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RESEARCH BRIEF
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An analysis of rural coastal households' livelihood selection choices in response to climate change: The case of Port St Johns Local Municipality, South Africa

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RESEARCH BACKGROUND

Climate change poses severe and escalating threats to communities, ecosystems, and traditional livelihoods globally, with 90% of natural disasters reported between 1996 and 2015 attributed to climate change, resulting in significant human and economic losses. Coastal regions, home to over 40% of the world's population, are particularly vulnerable, experiencing intensified storms, floods, seawater intrusion, coastal erosion, and rising temperatures and acidity levels in oceans.

In South Africa, rural coastal livelihoods have historically centred on fisheries and agriculture, but are now diversifying in response to climate change impacts such as increasing soil salinity and droughts affecting agriculture productivity, and disruptions to fisheries due to altered aquatic environments. These changes necessitate adaptation strategies that encompass both on-farm practices like crop diversification and water conservation, and off-farm activities such as tourism and migration, often driven by community initiatives in the absence of robust government support.

The adoption of these adaptation strategies is influenced by socio-economic factors such as age, education, gender, household size, and farm size. Higher education levels, for instance, are associated with better climate change understanding and adoption of adaptation measures, while gender disparities in access to resources and technology impact adaptive actions. Engagement with extension services and access to credit also play pivotal roles in enhancing farmers' adaptive capacity, underscoring the importance of institutional support in fostering effective adaptation to climate change impacts.

PROJECT SUMMARY

Understanding rural households' adaptation strategies to climate change is crucial yet poorly understood and documented, especially for coastal versus inland regions with different agro-climate and geo-political environments. This study aims to document and understand rural coastal households' livelihood adaptation responses, focusing on factors influencing their strategies at the family level.

KEY FINDINGS

- Rural coastal households mainly rely on horticultural crop production and small livestock farming, with **climate change adaptation strategies focusing on enhancing these established on-farm activities** through mixed farming, crop diversification, increased fertiliser use, home-garden agriculture, and adjusting planting dates.
- Off-farm activities such as handcrafts, fisheries, marine product sales, and tourism are highly seasonal, providing immediate but unreliable income, highlighting the **need for more stable income sources**.
- The **reliance on a mono-livelihood portfolio makes households vulnerable to climate change-related fluctuations** in temperature and precipitation, with livelihood choices influenced by socio-economic and institutional factors.

RESULTS AND DISCUSSION

BASIC SAMPLE STATISTICS

The sample consisted of 52% females and 48% males, with 81% being unmarried. 62% of households had land access and 82% were unemployed. Most respondents (96%) were not members of farmer groups and lacked access to credit as well as extension benefits (96%). The average distance to the nearest market was 9km and the mean monthly income was ZAR 4 728. The average time spent in school by a household head – averaged at 38 years old – was 11 years.

- **Rural coastal farming livelihood activities:** Livelihoods in the area were primarily on-farm (68.11%), with only 28.48% working off-farm and 3.41% engaging in both.
- **Rural coastal farming households' on-farm livelihood activities:** Crop production was the primary livelihood activity for 51.5% of households, followed by livestock production (46.7%), and aquaculture (1.8%).
- **Livestock owned by rural coastal farming households:** Common livestock included chickens (38%), goats (22%), cattle (18%), pigs (13%), and sheep (8%). Indigenous chicken, goats, and cattle were favoured due to their resilience to climate extremes (Lyu *et al*., 2020). This variety also allowed farmers to switch livestock in response to climate change and therefore, become more resilient.
- **Types of crops grown by rural coastal farming households:** Green vegetables were the main crop (49%), followed by potatoes (35%), marijuana (10%) and cereals (5%). Horticultural crops were preferred for their market demand and climate resilience.
- **Rural coastal farming households' off-farm livelihood activities:** Off-farm livelihood activities included handcrafts (40%), fisheries (21%), tourism transport (19%) as well as the collection and selling of sea stones (9%), seashells (6%) and seaweed (2%). Off-farm livelihood activities are heavily dependent on the tourism industry, making them highly seasonal.
- **Rural coastal farming households' on-farm livelihood activities**: Adaptation strategies included mixed farming (12%), crop diversification (11%), fertiliser and manure use (11%), changing fertilisers (10%), home-garden agriculture (8%), changing of planting dates (8%), soil and water management (6%), using distinct crop varieties (5%), altering livestock breeds (5%), decreasing livestock numbers (5%), water harvesting and irrigation (4%), agroforestry (4%), using agrochemicals (4%) and the inclusion of early-maturing, drought-tolerant cultivars (4%).

PROBLEM STATEMENT

Understanding rural households' livelihoods adaptation strategies to climate change is crucial but poorly understood (Jordan, 2021) and documented (Mwinkom *et al*., 2021). This is due, in part, to the grouping of inland and coastal strategies despite their disparate agro-climate and geo-political environments (Wolf *et al.,* 2010).

This study aims to document and understand rural coastal households' livelihoods adaptation responses, highlighting factors influencing their livelihood strategies at the family level of the rural coastal subsector.

METHODS

Port St. Johns Local Municipality (PSJLM) is located in the OR Tambo District of the Eastern Cape in the Republic of South Africa. It has a population of 176 000, 53.74% of which is female and 46.26% is male (ECSECC, 2017).

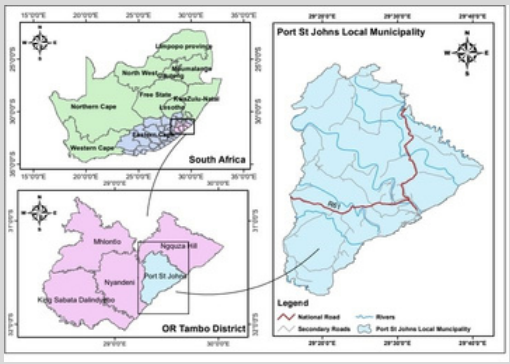

Figure 1. Port St Johns Local Municipality

The area experiences favourable temperatures for vegetation growth year-round, with a maximum range of 21.4°C to 25.5°C and a minimum range of 12.4°C to 20.7°C. The coast is sandy however the district contains highly fertile soils and a climate which is favourable for crop production. The PSTJM wild coast is characterised by different vegetation types, with large areas covered by grassland and bushveld dominating along the rivers. The vegetation is well suited to wildlife, tourism, and livestock grazing, aiding small-scale farmers in their livestock production.

Results suggest that more householders practice crop-related adaptation strategies than livestock-related adaptation strategies, indicating that most households are more dependent on crop production than on livestock production.

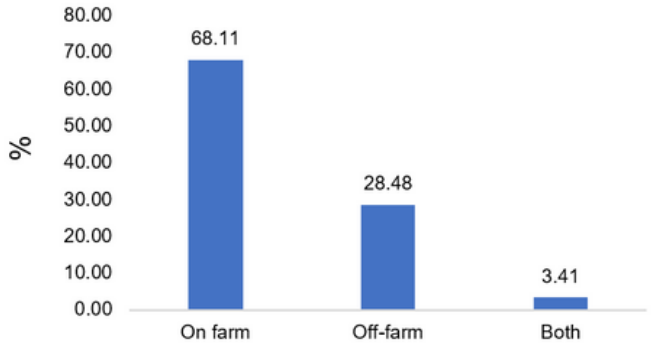

Figure 4. Categories of livelihood activities practiced in the study area.

RURAL COASTAL FARMING HOUSEHOLDS' LIVELIHOOD DIVERSITY

Seven livelihood combinations were observed among rural coastal farming households. Most were engaged in crop and livestock production (33%), followed by those exclusively involved in off-farm activities (26%), crop production only (19%), and livestock production only (17%). Other combinations were less popular.

These findings show the dominance of mono-livelihood portfolios at 61.23% (crop only, livestock only and off-farm only) while only 37.79% practiced double livelihood activities (skewed towards crop and livestock) and 1.14 % practiced multiple livelihood activities (the entire livelihood portfolio).

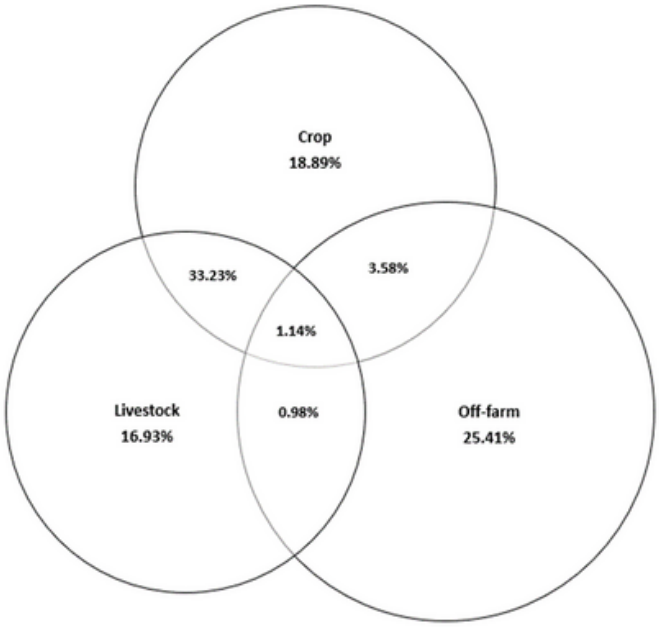

Figure 5. Rural farming households' livelihood portfolio diversity.

CONCEPTUAL FRAMEWORK

Rural coastal households share boundaries with unique natural resources that are altered by climate change, affecting the livelihoods of the coastal community (Roy & Basu, 2020). In this study, most rural coastal households were faced with two broad livelihood options – on-farm activities and off-farm activities (Figure 3). The choice of these livelihoods choices are influenced by individual households' characteristics (age, gender, education), and by the perceived utility each household derives from a pool of on-farm and off-farm livelihood options.

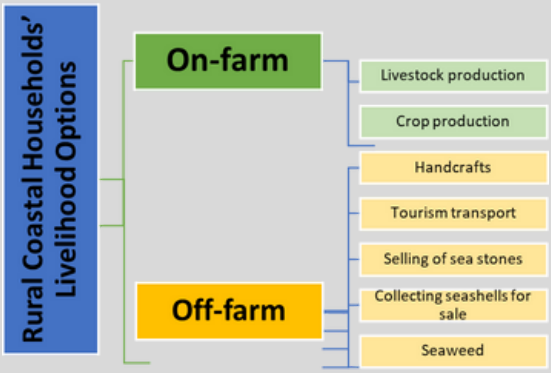

Figure 3. Livelihoods activities in Port St Johns Local Municipality

THE ANALYSIS

The Multivariate Probit (MVP) model was employed to explore factors affecting rural coastal households' climate change adaptations, revealing a set of regressors for each livelihood concurrently, while permitting unrestricted association amongst the unseen components (Lin, Jensen & Yen, 2005). The variables were education, gender, marital status, age, household income, household size, land ownership, land size, markets, credit, farm member, experience, and distance from the sea.

CORRELATION MATRIX FOR THE DIFFERENT LIVELIHOODS PRACTICES BY RURAL COASTAL HOUSEHOLDS

Coefficients for "off-farm only" and "on-farm only" are negative, revealing substitutability due to labour intensity. Positive coefficients for "both on- and off-farm" and "off-farm only" suggest complementarity (Belderbos *et al*., 2004), possibly because these are more generalised livelihood systems which can be cheaply financed by other portfolios, allowing a household to distribute risk.

FACTORS THAT INFLUENCE THE CHOICE OF LIVELIHOOD PORTFOLIOS OF RURAL COASTAL HOUSEHOLDS

- **Marital status of the household head:** Married household heads were more likely to choose "off-farm only" livelihoods. This may be because married individuals respond quickly to the pressure of family responsibilities, seeking off-farm activities to access immediate cash.
- **Household size:** Household heads with larger families were less likely to select "off-farm only" and "both off- and on-farm" livelihoods portfolios compared to those with smaller families. This may be explained by the low returns associated with off-farm activities as well as their seasonal nature, making them unreliable sources of income to meet the needs of larger households.
- **Education of the household head:** Higher education levels increased the likelihood of selecting "on-farm only" and "both off- and on-farm" livelihoods, possibly due to improved access to information and technologies that enhance the productivity of on-farm activities. The selection of "both off- and on-farm" activities represent an ambition to diversify livelihoods, inspired by previously acquired knowledge which increases climate change resilience through information accessibility and a greater awareness of adaptation strategies (Aryal et al. 2020; Vo, Mizunoya & Nguyen, 2021).
- **Access to credit:** Access to credit led to a substitution effect from "off-farm only" to "on-farm only" livelihoods as credit access allows households heads to finance improved and adapted strategies, affirming the findings of previous studies (Aryal et al., 2020; Vo, Mizunoya & Nguyen, 2021; Hasan & Kumar, 2022). Off-farm activities can largely be done with minimal financial support.
- **Access to land:** Increased access to land correlated with choosing "on-farm only" livelihoods which require land access, unlike "off-farm only" activities.
- **Distance to market:** Greater distance to formal food markets reduced the likelihood of choosing "on-farm only" livelihood activities and increased "off-farm only" choices. This is related to the transportation costs associated with marker accessibility (Alwang et al., 2012).

CONCLUSION

Rural coastal households derive their livelihoods mostly from on-farm activities – primarily consisting of horticultural crop production and some small livestock production. Off-farm livelihood activities such handcrafts, fisheries, the sale of marine products and tourism transport highly seasonal, making them simultaneously unreliable and also relatively popular as they provide immediate cash.

Most climate change adaptation approaches revolved around established on-farm activities, rather than adopting new technologies or changing to entirely new crops. The most popular strategies were the practice of mixed farming, crop diversification, increased fertiliser usage and application of animal manure, the use of new fertilisers, home-garden agriculture and shifting dates for planting.

The study concludes that these livelihood portfolios (on-farm, off-farm, and both on- and off-farm) substitute each other and are influenced by socio-economic and institutional factors. Rural coastal households depend primarily on crop and livestock-related activities for their income, skewing towards a mono-livelihood portfolio. This approach makes households vulnerable to the sudden or gradual fluctuations in temperature and precipitation that are associated with climate change. The selection of these livelihoods activities is influenced by a combination of socio-economic and institutional factors.

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