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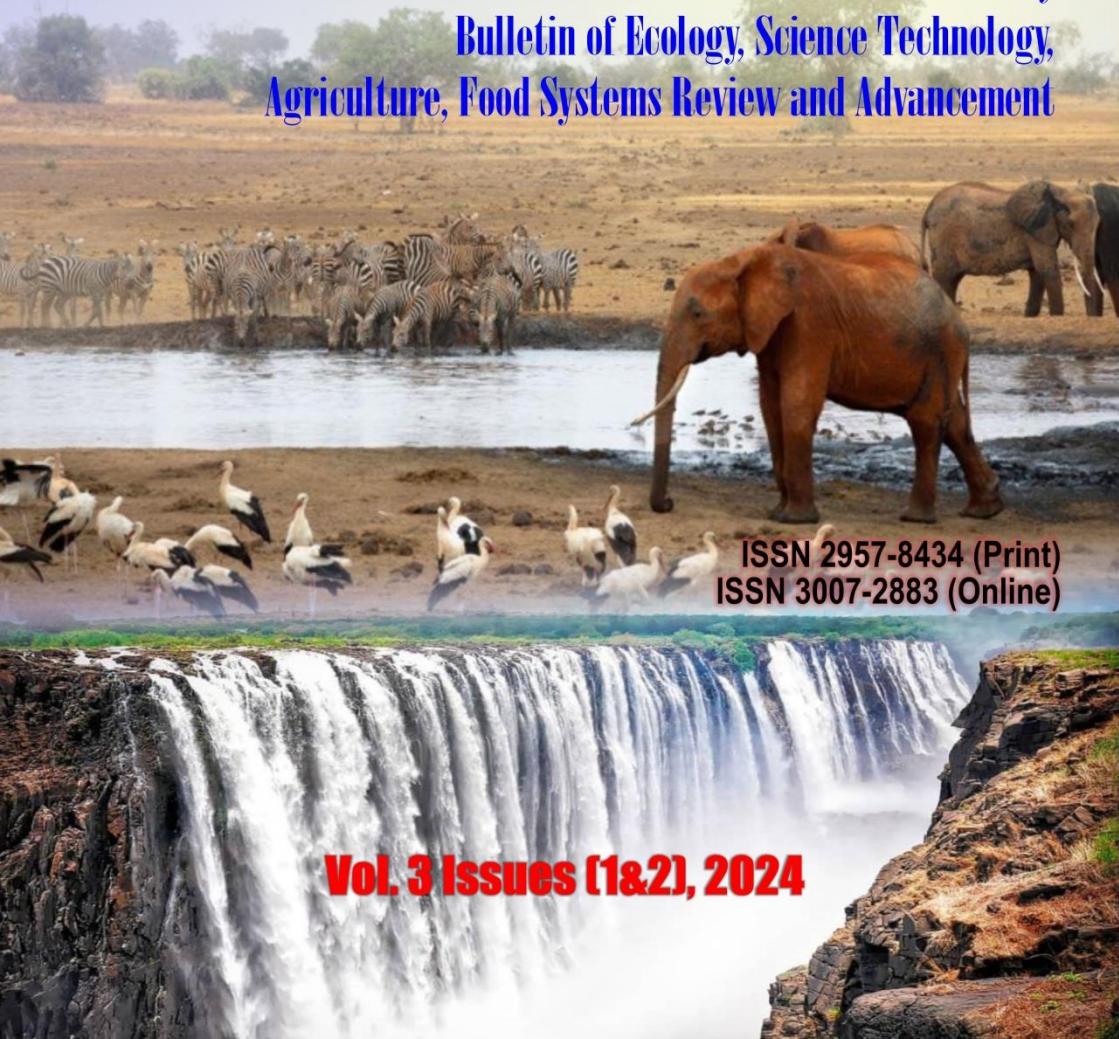

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JOURNAL PURPOSE

The purpose of *the Oikos - The Zimbabwe Ezekiel Guti University Bulletin of Ecology, Science Technology, Agriculture and Food Systems Review and Advancement* is to provide a forum for scientific and technological solutions based on a systems approach and thinking as the bedrock of intervention.

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Natural scientists, engineering experts, technologists, multidisciplinary teams are encouraged.

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Traditional Water Harvesting a Panacea to Climate Change: A Case Study of Chiweshe Farmers in Mazowe District in Zimbabwe

KADEMAUNGA WEBSTER[1], RUVIMBO S GOMO[2] AND MACHAYA TRUST[3]

Abstract

This study seeks to critically investigate the benefits communities derive from using traditional water harvesting practices. The Chiweshe community in Mazowe District in Zimbabwe is facing survival complications and dilemmas emanating from the changing climate. The climate change-induced challenges vary from persisting droughts, low rainfall patterns and water insecurity, cumulatively leading to food insecurity. Notwithstanding these challenges, the Chiweshe community has profited much through traditional water harvesting. To explore these benefits, this research used a mixed method approach. Data were collected through interviews, observations and questionnaires. A sample of 28 participants was selected in Chiweshe community using a combination of purposive and convenience sampling methods. The research discovered that from the use of sand dams, water harvesting pits, stone bunds and check dams, the community got income, improved harvests, availability of water, biodiversity, improved livelihoods among others. It was recommended that the Chiweshe community should enhance more

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traditional water harvesting strategies like the johad, khettara, stone tanks and zai pits used in other communities as to have comprehensive benefits.

Keywords: climate change, traditional water harvesting, traditional knowledge

INTRODUCTION

Climate change is a growing concern in Zimbabwe, with several adverse impacts on water resources, food security, and the livelihoods of rural communities. Traditional water harvesting practices have been identified as a promising solution to these challenges, as they can be beneficial in the mitigation of the effects of climate change. Many communities across the globe, have benefited through traditional water harvesting. The Chiweshe community in Zimbabwe has adopted the use of traditional water harvesting strategies, however hoe these strategies have benefited the community has not been explored. This study thus is an exposition of these benefits.

Many communities globally have employed various strategies to copy with the heinous effects of climate change. The benefits of exploiting these strategies are countless. For example, in the face of unreliable rainwater, some communities have used traditional water harvesting practices. These practices, have long been used across cultures and civilizations and they have been an important part of communities' livelihoods, providing essential resources for agriculture and daily life. As argued by Mehdi and Zhou (2021), the use of traditional water harvesting practices such as zai pits, jahod, stone tanks, khettara and sand dams have been successfully implemented in many communities across the world, providing numerous benefits. These benefits comprise of improved agricultural productivity, increased water and food security, reduced soil erosion and built a greater resilience to climate change. The positive outcomes of these traditional water

harvesting strategies highlight their potential as a sustainable, cost-effective, and culturally appropriate solution for climate change adaptation in rural communities.

BACKGROUND TO THE STUDY

In recent decades, studies on the benefits of traditional water harvesting practices have been on the rise. For instance, Subramanian (2017), has examined the use of traditional water harvesting in countries like India, China, and Nepal, while Jin (2019), has focused on practices in Africa and the Middle East. Patel (2021) has also studied the global history of traditional water harvesting, tracing its origins and evolution over time. This body of research has highlighted the wide range of benefits associated with traditional water harvesting practices, including increased food security. In Bangladesh, traditional water harvesting techniques such as the use of hand-dug wells and community ponds, have been shown to increase food security, reduce water-borne diseases, and improve the health and nutrition of rural communities (Adnan *et al*., 2015). In Brazil, the use of rainwater catchment systems is shown to benefit the communities through reduce deforestation and promote the conservation of water resources (Valverde *et al*., 2018). In Spain, traditional water harvesting techniques such as cisterns and reservoirs have been used for centuries to support agriculture and local communities. In Ethiopia, the use of traditional water harvesting practices such as fog harvesting and rock catchment systems has helped to increase crop yields and provide access to drinking water in dry areas (Tamene and Gebrehiwot, 2019). In Peru, the use of cisterns and water harvesting tanks is shown to improve food security and reduce water stress in rural communities (Lemes *et al.,* 2017). In Australia, traditional Aboriginal water harvesting techniques such as firestick farming and the use of soakages have been used to manage water resources and support. Traditional water harvesting practices in Ethiopia have reported to have generated a range of benefits and there include the use of stone terraces, infiltration

pits, and underground tanks, all of which have been shown to increase crop yields and improve food security (Teshome, 2011). These practices have also helped to reduce soil erosion and desertification, preserving vital ecosystems and biodiversity. In addition, the use of traditional water harvesting techniques is linked to an increase in the number of trees and shrubs that has helped to offset the effects of climate change (Kassie *et al*., 2014).

In Africa, the benefits of traditional water harvesting have long been witnessed in various countries. In the Sahel region of West Africa, the benefits of traditional water harvesting practices such as to improve soil fertility, reduce erosion, and increase crop yields have been enjoyed through the use of zai pits and contour bunds. Waters-Bayer (2007) posits that these practices have been especially beneficial in Burkina Faso, where they have helped to transform the livelihoods of rural farmers. In most of the rural communities in Burkina Faso, the farmers have improved their agricultural productivity as a result of the availability of water to irrigate the crops. In addition, traditional water harvesting practices have been also more beneficial in South Africa. Bohensky and Hughes (2009) contend that in South Africa traditional water harvesting practices such as the use of water pans, storage tanks, and underground cisterns have been shown to increase agricultural productivity and provide a reliable source of water for rural communities for centuries. Also, the use of traditional harvesting techniques such as rainwater catchment systems in Namibia, has significantly to improved crop yields and livestock productivity, and reduce the need for expensive and energy-intensive irrigation systems (Sutcliffe and Thomas, 2004). Another example comes from Ghana, where a range of benefits of using traditional water harvesting practices such as the use of small-scale reservoirs and rainwater catchment systems have been witnessed.

These benefits include improved agricultural production, food security and reduce water scarcity (Gyasi-Agyei *et al*., 2009). These practices have also been linked to a decrease in poverty levels and an increase in income for rural farmers (Afrifa *et al*., 2009). In addition, traditional water harvesting is shown to have positive impacts on the social and cultural well-being of communities, including the preservation of local knowledge and customs (Gyasi-Agyei, 2014). In Tanzania, traditional water harvesting practices such as the construction of 'zena' (small dams), have been shown to increase food security and promote community cohesion (Ashton, 2012). These practices have also been linked to a reduction in migration and out-migration, and an increase in crop diversity and income levels (Nelson *et al*., 2013). In addition, traditional water harvesting techniques have helped to maintain and restore degraded ecosystems, restoring the health of local rivers and lakes (Amerasinghe *et al*., 2005).

The traditional water harvesting practices of Zimbabwe have been shown to have several benefits for the country's economy, society, and environment. In terms of the economy, the increased crop yields and agricultural productivity associated with these practices have been shown to reduce poverty and improve the living standards of rural communities (Mazvimavi, 2011). From a social perspective, the practices have been found to strengthen community ties and promote a sense of cultural identity (Matenga, 2014). One of the most significant environmental benefits of traditional water harvesting practices in Zimbabwe is the reduction of soil erosion and sedimentation. As argued by Nyamangara and Murwira (2012), the use of techniques such as contour ridging and grass strip cropping is shown to reduce soil loss and improve soil quality. Additionally, traditional water harvesting practices in Zimbabwe have been found to increase groundwater recharge, reduce flooding, and increase the availability of water for livestock and wildlife (Lind, 2015). Thus, traditional water harvesting practices have been more beneficial in many countries but

their benefits have not been well recognized in many communities. This research therefore explored the major benefits of traditional water harvesting practices and how these benefits can be maximised.

STUDY DESIGN AND METHODOLOGY

A case study design was utilised for this research. A case study research design was employed for investigation to have detailed information and evidence of the benefits for the use of traditional water harvesting practices in climate change adaptation in Chiweshe community. A mixed research methods approach was implemented to gather data for this research and this was because it accommodates both quantitative and qualitative methods. The combination of these methods resulted in the collection of detailed information because it helped to compensate for the weaknesses of each individual method and resulted in more reliable and comprehensive data. For example, the in-depth understanding of people's experiences and perspectives gained through qualitative methods were complemented by the breadth and objectivity of quantitative methods. Overall, the use of both quantitative and qualitative methods provided a strong holistic knowledge of the benefits traditional water harvesting practices had for the community.

The targeted population for the study were the community members living in Chiweshe, who are engaged in traditional water harvesting practices. This include both the individuals and families who are directly involved in these practices, and the broader community who benefit from the availability of water. In addition, key informants such as traditional leaders, extension officers, and community development workers were also included in the targeted population.

The data were not collected from all members of the Chiweshe community, as this would have been impractical and time consuming. Instead, a subset of the community was selected for the study, based

on various factors such as their proximity to the study area, the willingness of the participants and their accessibility.

To collect data for this research, several 32 questionnaires were distributed to the members of the Chiweshe community, and 24 were successfully completed and returned. In addition, 14 interviews were arranged, and 8 were successfully completed. The demographics of the respondents who completed questionnaires and interviews are as follows, 17 males and 11 females to give a total of 28 participants and their ages ranges from 23 and above. This sample size was sufficient to provide reliable and valid data for the purposes of this study.

The researcher selected a small group of participants. This allowed for more in-depth interviews and analysis providing important knowledge into the role, types and problems faced by the community members in implementing water harvesting practices as climate change adaptation strategies. The information gathered from the interviews, focus group discussions, observations and questionnaires was analysed using a thematic analysis approach. The findings were then presented in the form of statistical and a narrative that describes the different aspects of the research question.

FINDINGS

The findings reveal that the Chiweshe community has several benefits got from the use of traditional water harvesting practices. The use of sand dams water harvesting practice has led to improved water security and agricultural productivity. This was revealed through focus group discussions and in-depth interviews with members of the community. These findings suggest that by using traditional water harvesting practices, the community can enjoy more benefits and improve its ability to withstand the effects of climate change. One farmer had this to say, during an interview that,

> Improved water security and agricultural productivity are the main benefits we are enjoying from using of traditional water harvesting practices in our community. Before, we would have to walk long distances to fetch water and we would have to wait for the rains to come to water our crops and livestock, but now, with these traditional water harvesting practices, we can ensure a consistent supply of water year-round. This has led to increased yields and better economic opportunities for our families.

These results show that, just like other communities around the world, the Chiweshe community has benefited immensely from using traditional water harvesting practices such as sand dams. Similar findings were reported in a study conducted by Mutambara *et al*. (2018) in the Limpopo River Basin in Southern Africa. The study found that by investing in traditional water harvesting practices, such as the construction of weirs and the use of sand dams, communities in the region have benefited much through increasing their access to water for agricultural production and other uses. This led to improved economic opportunities and a reduction in poverty levels.

Furthermore, the findings of the study reveal that increased economic opportunities through crop and livestock production is another main benefit accompanied by the use of traditional water harvesting practice such as stone bunds in Chiweshe community. This conclusion was drawn from focus group discussions and in-depth interviews with members of the community, who shared their experiences and insights into how these practices have generated a range of benefits into their lives. The study found that increased crop yields and the ability to keep livestock year-round are some of the benefits of using traditional water harvesting practices. This has also led to improved economic conditions for many people in the community. During an interview, a local farmer, argue d that:

> I practice stone bund water harvesting strategy and I have benefited much from it. The benefits include improved access to enough water, food security and this increased economic opportunity through crop and

> livestock production. Before, I would struggle to make ends meet, but now, with the increased crop yields and the ability to keep livestock year-round, I am now able to provide for my families and even have some extra income to invest in our future. It has truly been life-changing.

These words show how the traditional water harvesting practices have increased economic benefits from crop and livestock production.

In addition, the data findings reveal that the Chiweshe community has benefited from traditional water harvesting practices through improved health. In particular, the respondents indicated during an interview that traditional water harvesting strategies such as damming, have reduced the prevalence of water-borne diseases in the community. This is because water and sanitation have greatly improved as a result of the use of traditional water harvesting practices. For instance, the respondents reported that the incidence of cholera is shown to decrease by up to 30% in areas where traditional water harvesting strategies are in use in Chiweshe. Furthermore, traditional water harvesting practices have been shown to improve sanitation by providing access to clean water and reducing the reliance on contaminated surface water sources. Additionally, improved sanitation has led to a decrease in the incidence of other diseases, such as cholera, typhoid, and dysentery, that are all commonly transmitted through contaminated water. Thus, the implementation of traditional water harvesting practices in the Chiweshe community has benefited much to the community through improved health outcomes and reduced disease burden. One of the respondents argue that:

> Before we started using traditional water harvesting practices, we were always getting sick from drinking dirty water and using unsafe toilets. But now, we are benefiting from using rainwater harvesting tanks that provide us with clean water, and we use latrines that are safe and clean. Since we started using these methods, we have seen a significant decrease in illness in our community. We are so grateful for these benefits and improvements!

Therefore, these results have shown that traditional water harvesting practices have provided a range of benefits to the Chiweshe community such as availability of clean water that improved the health of the people.

The researchers also observed that around traditional rainwater harvesting areas like, sand damming, and water pans, there was enhanced biodiversity. The use of traditional water harvesting in Chiweshe community has benefited the community through reducing soil erosion, water conservation, retaining soil nutrients and promoted the survival of plants and animals. In addition, the improved availability of water for irrigation and livestock watering has led to improved goat and cattle projects in the community, leading to increased income and improved food security. This explains the significant benefits enjoyed by the Chiweshe community as a result of the use of traditional water harvesting practices. One of the farmers stated,

> Before we started using rainwater harvesting tanks and sand dams, we would have to walk for miles to get water for our crops and livestock. Now, we have water right on our doorstep. This has saved us so much time, and we can use that time to work on other income-generating activities. We have also noticed that the local tree species and wildlife are thriving, that is a good sign for our ecosystem. Therefore, we can argue that we have benefited much from using traditional water harvesting practice.

Similar benefits to biodiversity have also been reported in other communities using traditional water harvesting practices just like Chiweshe community. In a study conducted in the Central Plateau of Madagascar, researchers discovered that the use of traditional water harvesting methods resulted in an increase in the abundance of native plant species, particularly of important tree species such as Ficus (Cheke and Sussman, 2015). Similarly, in a study conducted in the semi-arid regions of India, researchers found that traditional water harvesting practices promoted an increase in the diversity of flora and

fauna. The researchers also found that traditional water harvesting practices resulted to an increase in the diversity of fauna, such as mammals, birds, and reptiles, that benefited from the increased availability of water, food, and habitat (Sharma et al., 2016). These findings showed that traditional water harvesting practices can have a positive effect on biodiversity and the ecosystem as a whole, in addition to providing benefits for the communities that implement them.

The findings have brought to the fore that the Chiweshe community has benefited much from the use of traditional water harvesting practices. While the benefits of traditional water harvesting practices in the Chiweshe community are similar to those enjoyed by other communities around the world, the extent of those benefits differs. While the Chiweshe community has benefited from increased water and food security, improved agricultural productivity, and improved health conditions, the benefits may be greater if additional water harvesting practices are adopted, such as those used by different communities in other countries. These water harvesting practices include the Khettara used in Morocco, johad in India, cistern in Greece, stone tanks in Italy and zai pits in China. This would provide additional opportunities for economic development and improve overall quality of life. Even though other countries are using similar traditional water harvesting practices with those used in Chiweshe community such as sand dams and wells, other new traditional water harvesting practices needs to be adopted in Chiweshe.

CONCLUSION AND RECOMMENDATIONS

The research findings have shown that various communities across the world and Chiweshe, in particular, have benefited immensely from using traditional water harvesting. The benefits include: water and food security, improved agricultural productivity, increased economic opportunity, reduced soil erosion and improved health conditions of

the people. These benefits have been acquired through the use of different traditional water harvesting practices, such as sand dams, *johad, khettara*, stone tanks, wells, and zai pits, among others. However, the extent of benefits differs from country to country resulting from the use of different traditional water harvesting practices. The study show that most of the types of traditional water harvesting practices used in Chiweshe community are different from those used in other countries and this might be the reason why the Chiweshe community is not benefitting the same with other countries using different practices. Therefore, basing with these findings, the researcher recommends that the Chiweshe community should adopt new traditional water harvesting practices used in other countries such as johad, khettara, and stone tanks among others. That would provide additional opportunities for economic development and improve overall quality of life.

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