International Journal of Social Science Research and Review

http://ijssrr.com
editor@ijssrr.com
Volume 5, Issue 8
August, 2022
Pages: 519-531

The Indigenous Adaptation Strategies on the Impacts of Rainfall Scarcity on Subsistence Food Production in Moletjie, Limpopo Province, South Africa

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http://dx.doi.org/10.47814/ijssrr.v5i8.2108

Abstract

Severe climate change manifestations have a significant influence on subsistence food production, notably rainfall shortage, which causes drought, dust, crop and livestock loss, and hence hunger, malnutrition, and poverty. The purpose of this research was to highlight indigenous adaptation techniques to the effects of rainfall shortage on subsistence food production. In-depth interviews were used to gather data until saturation was reached. According to the research, subsistence farmers are aware of the effects of rainfall shortage on subsistence food production. Farmers, for example, are aware that crop and livestock output are lessened and poor as a consequence of drought and soil erosion. To deal with the effects of rainfall shortage on traditional food production mechanisms, indigenous adaptation practices such as growing drought-resistant crops and using animal dung as manure are used. The research suggests combining western and indigenous ways to mitigate the harmful effects of rainfall shortage.

Keywords: *Climate Change; Rainfall Scarcity; Indigenous Adaptation Practices; Subsistence Food Production; Limpopo Province*

1. Introduction

Climate change is a global challenge with devastating impacts on human livelihood.[1] It manifests itself through increased temperatures, flood, drought, and rainfall scarcity.[2] Rainfall scarcity is defined as erratic, or unpredictable incidences of rainfall.[3] Erratic rainfall manifests as drought, soil erosion and poor production of subsistence crops and livestock.[4] These incidences negatively affect the local communities' livelihood patterns, which are mostly climate-reliant.[4] However, the impacts of erratic rainfall are mostly food insecurity as a result of increased crop failure, and loss of livestock.[5] In developing countries' rural communities, rainfall insufficiency has an extensive impact on the food production systems resulting in hunger, poverty, malnutrition, and compromised health and well-being.[6] Local communities in developing countries rely on subsistence food production, which is characterized by low efficiency and uncertainty

due to drought and insufficient rainfall.[8] Communities are predisposed to climate variability due to their lack of capacity to respond to the adverse impacts, especially in the areas which rely on rain-fed subsistence food production to satisfy household food requirements.[9,10,11]

1. International Panel of Climate Change (IPCC) (2007). "Climate Change 2007. Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change." Geneva, 2007.
2. World Health Organisation. (WHO). "Climate Change and Health." (Geneva: World Health Organisation, 2015).
3. Mugambiwa, S.S. "Adaptation Measures to Sustain Indigenous Practices and the use of Indigenous Knowledge Systems to Adapt to Climate Change in Mutoko Rural district of Zimbabwe", Jàmbá: Journal of Disaster Risk Studies 10 no.1(2018) a388. https://doi.org/10.4102/jamba.v10i1.388.
4. United Nations Framework Convention on Climate Change (UNFCCC). "Adaptation Assessment, Planning, and Practice: An Overview from The Nairobi Work Programme on Impacts, Vulnerability, and Adaptation to Climate Change." Climate Change Secretariat UNFCCC, Bonn, 2010.
5. Karienye, D., & Macharia, J. "Adaptive Capacity to Mitigate Climate Variability and Food Insecurity of Rural Communities Along River Tana Basin, Kenya." ("Adaptive Capacity to Mitigate Climate Variability and Food Insecurity ...") African Handbook of Climate Change Adaptation, 6, 2020.
6. Nyahunda L, Matlakala F.K, & Makhubele J.C. Role of social workers in mitigating the effects of climate change in Makonde communal lands, Zimbabwe. e-Bangi 16 no.9 (2019):4.
7. Chepkoech, W, Mungai, N W, Stöber S, Lotze-Campen H. "Understanding adaptive capacity of smallholder African indigenous vegetable farmers to climate change in Kenya". Climate Risk Management. 27 (2020) :100204. https://doi.org/10.1016/j.crm.2019.100204.
8. Dube, T. & Phiri, K. (2013). Rural livelihoods under stress: The impact of climate change on livelihoods in South Western Zimbabwe. American Journal Contemporary Research, (3) 5.
9. CARE, ALP (2013) "Climate change vulnerability and adaptive capacity in Garissa County." Care International and Adaptive Learning Program (ALP), 20, 2013. http://www.careclimatechange.org/ files/CVCA Kenya Report Final.pdf.
10. Food and Agriculture Organisation of the United Nations (FAO). (2016). Climate change and Food Security: Risks & Responses. Available at http://www.fao.org/publications.
11. International Panel of Climate Change (IPCC). Chapter 11: "Human Health: Impacts, Adaptation, and Co-Benefits", 2014.

South Africa's Limpopo Province, in which this study was conducted, in no exception.[12,13] Small-scale farmers are grabbling with the negative impacts of erratic rainfall patterns on the crops and livestock, which are characterised by low productivity. There is evidence that the farmers use their local resources to cope with the impacts of drought and soil infertility as a result of unpredictable and erratic rainfall patterns.[13] Local communities have devised the means to cope with the adverse impacts of erratic rainfall on the production of crops. [14] Thus, locally developed strategies are employed and used within communities that still value their indigenous knowledge to sustain their livelihood.[14,15] Subsistence farmers employ their indigenous knowledge to adapt to the negative impacts of erratic rainfall on their subsistence food production.[16] For example, indigenous adaptation practices embrace the use of the knowledge of seasonal changes that assist farmers make decisions about the type of crops they should plant.[14],[17] The farmers always plant the crops that they know will do well in a season with low or scarce rainfall.[17] Analysis of the indigenous adaptation practices adopted to cope with the negative impacts of erratic rainfall patterns in the form of drought and soil erosion, for example, could yield curial insights on climate change adaptation policy and insight towards the integration of western knowledge and indigenous knowledge for the benefit of small-scale farmers to improve their subsistence production to ensure food security. The present study describes the indigenous practices adopted by the members of a

rural community to cope with the negative impacts of erratic rainfall on subsistence food production in Moletjie community, Limpopo Province, South Africa. In this community there is evidence on rain-fed subsistence food production to satisfy the household nutritional requirements.

12. Limpopo Department of Agriculture (LDA) (2010). Downloaded reports. http://www.lda.gov.za.
13. Letsatsi-Duba, D. "Drought issues in Limpopo province, MEC of agriculture". Polokwane, Limpopo province (2009).
14. Bhusal, Y. "Local Peoples' Perceptions on Climate Change, Its Impacts and Adaptation Measures in Mid-Mountain Region of Nepal." (A Case study from Kaski District). Nepal: Tribhuvan University Institute of Forestry Pokhara, 2009.
15. Rankoana, S.A. "Perceptions of Climate Change and the Potential for Adaptation in a Rural Community in Limpopo Province, South Africa". Sustainability Journal, 8 no. 8 (2016): 672, 5.
16. Kruger, A. C. & Shongwe, S. "Temperature Trends in South Africa: 1960–2003." International Journal of Climatology 24, no. 15 (2004): 1932.103.
17. Kabanda, T & Nenwiini, S. "Impacts of Climate Variation on the Length of the Rainfall Season: An Analysis of Spatial Patterns in North-East South Africa." Theories and Applications of Climatology 125, no. 93 (2016):100. doi:10.1007/ s007040151498-7.

2. Literature Review

2.1 Indigenous knowledge

Indigenous knowledge (IK) refers to the knowledge, skills, and experiences that are accumulated over time and are used to address challenges and the needs of their developers.[18] It refers to the shared values and beliefs that were experienced throughout generations.[19] IK is the local knowledge that is unique to a given society. It is the basis for local-level decision-making in agriculture, health care, food preparation, education, and natural resource management events in rural communities.[20] IK is defined as knowledge of a community that understands their environment and how they organize indigenous knowledge of flora and fauna, cultural beliefs, and history to enhance their lives.[19] Every community possesses IK as it is based on philosophies, practices, and knowledge that have been generated either locally or elsewhere[22], and subsequently been transformed by local people and integrated into their way of life and expressed in the local language.[23] It is therefore difficult to transmit IK to those who do not share the languages, traditions, and cultural experiences of a group or community.[21] Indigenous knowledge is seen as a local approach on the basis that it is anchored in a specific community, it is established within the boundaries of broader cultural traditions but still developed by a specific community, and is learned through repetition.[19,21,22] IK is expressed through beliefs, medicine, knowledge technology, education, communication, agriculture, food technology, arts, and crafts.[24]

18. Smit. A.J & Masoga M, 2012 African Indigenous Knowledge Systems and Sustainable Development: Challenges and Prospects, People's Publishers, Wandsbeck. South Africa.
19. Semali, L. and Kincheloe, J. (1999). Introduction: What is Indigenous Knowledge and Why Should We Study It? In Semali, L. and Kincheloe, J. (ed), What is Indigenous Knowledge? Voices from the Academy, pp. 46. New York and London: Falmer Press.
20. Macedo, D., Semali, L., & Kincheloe, J. (1999). Decolonizing indigenous knowledge. What is indigenous knowledge: Voices from the academy, 134-176.
21. Njiraine, D., Ocholla, D. N., & Onyancha, O. B. (2010). Indigenous knowledge research in Kenya and South Africa: an informetric study. Indilinga African Journal of Indigenous Knowledge Systems, 9(2), 197.
22. Nakashima D (2008) An Indigenous Knowledge forum on Climate Change Impacts. Pachamama 2: 5.

23. Mohale, M. R. "Khelobedu Cultural Evolution through Oral Tradition." (University of South Africa: Pretoria, 2014).
24. Kok, J.A. (2005). Can Models for Knowledge Management be Successfully Implemented to Manage the Diversity of Indigenous Knowledge? South African Journal of Information Management, 7(4). Accessed on: 1 August 2006.

2.2 The Role of Indigenous Knowledge in Climate Change Adaptation

The role of indigenous knowledge in climate change is linked to local communities' perception, understanding of the impacts of climate change, and the indigenous practices they have developed to cope with the impacts of climate change.[25,26] The notion that communities whose livelihood is reliant on natural resources are most susceptible to the negative impacts of climate change.[1] Thus, local communities are aware of and respond to the impacts of climate change in various ways, drawing on local knowledge as well as finding solutions to cope with the changes.[27,28] The extent to which communities designed and implemented climate change adaptation mechanisms is evident across African communities.[26] The unwarranted effects of drought and soil erosion are evident in the rural communities where subsistence food production is the main compromised source of food security. Community members, especially small-scale farmers have developed several coping mechanisms to cope with climate change manifestations, particularly the impacts of erratic rainfall.[27] The effects of drought and soil erosion are the main cause of poor subsistence food production leading to food insecurity.[28] The use of indigenous adaptation such as change of planting season, have proved to be effective in the production of subsistence crops, thus addressing the challenge of food insecurity.[29,30,31]

25. Robinson, J. B., & Herbert, D. (2001). Integrating climate change and sustainable development. International Journal of Global Environmental Issues, 1(2), 130-149.
26. Jan, S. & Anja, B. (2007). Indigenous Peoples and Climate Change. University of Oxford and Missouri Botanical Garden.
27. Yohe, G. & Tol, R. (2002). Indicators for Social and Economic Coping Capacity: Moving toward a working definition of Adaptive Capacity. Global Environmental Change. 1 (12) 25-40.
28. Brechin, S. R. (2003). Comparative Public Opinion and Knowledge on Global Climatic Change and the Kyoto Protocol: the U.S. versus the world. International Journal of Sociology and Social Policy 23.10: 106-134.
29. Madzwamuse, M. (2010). Climate Governance in Africa: Adaptation Strategies and Institutions: Hienrich Boll Stiftung.
30. Ziervogel, G., Taylor, A., Hachigonta, S. & Hoffmaister, J. (2008). Climate Adaptation in southern Africa: Addressing the needs of Vulnerable Communities. Environment Institute (SEI), Stockholm, Sweden. Retrieved from https://www.sei-international.org/publications [Accessed September 2020].
31. Tambo, J. A. (2016). Adaptation and Resilience to Climate Change and Variability in north-east Ghana. International Journal of Disaster Risk Reduction, 17, 85–94.

2.3 Indigenous Knowledge and Food Production

Household food security is a challenge to most South Africans living in poverty, especially those people living in rural areas.[1] It is argued that indigenous knowledge plays a vital role in food production, as it addresses how food can be produced, managed, and persevered through knowledge and practices adopted by previous generations.[30] The use of indigenous knowledge in food production is important as its application serves as a source of livelihood improvements, sustainability of indigenous food, and eradication of food shortage.[17,32,34] Rainfall scarcity threatens the livelihood of the community members, especially in poor, semi-arid regions[35,36], such as the Limpopo Province. As a result, indigenous methods and systems are employed to maintain the food supply systems threatened by the negative impacts of climate change.[12,13,16]

32. Mugabe, F.T., Mubuya, C.P., Ninja, D.H., Munodawafa, A., Gondwe, P., Mutshwangwa E.A., Chagonda, C., Masere, P., Makuvaro, D.J. & Murewi, C. (2010). *Using Indigenous Knowledge for Climate Change Adaptation in Southern Zambia and South-Western Zimbabwe*. *Zimbabwe Journal Technical Science*, 1 (1) 6-11.
33. Gbetibouo, G. A. (2008). Understanding Farmer's Perceptions and Adaptation to Climate Change and Variability: The case of Limpopo Basin, South Africa. Policy Brief, 15-8.
34. Gyampoh, B. A., Amisah, S., Idinoba, M. & Nkem, J. (2014). Using Traditional Knowledge to Cope with Climate Change in Rural Ghana. In Proceedings, Third International Conference on Climate and Water. 205–213. Helsinki, Finland, Finnish Environment Institute (SYKE).
35. Somah, T. P. (2013). Climatic Change Impacts on Subsistence Agriculture in the Sudano-Sahel Zone of Cameroon - Constraints, and Opportunities for Adaptation. Ph.D. Thesis. Brandenburgische Technical University.
36. Ministry of Environment and Tourism. (2006). National Capacity Self-Assessment. Government of Zimbabwe, Harare. Available at: http://www.undp.org/content/undp/en/home/librarypage/environmentenergy/integrating_environmentintodevelopment/ncsa-final-reports--action-plans-andccr.html. [Accessed May 2020].

3. Methods and Materials

Study Location

The Limpopo Province is located in the north of South Africa neighboring Mozambique, Botswana, and Zimbabwe, it lies between latitudes 22-25ºS and longitudes 27-32ºE. Moletjie community lies between Ga-Komape and Mabokelele in the Capricorn District, in Limpopo Province, South Africa. The climate of the area is hot and usually warm.[12] In winter, there's much less rainfall than in summer, the typical temperature is between 20.0 °C to 28.0 °C. Precipitation averages 713 mm. Precipitation is lower in July/August, with a mean of 1mm. Most rainfall is experienced in December, with a mean of 179 mm and therefore the average temperatures vary during the year by 8.0 °C.[38] The majority population of Moletjie community members is African, mostly born and bred in Limpopo Province. The community is mostly populated by Bapedi-speaking people who still practice rain-fed subsistence food production of crops and livestion.

Study Design

A qualitative study was conducted to examine the indigenous adaptation strategies on the impacts of erratic rainfall on subsistence food production. A semi-structured interview schedule was used to collect data. It comprised biographical information of the participants, followed by their awareness of the impacts of rainfall scarcity, and the indigenous strategies employed cope with the impacts of erratic rainfall on subsistence crop and livestock production. The study participants were selected through purposive sampling to make up a sample of 150 participants. A larger sample was used to acquire a range of responses about the indigenous methods employed in coping with rainfall scarcity. The sample was made up of unequal numbers of males (60) and females (90). The main criteria used was a selection of community members who still practise subsistence food production by planting crops in the home-gardens and raising livestock such as cattle under observable impacts of erratic rainfall.

37. Google earth (2021) https://earth.google.com/web/@23.7402659,29.30181828,1277.85941971a,11238.70371034d,35y,0h,0t,0r. [Accessed January 2021].
38. South African Weather Services (SAWS). “Annual Rainfall, min/max Temperature”. (South African Weather Services, Pretoria, 2015).

The participants' age ranged from 40 to 85 years, with participants mostly aged between 55 and 74 years. Of the 250 participants, 115 participants produced subsistence crops in their home- gardens, while 35 participants planted the crops in the home-gardens and ploughing fields. The types of subsistence crops grown were maize, watermelons, nuts and beans.

All the participants were Sepedi-speaking people. However, the interviews were conducted in Sepedi and translated to English. The purpose and goal of the study were clarified to the participants. Interviews were conducted in the households of the participants. An interview schedule was developed to enable quality data collection process. The interviews were conducted face-to-face and each was scheduled for 1½ hours. Data was captured through notetaking as most participants were not comfortable with audio-taping of the interviews. Data was transcribed to ease qualitative analysis and collected until saturation. Thematic content analysis (TCA) was used to analyze the data. TCA is a method used to identify, analyze, and report patterns in data and to break collected data into themes and sub-themes.[39] The method was used to identify, analyze, and report themes and sub-themes within data.

4. Results and Discussion

4. 1 The Adaptation Strategies Used to Cope with the Impacts of Rainfall Scarcity on Subsistence Food Production

Respondents have identified several indigenous adaptation strategies used to cope with the negative impacts of rainfall scarcity. These strategies include transhumant, change of planting season, mixed cropping, division of labour, and fertilization of soil. This is supported by previous studies that, subsistence farmers employ local based strategies to cope with the negative effects of unpredictable precipitation patters to sustain their lives.[34,35] As a result, these strategies have been effective in coping with the adverse impacts of erratic rainfall such as hunger, poverty and malnutrition. These indigenous based strategies are in line with the Sustainable Development Goal (SDG) 3 that speaks to poverty alleviation in local communities.

39. Braun, V. & Clarke, V. (2006). Using Thematic Analysis in Psychology. Qualitative Research in Psychology, 3, 77-101.

Local community members rely on the knowledge passed on from the previous generation in adapting to devastations. Moletjie community is not food secure, as their main source of food production is compromised by the harsh impacts of rainfall scarcity. However, community members use indigenous adaptation strategies which is in line with the Afrocentricity ideology that Africans should rely on their indigenous mechanism in sustaining their living conditions.[42] The impacts of climate change manifestations such as erratic rainfall, are mostly felt by the local communities whose livelihoods are climate-reliant.[14,15,16] These strategies were developed based on their local experiences and used to cope with drought, soil erosion, declined production of harvests, changing of soil structures, drought, and erratic rainfall patterns.[40,41] Unpredictable precipitation patterns and drought compromise local community members' food resources, as a result local adaptation practices are applied alleviate hunger, poverty, and malnutrition.[14,16]

Transhumant

Respondent 16 articulated that:

> *"Recently, we have been sending our livestock to the nearest fertile lands that are mostly owned by commercial farmers which is also problematic as some livestock as not fit to walk a distance because of hunger".*

Respondent 45 supported that:

"The method of taking livestock for grazing in areas where there is sufficient grazing has recently been the most effective strategy to sustain our livestock".

Subsistence farmers practice transhumance as one of their adaptation strategies to adjust to different environmental conditions. The study findings show that the impacts of erratic rainfall patterns upon rural communities are complex, as it alters competition between plants and their growth habits, productivity, and plant-animal interactions. The observation projected is that dry trends alter the timing of grass production and the quality of crops. [1]

An observation from this study is that livestock is sometimes killed and sold for a low price to avoid death caused by insufficient grazing. Sometimes livestock is killed and consumed as under-fed livestock is not suitable for marketing. However, this type of strategy results in a financial strain on households that only depend on livestock farming. This finding corroborates an assertion that local families lose their production as a result of death or decay because of the harsh impacts of soil erosion and drought caused by erratic rainfall patterns.[3] As a result of excessive temperatures and unpredictable precipitation patterns, subsistence farmers attest that there is a usual practice of livestock slaughtering to avoid the death and decay of livestock.

Respondent 20 conferred that:

"The local strategies used in the community is changing of crops, and soil fertilization. We sometimes opt for mixed cropping for simultaneous harvest. These mechanisms decrease the chances of hunger and poverty".

Change of Planting Season

Respondents stressed that:

"In coping with the negative impacts of rainfall scarcity, we have changed our planting season. We wait for the first rain then plant crops that will be watered by the second rain".

A common adaptation practice reported in the study was the adoption of the late planting season as a result of late-onset of rainfall. The subsistence farmers observed that rainfall was starting late and was negatively affecting the commencement of the planting season. Poor production of subsistence crops is a result of seasonal changes in temperature and rainfall amount.[12,43,44]

Change of Crops

Short-season crops

Respondent 55 expressed that:

"We plant crops that can withstand extreme weather conditions. These are convenient as they require less rainfall. We are now utilizing crops like millet so that we can get good harvests"

"*We mostly plant maize and complement it with drought-resistant crops such as sweet potatoes, groundnut, watermelon, and beans as they endure the severe climatic conditions. These are the most common crops harvested in the community".*

Respondent 36 supported that:

"Short-seasoned crops have been the best method of planting as it is effective and convenient to most subsistence farmers in the community".

Rainfall scarcity has restricted the planting abilities of subsistence farmers, as they are forced to plant crops that are favored by climatic conditions. However, as a result of rainfall scarcity, short-season crop farming has been identified as an effective indigenous strategy that sustains community members' livelihood.[10] Short-season crop farming assists subsistence farmers to produce sufficient food for their households. Studies concur that as a result of drought and soil erosion, indigenous sources of staple food in rural communities such as millet and sorghum are evident as production requires little rainfall.[15] However, frequent drought and late-onset of rain make forces subsistence farmers to opt for short-season crops and low rain demand crops to match with irregular precipitation patterns[6,10]

Mixed Cropping

Respondent 43 expressed that:

"We mix crop seeds such as sweet potato, maize, and beans for harvest growth"

Respondent 90 corroborates that:

"The method of mixing crop seeds enhances a good chance of concurrent growth and harvest on crops that requires little rainfall"

As a result of erratic rainfall patterns, indigenous adaptation strategies such as mixed cropping is observable in indigenous families. Seeds of maize, sweet potato, watermelons, groundnuts, and beans are mixed and planted together on the same field to increase the chances of simultaneous growth of harvests. This sort of mixed planting is known as crop expansion.[8,3]

Soil fertilization

Notably, respondent 10 voiced the following:

"We have adopted a system of tilling the land before the rain comes so that by the time it comes the soil will be able to hold water for a long time".

Respondent 66 supported that:

"We use strategies such as adding dry grass around the seeds so that it is sustained if there is low rainfall, cattle's dung as manure for a fresh and long-life span of crops".

Community members have devised means to cope with the negative impacts of unpredictable precipitation through employing indigenous methods such as the usage of cattle dung, temporary walls on riverbanks, and land titling. Cattle manure is used to fertilize the soil and improve its moisture to increase crop productivity. Moreover, the soil is tilled with the crop remains to improve its texture and fertility. These indigenous practices are found to be effective in reducing crop production risk.[32,43] However, the most effective adaptation strategy to drought, soil erosion, and erratic rainfall is the use of cattle dung as fertilizers in sustaining crop production.[32]

40. Jianchu, X., Shrestha, A., Rameshananda, V.R., Eriksson, M. & Hewitt, K. "Regional Challenges and Local Impacts of Climate Change on Mountain Ecosystems and Livelihoods". ICIMOD Technical Paper, (2007).
41. Rankoana, S.A. & Mothiba, T.M. "Perceptions on Climate Change and its Effects on the Health Conditions of Mogalakwena Community members in Limpopo Province, South Africa." African Journal for Physical, Health Education, Recreation and Dance, 1, no. 1 (2015): 244-254.
42. Asante, M.K. An Afrocentric Manifesto: Toward an African Renaissance. (John Wiley & Sons, 2013).

43. Abid, M., Schilling, J., Scheffran, J. & Zulfiqar, F. "Climate Change Vulnerability, Adaptation, and Risk Perceptions at Farm level in Punjab, Pakistan". Science of the Total Environment, 547, (2016): 447–460.
44. Maponya, P. & Mpandeli, S. "Climate Change and Agricultural Production in South Africa: Impacts and Adaptation Options." 2012.
45. Nazarea-Sndoval, V. (1995). Local Knowledge and Agricultural Decision-making in the Philippines: Class, Gender, and Resistance. Ithaca: Cornel University Press. Neumann, W.L. 2005. Social research methods: Qualitative and Quantitative approaches. 4th edition. Boston: Allyn Bacon.

Division of Labour

Respondent 58 indicated that:

> *"During land tiling process, women are mostly found in fields than men. However, men also participate in such activities if available".*

Respondent 105 expressed that:

> *"I am a single woman with young kids, I am the one responsible for my crops and ploughing field as I have no man to assist".*

Respondent 148 highlighted that:

> *"We are forced to work on fields as most of the husbands in the community have left for employment in urban areas".*

The study identified labour division as one of the indigenous strategies adopted in the community, as responsibilities were shared amongst family members. However, women participated more in such activities than men as some men left for employment in urban areas. Labour division in subsistence farming shows that women are bare maximum responsibility in subsistence crop production. As a result of rainfall scarcity that leads to drought and soil erosion, women were identified as the main subsistence farmers in the community as men's contributions were minimal.[15,27]

Conclusion

Rainfall scarcity as a manifestation of climate change has negatively impacted local communities, as indigenous adaptation measures are employed to cope with the adverse effects. Indigenous methods such as land tiling and crop watering tactics are found to be the most effective strategies in the community. Community members relied on indigenous adaptation methods such as using cow dung as manure for a fresh and long-life span of crops that are harvested and creating temporary walls on the riverbanks to store water for irrigation. Drought-resistant crops are widely planted to avoid poverty, hunger, and malnutrition within the community. These strategies have been effectively sustaining the community during the adverse impacts of rainfall scarcity. The study attests that lack of precipitation, results in drought, soil erosion and dust increases the likelihood of malnutrition, hunger, poverty, and diseases that negatively impacts the Moletjie community members.

References

Abid, M., Schilling, J., Scheffran, J. & Zulfiqar, F. "Climate Change Vulnerability, Adaptation, and Risk Perceptions at Farm level in Punjab, Pakistan". *Science of the Total Environment,* 547, (2016): 447–460.

Asante, M.K. *An Afrocentric Manifesto: Toward an African Renaissance*. (John Wiley & Sons, 2013).

Bhusal, Y. "*Local Peoples' Perceptions on Climate Change, Its Impacts and Adaptation Measures in Mid-Mountain Region of Nepal."* (A Case study from Kaski District). Nepal: Tribhuvan University Institute of Forestry Pokhara, 2009.

Braun, V. & Clarke, V. (2006). Using Thematic Analysis in Psychology. *Qualitative Research in Psychology*, 3, 77-101.

Brechin, S. R. (2003). *Comparative Public Opinion and Knowledge on Global Climatic Change and the Kyoto Protocol: the U.S. versus the world*. *International Journal of Sociology and Social Policy* 23.10: 106-134.

CARE, ALP (2013) "*Climate change vulnerability and adaptive capacity in Garissa County*." Care International and Adaptive Learning Program (ALP), p 20, 2013. http://www.careclimatechange.org/files/CVCA_Kenya_Report__Final.pdf.

Chepkoech, W, Mungai, N W, Stöber S, Lotze-Campen H. "Understanding adaptive capacity of smallholder African indigenous vegetable farmers to climate change in Kenya". Climate Risk Management. 27 (2020) :100204. https://doi.org/10.1016/j.crm.2019.100204.

Dube, T. & Phiri, K. (2013). Rural livelihoods under stress: *The impact of climate change on livelihoods in South Western Zimbabwe. American Journal Contemporary Research*, (3) 5.

Food and Agriculture Organisation of the United Nations (FAO). (2016). *Climate change and Food Security: Risks & Responses.* Available at http://www.fao.org/publications.

Gbetibouo, G. A. (2008). *Understanding Farmer's Perceptions and Adaptation to Climate Change and Variability: The case of Limpopo Basin*, South Africa. *Policy Brief*, 15-8.

Google earth (2021) https://earth.google.com/web/@23.7402659,29.30181828,1277.85941971a,11238.70371034d,35y,0h,0t,0r. [Accessed January 2021].

Gyampoh, B. A., Amisah, S., Idinoba, M. & Nkem, J. (2014). *Using Traditional Knowledge to Cope with Climate Change in Rural Ghana.* In Proceedings, Third International Conference on Climate and Water. 205–213. Helsinki, Finland, Finnish Environment Institute (SYKE).

International Panel of Climate Change (IPCC). Chapter 11: "*Human Health: Impacts, Adaptation, and Co-Benefits",* 2014.

International Panel of Climate Change (IPCC) (2013). *Summary for Policymakers*. In T.F.D. Stocker, G.K. Qin, M. Plattner & S.K. Tignor (Eds.), *The Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. New York: Cambridge University Press.

International Panel of Climate Change (IPCC). "*Climate Change 2007. Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.*" Geneva, 2007.

Jan, S. & Anja, B. (2007). *Indigenous Peoples and Climate Change*. University of Oxford and Missouri Botanical Garden.

Jianchu, X., Shrestha, A., Rameshananda, V.R., Eriksson, M. & Hewitt, K. "Regional Challenges and Local Impacts of Climate Change on Mountain Ecosystems and Livelihoods*". ICIMOD Technical Paper*, (2007).

Kabanda, T. & Nenwiini, S. "Impacts of Climate Variation on the length of the Rainfall Season: An Analysis of Spatial Patterns in North-East South Africa." *Theories and Applications of Climatology* 125, no. 93 (2016): 100. doi:10.1007/ s007040151498-7.

Karienye, D., & Macharia, J. "*Adaptive Capacity to Mitigate Climate Variability and Food Insecurity of Rural Communities Along River Tana Basin, Kenya.*" ("Adaptive Capacity to Mitigate Climate Variability and Food Insecurity ...") *African Handbook of Climate Change Adaptation*, 1-12, 2020.

Kok, J.A. (2005). Can Models for Knowledge Management be Successfully Implemented to Manage the Diversity of Indigenous Knowledge? *South African Journal of Information Management*, 7(4). Accessed on: 1 August 2006.

Kruger, A. C. & Shongwe, S. "Temperature Trends in South Africa: 1960–2003." *International Journal of Climatology* 24, no. 15 (2004): 1929–1945.103.

Letsatsi-Duba, D. "*Drought issues in Limpopo province*, MEC of agriculture". Polokwane, Limpopo province (2009).

Limpopo Department of Agriculture (LDA) (2010). Downloaded reports. http://www.lda.gov.za.

Macedo, D., Semali, L., & Kincheloe, J. (1999). Decolonizing indigenous knowledge. What is indigenous knowledge: Voices from the academy, 134-176.

Madzwamuse, M. (2010). Climate Governance in Africa: Adaptation Strategies and Institutions: Hienrich Boll Stiftung.

Majake, M.P. (2005). Evaluation of the Impact of a Household Food Security in Qwaqwa using a Coping Strategy Index. Unpublished M Agric (Food Security), African Centre for Food Security, University of KwaZulu Natal, Pietermaritzburg.

Maponya, P. & Mpandeli, S. **"***Climate Change and Agricultural Production in South Africa*: *Impacts and Adaptation Options."* 2012.

Mascarenhas, A. (2004). Knowledge, Indigenous Knowledge, Peace, and Development. *Indilinga: African Journal of Indigenous Knowledge Systems*, 3(1): 1-15.

Ministry of Environment and Tourism. (2006). National Capacity Self-Assessment. Government of Zimbabwe, Harare. Available at: http://www.undp.org/content/undp/en/home/librarypage/environmentenergy/integrating_environmentintodevelopment/ncsa-final-reports--action-plans-andccr.html. [Accessed May 2020].

Mohale, M. R. "*Khelobedu Cultural Evolution through Oral Tradition*." (University of South Africa: Pretoria, 2014).

Mpandeli, N.S. "Coping with Climate Variability in Limpopo Province*". Sustainable Rural Livelihoods Technical Report, 2005*.

Mugabe, F.T., Mubuya, C.P., Ninja, D.H., Munodawafa, A., Gondwe, P., Mutshwangwa E.A., Chagonda, C., Masere, P., Makuvaro, D.J. & Murewi, C. (2010). *Using Indigenous Knowledge for Climate Change Adaptation in Southern Zambia and South-Western Zimbabwe*. *Zimbabwe Journal Technical Science,* 1 (1) 6-11.

Mugambiwa, S.S. "Adaptation Measures to Sustain Indigenous Practices and the use of Indigenous Knowledge Systems to Adapt to Climate Change in Mutoko Rural district of Zimbabwe*", Jàmbá: Journal of Disaster Risk Studies* 10 no.1(2018) a388. https://doi.org/10.4102/ jamba. v10i1.388.

Nakashima D (2008) An Indigenous Knowledge forum on Climate Change Impacts. Pachamama 2: 3-6.

Nenwiini, S & Kabanda, T. "Impacts of Climate Variation on the Length of the Rainfall Season: An Analysis of Spatial Patterns in North-East South Africa." *Theories and Applications of Climatology* 125, no. 93 (2016):100. doi:10.1007/ s007040151498-7.

Nazarea-Sndoval, V. (1995). Local Knowledge and Agricultural Decision-making in the Philippines: Class, Gender, and Resistance. Ithaca: Cornel University Press. Neumann, W.L. 2005. Social research methods: Qualitative and Quantitative approaches. 4th edition. Boston: Allyn Bacon.

Njiraine, D., Ocholla, D. N., & Onyancha, O. B. (2010). Indigenous knowledge research in Kenya and South Africa: an informetric study. *Indilinga African Journal of Indigenous Knowledge Systems*, *9*(2), 194-210.

Nyahunda L, Matlakala F.K, & Makhubele J.C. Role of social workers in mitigating the effects of climate change in Makonde communal lands, Zimbabwe. e-Bangi 16 no.9 (2019):1–8.

Phokele, M. & Mpandeli, S. (2012). *Climate Change Adaptation Strategies used by Limpopo Province Farmers in South Africa*, Journal of Agricultural Science.

Rankoana, S.A. "Perceptions of Climate Change and the Potential for Adaptation in a Rural Community in Limpopo Province, South Africa". *Sustainability Journal, 8* no. 8 (2016): 672, 1-10.

Rankoana, S.A. & Mothiba, T.M. "Perceptions on Climate Change and its Effects on the Health Conditions of Mogalakwena Community members in Limpopo Province, South Africa." *African Journal for Physical, Health Education, Recreation and Dance*, 1, no. 1 (2015): 244-254.

Robinson, J. B., & Herbert, D. (2001). Integrating climate change and sustainable development. *International Journal of Global Environmental Issues*, *1*(2), 130-149.

Semali, L. and Kincheloe, J. (1999). Introduction: What is Indigenous Knowledge and Why Should We Study It? In Semali, L. and Kincheloe, J. (ed), *What is Indigenous Knowledge?* Voices from the Academy, pp. 3-58. New York and London: Falmer Press.

Smit. A.J & Masoga M, 2012. African Indigenous Knowledge Systems and Sustainable Development: Challenges and Prospects, People's Publishers, Wandsbeck. South Africa.

Spencer, A., Poorting, W., Butler, C. & Pidgeon N. S. (2011). *Perceptions of Climate Change and Willingness to save Energy related to Flood Experience*. National Climate Change, 1, 46–49.

Somah, T. P. (2013). *Climatic Change Impacts on Subsistence Agriculture in the Sudano-Sahel Zone of Cameroon - Constraints, and Opportunities for Adaptation.* Ph.D. Thesis. Brandenburgische Technical University.

South African Weather Services (SAWS). "Annual Rainfall, min/max Temperature". (South African Weather Services, Pretoria, 2015).

StatsSA. "*Report on the Survey of Large and Small-scale Agriculture."* (Statistics South Africa, Pretoria, 2016).

Tambo, J. A. (2016). *Adaptation and Resilience to Climate Change and Variability in north-east Ghana. International Journal of Disaster Risk Reduction,* 17, 85–94.

United Nations Framework Convention on Climate Change (UNFCCC). "*Adaptation Assessment, Planning, and Practice: An Overview from The Nairobi Work Programme on Impacts, Vulnerability, and Adaptation to Climate Change*." Climate Change Secretariat UNFCCC, Bonn, 2010.

World Health Organisation. (WHO). "*Climate Change and Health." (*Geneva: World Health Organisation, 2015).

Yohe, G. & Tol, R. (2002). *Indicators for Social and Economic Coping Capacity: Moving toward a working definition of Adaptive Capacity*. *Global Environmental Change*. 1 (12) 25-40.

Ziervogel, G., Taylor, A., Hachigonta, S. & Hoffmaister, J. (2008). *Climate Adaptation in southern Africa: Addressing the needs of Vulnerable Communities. Environment Institute (SEI), Stockholm, Sweden*. Retrieved from https://www.sei-international.org/publications [Accessed September 2020].

Byers AC. Historical and contemporary human disturbance in the upper Barun valley, Makalu-Barun National Park and Conservation Area, east Nepal. Mt Res Dev. 1996; 16:235-247.

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