impact on key development sectors due to poor policy and institutional frameworks (AMCEN, 2014). The above scenario makes Africa to be one of the most vulnerable continents to climate change and climate variability (FAO, 2010). Climate change and variability present new development challenges, particularly in Sub-Saharan African countries where the majority of the population depends on climate-sensitive activities, in particular, agricultural production (Villanueva and Hiraldo, 2011). Agricultural production and food security in many regions of Africa will likely be severely compromised by climate

change and climate variability, mainly by worsening the water stress currently faced by some countries, while other countries currently not at risk will suffer from increased water stress (AMCEN, 2011; FAO, 2010).

The reliance of the vast majority of Zimbabweans on rain-fed agriculture and the sensitivity of major sectors of the economy, especially agriculture, to the climate make Zimbabwe particularly susceptible to climate change. Zimbabwe currently lacks a specific policy response to climate change, with the current scenario characterised by fragmented responses in a multiplicity of sectoral policies (Chagutah, 2010). In addition, the established institutional framework is characterised by a weak capacity to implement policies and strategies related to climate change adaptation. There is also an apparent lack of specialist skills in climate change research, as well as the capacity to generate such skills through the national tertiary education system (Chagutah, 2010).

Very little meaningful and systematic research has been carried out on climate change in Zimbabwe over the past couple of decades, particularly on adaptation, in spite of the high vulnerability of the country to climate change highlighted above. Although past studies have yielded significant information on sectoral vulnerability to climate change in the country, such considerable knowledge is not matched by efforts towards adaptation, with very little available in the way of sectoral adaptation response plans (Chagutah, 2010). Additionally, while communities have developed varied ways of coping with climate change and perennial droughts, very few studies have systematically recorded these coping strategies so as to map existing community adaptation strategies (Chagutah, 2010).

This study therefore examines the impacts of climate change and climate variability on agriculture, and the adaptation strategies by communal farmers in Mberengwa District, with a special focus on Chingechuru ward. The study was guided by the following research questions:

1. What are the indicators of climate change in Chingechuru ward?
2. What are the impacts of climate change on agriculture in Chingechuru ward?
3. What climate change adaptation strategies have been adopted by farmers in the study area?
4. What challenges are being faced by farmers in Chingechuru ward in their efforts to adapt to climate change?
5. What measures can be adopted so as to strengthen climate change adaptation among the farmers in Chingechuru?

2. Methodology

2.1 Study site

Chingechuru is one of the nine wards of Mberengwa West Constituency in Mberengwa District (Figure 1) in the Midlands Province. Mberengwa District is one of the driest districts in Zimbabwe, characterised by mid-season dry spells and frequent droughts. Most of the District is located in agro-ecological Region IV, with some parts situated in

Region V. The aridity of Mberengwa has made it highly vulnerable to climate change. This vulnerability has mostly been felt by the communal farmers, forcing them to desperately search for ways to adapt to the climate change menace.

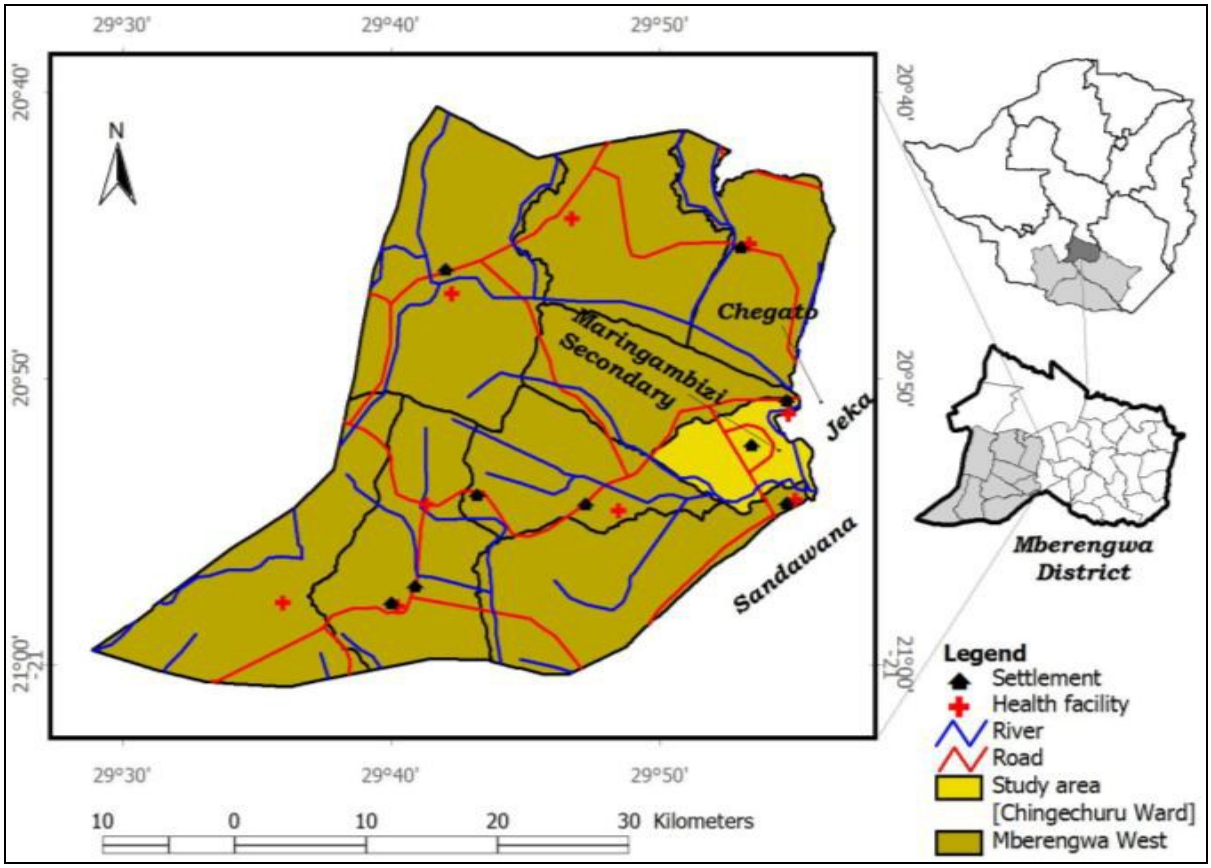

Figure 1: Chingechuru Ward in Mberengwa District (Dziva and Kusena, 2013)

2.2 Data collection and analysis

The study employed the mixed-methods design in collecting primary data. Quantitative data were collected using a questionnaire targeting the households in Chingechuru ward, while qualitative data were collected through key informants and observation. The questionnaire was personally administered through the simple random sampling of 60 households from the sampling frame of 106 households in Chingechuru. Key informants were sampled purposively, and included the ward Agricultural Research and Extension (AREX) officer, the ward councilor and the traditional leadership. Questionnaire responses were calculated into percentage frequencies which were then presented as tables. These were then corroborated in the discussion of the results, with the responses from the key informants analysed through content analysis, as well as with the outcomes from field observations.

3. Results and discussion

One of the objectives of the study was to identify indicators of climate change in Chingechuru from the study respondents. Table 1 depicts questionnaire respondents'

views on climate change indicators in the study area. Eighty six percent (86%) of questionnaire respondents highlighted late onset of the rainy seasons, while another 67% noted shorter rainy seasons as indicators of climate change in the study area. Still relating to rain, 77% of questionnaire respondents noted that some wells which used to supply water throughout the year had dried up, with another 85% indicating that river flows in the study area had gone down markedly, with very few rivers now flowing throughout the year. The questionnaire respondents also highlighted increases in rain-related risks. For instance, 83% of questionnaire respondents noted an increase in mid-season dry spells, while another 53% indicated an increase in incidences of extreme flooding as indicators of climate change in the study area.

Concerning temperatures, while 3% opined that summers were getting cooler, a far much larger percentage (76%) also noted that the summers were getting hotter than usual. A further 65% noted that winters were becoming warmer and shorter, while only 10% indicated that winters were becoming cooler. This seems to suggest an increase in temperatures in the study area.

Table 1: Indicators of climate change in Chingechuru ward

Climate Change Indicator	**Percentage Frequencies of Responses**					
	S.A	**S.W.A**	**D.K**	**S.W.D**	**S.D**	**Total**
Winters are becoming warmer and shorter?	65		19		16	100
Winters are becoming cooler?	10	3	35	9	43	100
Summers are becoming hotter?	76		12	12		100
Summers are becoming cooler?		7	28	30	35	100
Onset of effective rainfall coming late?	86	10	4			100
Rain seasons ending earlier than before?	67	18	5	10		100
Increased incidences of mid-season droughts?	83	8	3	6		100
Increased incidences of floods?	53	17	18	7	5	100
Decline in forest and wildlife resources?	62	23	6	9		100
Fuel wood scarcity?	61		14	15	10	100
Some wells which used to supply water throughout the year have dried?	77	8	10		5	100
Some rivers which used to flow throughout the year are now seasonal?	85	6	5	4		100

S.A. = Strongly Agree; S.W.A. = Somewhat Agree; D.K. = Don't Know; S.W.D. = Somewhat Disagree; S.D. = Strongly Disagree.

A decline in forest cover and wildlife populations was identified as another indicator of climate change by 62% of the questionnaire respondents in Chingechuru. The decline in forest cover was further substantiated by 61% of the questionnaire respondents who indicated an increase in fuelwood scarcity in the study area.

Sentiments by the key informants also noted similar indicators of climate change to the ones highlighted by the questionnaire respondents above. Of particular note was the AREX officer for Chingechuru who indicated that the rains in the study area were becoming more sporadic, short-seasoned and interspersed with increasing incidences of flooding, resulting in various challenges to farming in the study area.

The second objective of the study looked at the impacts of climate change in the study area, and these are presented in Table 2. As Table 2 clearly depicts, most of the questionnaire respondents (80%) associated climate change in the study area with declining agricultural yields, which they attributed to various reasons including increased incidences of crop (68%) and livestock (65%) pests and diseases, destruction of crops by frequent floods (51%), disruption of crop growth due to increased incidences of mid-season dry spells (73%), and late, and shorter, rainy seasons which now fail to support crop production as before (73%).

Other identified significant impacts of climate change on agriculture in the study area included increased scarcity of drinking water for livestock (68%), and dwindling livestock pastures (63%) which are increasingly being taken over by more drought-tolerant and unpalatable grass and shrub species.

Table 2: Impacts of climate change on agriculture in Chingechuru ward
(multiple responses per respondent)

Impacts of climate change	**% frequency**
Rains not supporting crop production as before	73
Increased incidences of crop pests and diseases	68
Disruption of crop development due to increased mid-season dry spells	73
Crop destruction due to increased incidences of extreme floods	51
Decline in crop yields	80
Shortage of drinking water for livestock	68
Dwindling pastures for livestock	63
Increased incidences of livestock pests and diseases	65

In light of the indicators and impacts of climate change on farming highlighted above, the study went further to investigate adaptation strategies by the households in the study area (Table 3).

Table 3: Climate change adaptation among farmers in Chingechuru ward
(multiple responses per respondent)

Climate change adaptation strategies	**% frequency**
Planting different varieties of crops (crop diversification)	23
Planting drought resistant crops	34
Planting early maturing crops	37
Staggering planting dates	15
Adjusting of planting dates	20
Irrigation	3
Expansion of grain reserves	11
Shifting from crop to livestock production	-
Insurance of farming activities against risks	-
No adaptation taken	15

As a response to rainfall variability due to climate change, farmers in Chingechuru have adopted various coping strategies which include: planting early maturing crops (37%)

in response to the shortening growing seasons; planting drought resistant crops (34%) in light of the now insufficient rains; the adjusting of planting dates (20%) so that they coincide with the onset of the rains, and also the staggering of the planting dates (15%) so that if some plants fail, others may do well; as well as irrigation (3%) to supplement insufficient rains.

Other farmers have improved their grain storage capacities (11%) as a climate change adaptation strategy. This is being done in light of the now more frequent droughts, mid-season dry spells, and destructive floods highlighted above, which are contributing to declining yields.

A quick glance at Table 3 depicts an apparent failure by the large majority of farmers in Chingechuru to adopt the various climate change adaptation strategies, notwithstanding the various identified indicators and impacts of climate change in the study area. It is interesting to note that as much as 15% of the questionnaire respondents had not adopted any climate change adaptation strategies in the study area. This prompted the researchers to investigate the reasons behind the mediocre adoption of the climate change adaptation strategies. The study revealed various challenges that farmers in Chingechuru were facing in their endeavors to adapt to climate change (Table 4).

Fifty eight percent (58%) of questionnaire respondents highlighted lack of current knowledge on climate change adaptation as a major impediment to adoption. Such a lack of knowledge on current adaptation strategies has further been compounded by shortage of agricultural extension stuff as noted by 76% of the questionnaire respondents, which has made extension services in the study area to be ineffective. The AREX officer for the ward noted with concern that he services not only the farmers in Chingechuru, but also those from other wards, thereby resulting in an unsustainably high extension worker to farmer ratio. This automatically makes agricultural extension services in the study area ineffective, yet these are a key driver of the adoption of agricultural innovations.

Resource constraints have also greatly impeded the adoption of climate change adaptation strategies by households in the study area. All questionnaire respondents (100%) highlighted lack of money as a major challenge to the adoption of various climate change adaptation strategies. Unavailability of cash has been linked to lack of improved seeds and also lack of irrigation water by 41% and 90% of questionnaire respondents, respectively. The various adaptation strategies require capital, which the majority of the poor peasant farmers in Chingechuru do not have.

Table 4: Hindrances to agriculture-related climate change adaptation in Chingechuru ward (multiple responses per respondent)

Hindrance	**% frequency**
Lack of improved seeds	41
Lack of water for irrigation	90
Lack of current knowledge on climate change adaptation	58
Lack of information on weather and climate	68

Lack of money to acquire adaptation technologies	100
Lack of effective extension services	76
Inability to insure farming activities against risks	100

Another important hindrance to the adoption of climate change adaptations noted by 68% of the questionnaire respondents in the study area revolved around lack of accurate and timely information on weather and climate. Without such crucial information, farmers are virtually unable to make informed climate-change related adaptation decisions. Most of the farmers in Chingechuru rely on interpersonal information exchange on weather conditions, as they lack access to radio, television, newspapers and the internet. With the extension worker overwhelmed by huge service areas, many farmers still relied on local indigenous knowledge for weather and climate predictions. For example, some interviewed key informants noted that when wild fruit trees bear unusually too many fruits, most local people believe this to be a predictive tool for low seasonal rainfall. Such indigenous knowledge systems, though important, are certainly not adequate, and effective, information sources on weather and climate, especially when the complex phenomenon of climate change is factored in.

4. Conclusion and implications

The study has revealed that climate change is a reality in Chingechuru ward. Study respondents have highlighted various indicators of climate change in the study area, in addition to identifying several negative impacts of the purported changes in climate upon farming activities. The adverse impacts of climate change on agriculture in the study area have further been compounded by the inability of the majority of farmers to adopt various adaptation strategies due to several hindrances. With agriculture identified as the major livelihood activity in the study area, the need to boost current adaptation strategies among the farmers is apparent.

Government, in partnership with other rural development agencies, needs to take measures so as to ensure that farmers in Chingechuru, and similarly affected areas across the country, acquire enhanced capabilities to more effectively adapt to climate change. While awareness of climate change and its impacts on agriculture were relatively high among households in Chingechuru, low levels of adaptation were largely attributed to limited adaptation knowledge and resource limitations. The first port of call towards enhanced climate change adaptation in agriculture, therefore, would be the improvement of extension services in the study area, particularly through increased numbers of extension personnel. This will result in more favourable extension worker to farmer ratios, thus making the diffusion of climate change adaptation strategies and technologies more effective. With the ongoing digitalization of radio and television services, hopefully more agricultural programmes on these media will further enhance climate change adaptation knowledge among the farmers. Currently, many rural areas in Zimbabwe, especially in remote areas, are not covered with radio and television services.

Resource constraints, particularly lack of cash, have also been identified as another major impediment to climate change adaptation in the study area. Government, acting as guarantor, could assist eligible farmers to access low-interest loans from various financial institutions. This will help the farmers to acquire basic adaptation necessities such as improved seed varieties.

One of the most important climate change adaptation strategies in agriculture, particularly in arid to semi-arid areas such as Chingechuru, is centred on the provision of water for irrigation. However, communal farmers are not able to develop water resources for irrigation as these are high-capital projects. Government, again in partnership with other rural development players, could promote some small-scale irrigation schemes in the study area through the construction of small dams or the sinking of boreholes.

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