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Gambian farmers' perception of and access to climate services on early warning and adaptation

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Abstract

Climate variability and extreme weather are the main contributors to the current increase in global food insecurity. As global temperatures rise, extreme climatic conditions will become more frequent and severe. Using seasonal weather forecasts and early warning systems will enable farmers and households to adjust their production plans and take measures to account for expected weather events. Linking early warning to early action is particularly vital in the agriculture sector. In agriculture, an estimated 5-10% of domestic agricultural losses are due to changes in weather. A one-meter rise in sea level would effectively submerge up to 8% of the country's land area. In the Gambia, these phenomena are reflected in a significant drop in harvest, water shortage, and worsening of health crises, resulting in growing food insecurity and threatening the progress made in the fight against poverty in the last decades. Studies show that obtaining and using weather forecasts can reduce the impact of weather shocks by 10-30%. If climate information is available but does not enable households to adopt adaptation strategies their value will be lost. Therefore, this study is set to assess how access to climate information services enables households to adopt climate risk adaptation strategies. The binary logistic regression model is used to analyse household access to and the use of the information for decision-making while the multinomial logit (MNL) model is used to analyse the perceptions of the usefulness and reliability of early warning and weather forecasting information. The recursive bivariate probit (RBP) model is used to analyse the determinant of the use of climate information and its impact on adopting an adaptation measure. This research results show the level of access to climate information services in the Gambia, and the main factors that influence access to climate information. How farmers perceived the usefulness and reliability of early warning and weather forecasting information. The impact of the use of climate information on the adoption decision of farmers.

Keywords: Access, adaptation, climate services, climate variability, early warning, perception, The Gambia

Introduction

Between 1970-2019 climate and weather-related disasters occurred on average every day claiming many lives and causing US$202 million in losses daily (WMO, 2021). Studies in various countries show that obtaining and using climate information services can reduce the impact of weather shocks by 10-30% (Cabot Venton et al., 2012; Laudien et al., 2020; Meza et al., 2008; Rathore et al., 2016; Tarchiani et al., 2021). Timely and accurate availability of information on climate risk management through early warning is a useful tool in policy decision-making processes. (Hallegatte et al., 2018; A. J. Kull et al., 2016; WMO, 2015) found positive benefits to investing in weather prediction and early warning systems. Accurate and timely early warning information provides farmers with vital information that helps them make informed decisions about their farming operations and can help them plan for and respond to extreme weather events. With the increasing effects of climate change, these technologies are critical for strengthening the resilience and sustainability of The Gambia's agricultural industry. The Gambia is prone to different weather-related risks such as floods, wind storms, and drought. Effective early warning systems can significantly reduce natural disasters and climate change risks. As reported by (Abdulla et al., 2020; FAO 2019), there is a gap among users regarding the availability and accessibility of information for use in making agricultural or livelihood management decisions. Understanding the perception of and access to climate services, particularly those related to early warning and adaptation, among Gambian farmers is crucial for building climate resilience and facilitating informed decision-making in the agricultural sector. (Hansen et al., 2019) if climate information on early warning is available but does not enable households to adopt climate risk adaptation strategies their value will be lost. Therefore, this study was set to assess farmers' access to and use of climate service on early warning, the perceptions of the usefulness and reliability of early warning information and how the use of climate information influences farmers' adoption decisions of adaptation strategies.

Material and Methods

A mixed-method approach was used to investigate climate information's role in climate change adaptation among Gambian farmers. A survey of 420 farmers was conducted in three regions of the country: North Bank, Central River South, and Upper River. Accessing and using information are two different steps in the decision-making process and can therefore be shaped by different factors. Therefore, two separate logit models were used to analyse household access to information and the use of information for decision-making. Agricultural households with access to climate information were coded 1, and those without were coded 0. Similarly, farm households that used climate information for decision-making were coded 1, otherwise coded 0. The multinomial logit (MNL) model will be used to analyse the perceptions of the usefulness and reliability of early warning information. The recursive bivariate probit (RBP) model proposed by (Chiburis et al., 2012) was used to analyse the factors that influence the use of climate information on the adoption of an adaptation measure.
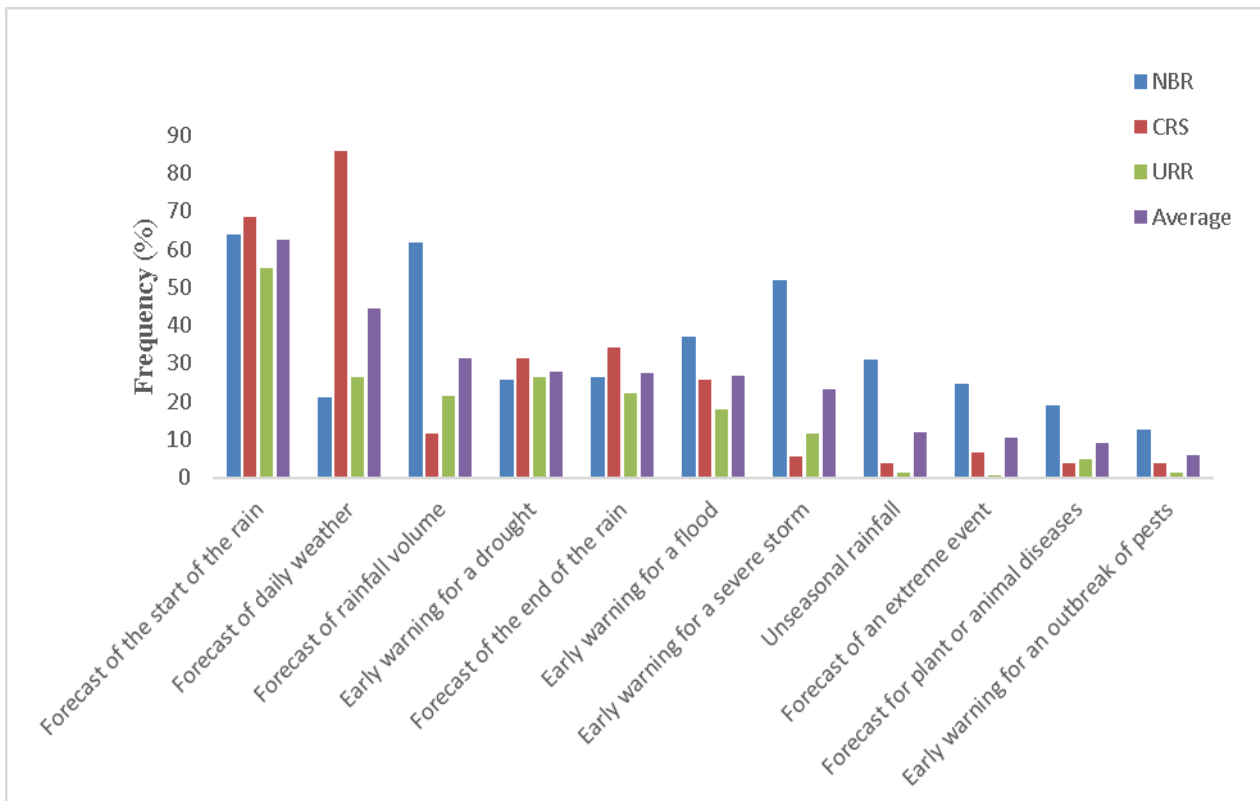
Results and Discussion

The most prevalent climatic information available to Gambian farmers is the forecast of the start of the rainy season. This is most likely due to the fact that the rainy season is the most significant season for agriculture in the Gambia. Radio is the most common source of early warning climate information for Gambian farmers. The Internet is the least source of climate information for farmers. This is because according to Business Insider Africa, 2023, is one of the countries with expensive data charges, with averages of $5.86 per gigabyte.

Table 1: Pearson chi-square test for the relation between the use of climate information and adaptation

Use of climate information	Adaptation		
	Non-Adapt	Adapt	Total
Use	11	292	303
	3.63	96.37	100
	19.64	80.22	72.14
No use	45	72	117
	38.46	61.54	100
	80.36	19.78	27.86
Total	56	364	420
	13.33	86.67	100
	100	100	100
Pearson chi2(1)	88.6185		
Pr	0.000		
Cramér's V =	-0.4593		

Source: Author, 2023

Table 1 show the relationship between farmers who use or do not use climate information those that take or do not adaptation strategies. The Cramer's V give us the effect size. The probability of the chi square is significant at 1% this mean that the relationship between farmers who use climate information and take or not taken adaptation strategy is significant. The result of the proportion test calculator shows a significant difference between farmers who use or do not use climate information and those that adapt or do not any adaptation strategy.

The study found that access to marketing information, attending training on climate change adaptation, trust in the media, and extension services and witnessing unexpected weather events are main the factors shaping farmers' access to and use of climate information. Gender, age and education does not show a significant influence on farmers' access to and application of climate information, but female does show a negative influence on the access and utilisation of climate information. This result indicates that female farmers are less likely to access and use climate information than male farmers. this is due to the fact that women are more likely to be marginalised and have less access to resources than men. Female farmers believe climate information is less accurate and useful than male farmers. Female farmers have fewer resources, and there are gender norms around climate change that make it difficult for women to adapt. Women in the Gambia are expected to shoulder the burden of child care, making it difficult for them to learn about climate change. Female farmers frequently have lower levels of education than male farmers. The RBP model results reveal that farmers' use of climate information has a statistically significant impact on the adoption of an adaptation strategy. Farmers who notice a change in the weather also have greater adaptive potential.

Conclusions and Outlook

Climate knowledge is critical in enabling farmers in rural Gambia to adjust to the effects of climate change. The study's findings emphasise the necessity of governments redoubling their efforts to ensure that climate information is timely, accurate, and suited to the needs of farmers. Thus, providing farmers with relevant climate information can play a crucial role in helping them adapt to climate change's negative impact.

References

Abdulla, M. A., Barrett, M. G., Juneja, M. M., Klamert, M. U., & Pearce, M. J. (2020). *Focal points*. https://executiveboard.wfp.org

Chiburis, R. C., Das, J., & Lokshin, M. (2012). A practical comparison of the bivariate probit and linear IV estimators. *Economics Letters*, *117*(3), 762–766. https://doi.org/10.1016/j.econlet.2012.08.037

Hallegatte, S., Fay, M., & Barbier, E. B. (2018). Poverty and climate change: Introduction. In *Environment and Development Economics* (Vol. 23, Issue 3, pp. 217–233). Cambridge University Press. https://doi.org/10.1017/S1355770X18000141

Hansen, B. B., Pedersen, Å. Ø., Peeters, B., Le Moullec, M., Albon, S. D., Herfindal, I., Sæther, B. E., Grøtan, V., & Aanes, R. (2019). Spatial heterogeneity in climate change effects decouples the long-term dynamics of wild reindeer populations in the high Arctic. *Global Change Biology*, *25*(11), 3656–3668. https://doi.org/10.1111/gcb.14761

Kull, A. J., Mena, J. A., & Korschun, D. (2016). A resource-based view of stakeholder marketing. *Journal of Business Research*, *69*(12), 5553–5560. https://doi.org/10.1016/j.jbusres.2016.03.063

Meza, F. J., Hansen, J. W., & Osgood, D. (2008). Economic value of seasonal climate forecasts for agriculture: Review of ex-ante assessments and recommendations for future research. In *Journal of Applied Meteorology and Climatology* (Vol. 47, Issue 5, pp. 1269–1286). https://doi.org/10.1175/2007JAMC1540.1

Rathore, L. S., Chattopadhyay, N., & Chandras, S. V. (2016). Combating Effect of Climate Change on Indian Agriculture through Smart Weather Forecasting and ICT Application. *Journal of Climate Change*, *2*(1), 43–51. https://doi.org/10.3233/jcc-160005

Tarchiani, V., Coulibaly, H., Baki, G., Sia, C., Burrone, S., Nikiema, P. M., Migraine, J. B., & Camacho, J. (2021). Access, uptake, use and impacts of agrometeorological services in Sahelian rural areas: The case of Burkina Faso. *Agronomy*, *11*(12). https://doi.org/10.3390/agronomy11122431 .