

Climate-Smart Agricultural Practices for Economic Development in Semi-Arid Areas: A Case of Matobo and Umzingwane Districts in Zimbabwe

Jemethious Dube

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ABSTRACT	ARTICLE DETAILS
Climate change has threatened the global agricultural sector and food security systems globally, thus leading to the resurgence of high temperatures, increased occurrences of heat waves, reduced rainfall, increased incidences of cyclonic activities, resulting in the spread of endemic crop and animal pests and diseases. Farmers in semi-arid regions of Zimbabwe have not been spared from the natural calamities. The study that sought to explore the experiences of local farmers on Climate Smart Agricultural Practices (CSA), identified challenges faced by farmers with a view to prescribing the most practicable solutions for adoption. Once local communal farmers get capacitated with modern Smart technologies, their level of productivity will be improved, thus positively impacting on their economic status. The study, which followed a mixed methods approach, used a sequential explanatory research design and established several factors contributing to farmers' inability to embrace advanced smart technologies. The study established that some communal farmers have partially adopted the pfumvudza/Intwasa concept, drought tolerant cropping systems, diversification, smart irrigation systems and use of fodder banks for livestock especially during the off season periods. Use of smart irrigation systems, enhanced varietal participation and practice of water harvesting technologies have also been found to be partially adopted owing to a myriad of existing challenges. Considering the role and benefits from CSA practices, it is highly recommended that farmers in semi-arid regions need fully adopt the smart farming practices which have the capacity to improve both food security and economic viability. Enactment of some climate smart acts need be considered so as to regulate climate issues among semi-arid farming communities. KEYWORDS: Climate-Smart, Global Warming, Semi-Arid, Forecasting.	Published On: 01 September 2026 Available on: https://ijrsr.org/

INTRODUCTION

Climate change has threatened the global agricultural sector and food security systems. Global warming which drives climatic changes has led to resurgence of increased temperatures, droughts, increased occurrences of heat waves, reduced rainfall receivable, increased incidences of cyclonic activities, spread of endemic crop and animal pests and diseases globally (Mariappan *et al*, 2023). Crop and livestock farmers in semi-arid regions of Zimbabwe are not been spared from the negative effects of these natural calamities. Poor receivable rainfalls of between 400-550mm per annum and highly unreliable to sustain rural population which relies directly under rain fed agriculture has been a cause of concern to most communal farmers (Payne, 2023). CSA adoption contributes to improved farm resilience to climate change and mitigation of greenhouse gas emissions which impacts positively on crop yields, increased farm incomes thus leading to greater economic diversification, thus working towards poverty reduction to achieve realisation of the United Nations Sustainable Development Goals (Kabato *et al*, 2025). Agriculture being a major source of employment for both formal and informal sectors in developing countries, accounting for above 13.3% of Zimbabwe's Gross Domestic Product (GDP), it therefore becomes mandatory that a research study assessing the level of adoption of CSA practices in

Climate-Smart Agricultural Practices for Economic Development in Semi-Arid Areas: A Case of Matobo and Umzingwane Districts in Zimbabwe

semi-arid districts of Matobo and Umzingwane be undertaken. There is further need to reinforce the current practiced climate smart agricultural practices so as to find lasting solutions to farmers in semi-arid regions of Zimbabwe (Chisadza *et al*, 2025).

STATEMENT OF THE PROBLEM

Most communal farmers in semi-arid districts of Matobo and Umzingwane continue to face serious food insecurities mainly as a result of seasonal droughts year in year out. Both crop and livestock farmers have continued to count heavy losses even during the most recent years in the year 2012 and 2020 agricultural seasons respectively (Prajapat *et al*, 2024, Nyathi *et al* 2025). Shifting agricultural seasons have continuously disrupted efforts by most communal farmers to remain sustainable despite the advent of many Climate Smart Agricultural practices which currently have been poorly adopted by these communities (Mugambiwa, 2021). A study into the level of adoption, causes of poor adoption and strategies in improving adoption levels of CSA practices therefore remain mandatory.

AIMS OF THE STUDY

The study aimed at identifying the potential of the Climate Smart Agricultural practices that can be adopted in smallholder farming sectors in semi-arid farming districts of Matobo and Umzingwane. The current practices, challenges, and policy recommendations were identified for semi-arid farming communities to adopt.

RESEARCH QUESTIONS:

What are the farmers' experiences in the use of various climate-smart agricultural practices in the face of climatic changes within their farming communities?

What are the challenges facing smallholder farmers in fully embracing climate-smart agricultural practices?

Which measures need to be considered in improving the adoption of climate-smart agricultural practices?

RESEARCH OBJECTIVES

The research enabled the researcher:

To identify the farmers' experiences in the use of various climate-smart agricultural practices in the face of climatic changes within their farming communities.

To identify challenges facing smallholder farmers in trying to embrace climate smart agricultural practices.

To prescribe strategies for consideration in improving the adoption of climate-smart agricultural practices for food security and economic development.

To generate knowledge on climate-smart agriculture practices for use by other future academicians.

METHODOLOGY

The study employed a multi-methodological approach that incorporated questionnaires, interviews, and observations. Both qualitative and quantitative data collection methods were made use of in the quest to establish the practical truths on farmers' experiences. Literature has been extensively reviewed on climate-smart agricultural practices that have been implemented in other related semi-arid regions of Zimbabwe and beyond. Sampling was purposive and followed a well-structured stratified technique to establish the real truth of the matter. Questionnaires were sent to select lead farmers within the two districts and to the agricultural technical business officers on the ground to obtain the foundational truths and farmers' experiences. The questionnaire was pretested on one agricultural advisory officer and two smallholder communal farmers in one of the two districts. The questionnaire had both open-ended and closed-ended questions to obtain the real information on farmers' experiences. Data collected was statistically analysed to arrive at conclusive positions accurately.

FINDINGS AND OBSERVATIONS

Most respondents (80%) seem to acknowledge that adopting climate-smart agricultural practices is the most probable measure in making efforts to evade the current climatic risks emanating from climatic changes in weather patterns.

Several climate smart agricultural practices are currently in play as depicted in the presentation attached herewith. The figure attached depicts the range of some CSA practices that are currently being partially adopted by farmers.

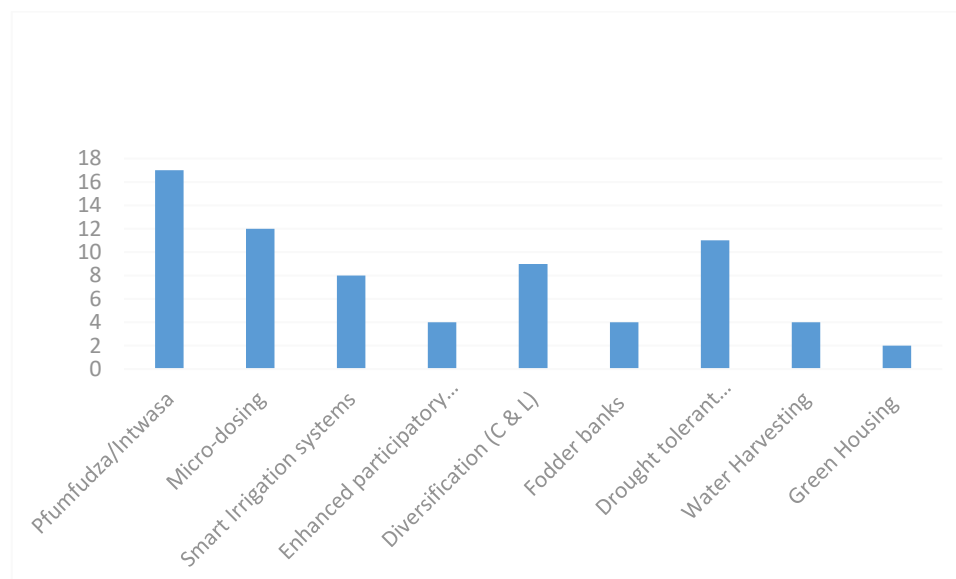


Fig 1: Climate-Smart Agriculture practices practiced in semi-arid Matobo and Umzingwane Districts:Source Kagotho *et al*, (2025) and Ishimwe (2018)

Challenges influencing adoption of climate smart agriculture practices

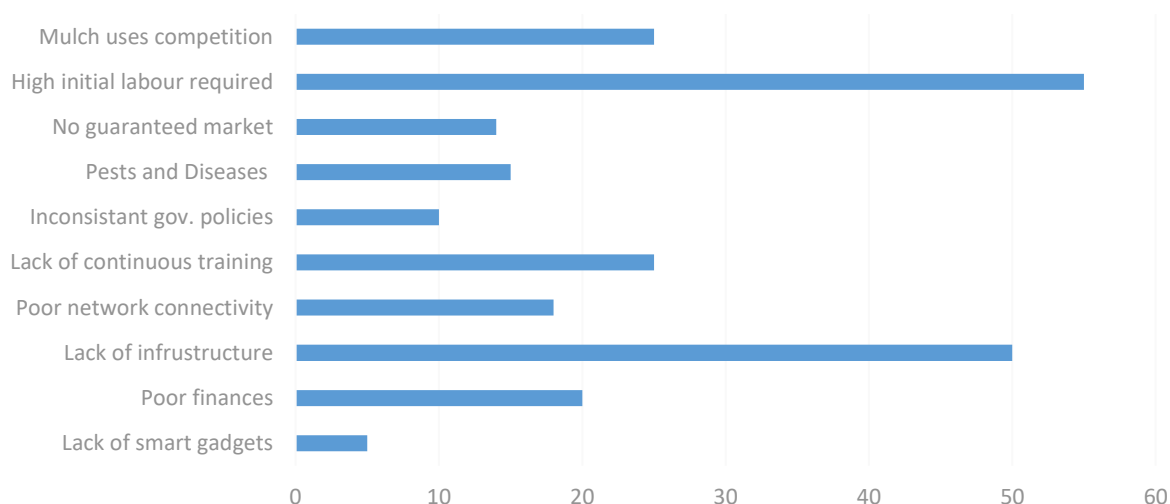


Fig 2: Factors influencing adoption of CSA practices by semi-arid farmers in Matobo and Umzingwane Districts: Washaya *et al*, (2022) and Mayoyo *et al*, (2023)

The competing uses of organic mulch in both moisture conservation and livestock feed influence its use in both soil and moisture conservation. Findings are in line with Mgozoli *et al*, (2020) who argued that other proponents of conservation agriculture have also failed to convince smallholder farmer on the use of crop residues to use grass mulch in soil mulch ahead livestock feeding. The findings on different factors influencing adoption of CSA practices are in line with Demo and Asefa (2024) who assert that mulching used in semi-arid regions reserves moisture, control soil temperature and minimize soil evaporation rates. Generally, conservation agriculture requires high initial labour requirements in opening up planting land thus it becomes difficult for most aged communal farmers to adopt. Policies on inputs distribution too general and are not target specific which act as a loophole in driving adoption of the full package.

Lack of continuous training especially when Non-governmental Organizations concludes their programs becomes a threat in the continuous practice of technologies. Further more it was observed that limited access to smart gadgets derail progress in adopting climate smart agricultural practices. This argument is in line with Balasundram (2023) who posits that lack of digital technology in communal farming areas has further affected adoption on climate smart practices. Unavailability of adequate capital which could enhance establishment of improved irrigation systems is a major blow to the aspiring communal farmers. These findings are in line with findings by Muhoyi and Mbonigaba (2022) who argued that only modernizing small holder irrigation schemes in communal

Climate-Smart Agricultural Practices for Economic Development in Semi-Arid Areas: A Case of Matobo and Umzingwane Districts in Zimbabwe

areas would improve productivity in drought stricken parts but needs financial backing by governments. Lack of adequate infrastructural development derail progress and thus act as a major setbacks hindering complete adoption of improved CSA practices.

CONCLUSION

Most locally available resources have some competing uses in semi-arid communal areas a case of organic mulch being key in both moisture conservation and livestock feed thus negatively influencing its use in soil and moisture conservation practices. Few farmers have so far fully adopted the full package of CSA owing to high initial labour requirements in CA which thus make it costly for most resource poor communal farmers. Lack of continuous training and subsequent monitoring programs especially when the development partners' program tail off is among the key problem areas derailing CSA adoption and practice even well after the programs ending. The high demand for strengthened government extensions support systems is fundamental in the sustenance of these CSA programs.

RECOMMENDATIONS

In view of the wide research findings, the researcher recommends that:

Communal farmers need to adopt the full package of Climate Smart Agricultural practices so that they realize improved yields. The package must include pfumfudza/Intwasa, micro-dosing, smart irrigation systems, enhanced variety participatory approach, use of drought resistant small grains, adoption of water harvesting technologies, green housing practices, in addition crop and livestock diversification strategies. Diversification enable farmers in semi arid regions to outdo the risks associated with leaning on one agricultural enterprise should natural disasters arise.

More-so, farmers need to make use of smart weather forecasts platforms such as weekly weather updates from meteorological services in their planning activities. Raja *et al*, (2022) emphasized the need for use of predictive data technologies to help speed decision making processes.

The government should as well consider strengthening public extension support services so as to effectively monitor adoption of CSA strategies by most farmers. Incentives should be introduced to encourage farmers who participate in CSA practices.

Research stations should consider establishing multi-locational farmer participatory variety trials so as to motivate farmers in order to speedily embrace the newly developed climate smart varieties.

The government ought to regulate an act or policy to motivate farmers on Climate Smart Agriculture practices for compulsory adoption and implementation.

Given that some respondents highlighted lack of funding-will by banks for such bankable programs like borehole drilling and laying down of drip irrigation systems, the public banking institutions need be persuaded to consider opening up cheap accessible lines of credit for small holder communal farmers so that they invest in improved technologies.

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