Assessment of indicators of rural household-level vulnerability to climate change: A comparison between a coastal, near the river and an inland village

Prepared by Sotsha K.

Supervisor: Prof. BJ Bester

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Outline of the presentation

- Background and research problem
- Objectives and research questions
- Hypotheses
- Conceptual framework

Outline of the presentation cont'd

- Materials and methods
- Findings – Descriptive results
- Findings – Empirical results
- Conclusions

Background and research problem

- What is climate change?
- Where has it been?
- What are its causes?
- Why is it one of the major concerns?
- What was the purpose of the study?
- It has to be known how particular localities are affected by climate change

Research objectives and research questions

- To provide indicators of vulnerability to climate change, specifically for rural households involved in crop-livestock production.
  - To assess the main indicators of vulnerability related to climate change in crop-livestock producing rural households
  - To determine the role of agricultural production in the livelihoods of the rural households
  - To examine underlying socioeconomic and institutional characteristics that determine how rural households respond to and cope with climate change

Research objectives and research questions cont'd

- Why assess rural household vulnerability indicators?
- What constitutes the basis for rural livelihoods?
- How and to what extent does climate change affects crop-livestock production?
- What factors determine how rural households respond to and cope with climate change, thus allowing for a greater role for crop-livestock production?

Hypotheses

- Rural households depend on crop-livestock production as one of their livelihood strategies
- Rural household crop-livestock production is vulnerable to climate change
- The capacity of rural households to adapt to climate change is determined by different socioeconomic and institutional characteristics

Conceptual framework

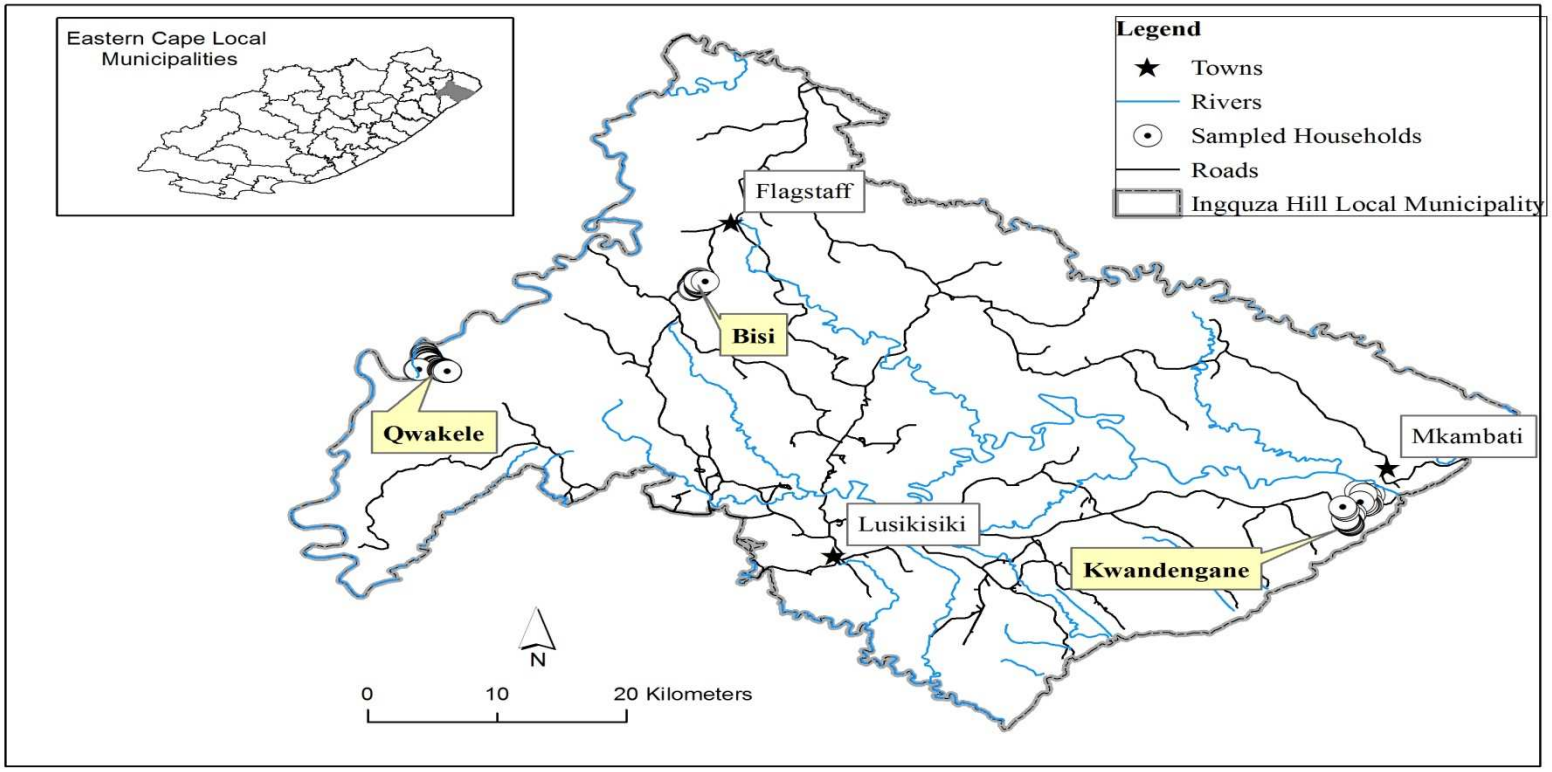
- In answering the questions, a framework was developed
- Vulnerability is a degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes
- Vulnerability = f(exposure, sensitivity and adaptive capacity)
- E.g: Exposure – extreme events (droughts)

  Sensitivity – irrigation rate

  Adaptive capacity – infrastructural development

Materials and methods

- Study areas



Materials and methods cont'd

- Sampling and data collection

Village	Pop	# of HH	Sample	%
Qwakele	487	97	40	41.23
Kwandengane	548	108	40	37.04
Bisi	1106	220	40	18.18

- Data analysis

$$Y_{income} = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \ldots\ldots\ldots \beta_n X_n + U_i$$

$$Y_{water} = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \ldots\ldots\ldots \beta_n X_n + U_i$$

$$Y_{diversification} = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \ldots\ldots\ldots \beta_n X_n + U_i$$

Variables	Unit	Type of variable
Age	Actual in years	Continuous
Gender	Male or Female	Categorical
Marital status	Single or otherwise	Categorical
Education	No education or otherwise	Categorical
Income class	Intervals	Categorical
Household size	Actual number	Continuous
Individuals bringing income	Actual number	Continuous
Household average income	Actual amount	Continuous
Garden size	Estimated size	Continuous
Reasons for growing crops in a garden	Selling or otherwise	Categorical
Field size	Estimated size	Continuous
Source of water for crops	Rain or irrigation	Categorical
Government support	Have access or not	Categorical
Organizations	Participate or not	Categorical
Distance to water resources	Estimated time in minutes	Continuous
Adequate/unreliable (water resources)	Adequate or unreliable	Categorical
Number of assets	Actual number	Categorical
Number of livestock	Actual number	Categorical
Infrastructure	Have access or not	Categorical
Sources of water	River or other	Categorical

Findings – Descriptive results

- Average age – 56 yrs
- Low levels of education
- High level of unemployment
- Social grants was the major source of income
- Household average income per month R2079.92
- All sample households have access to land
- Poor access of valuable assets
- Own savings – major source of capital
- Family labour – major source of labour
- Food security influences choice of crops
- Consumption – utilization of produce

Findings – empirical results

$$Y_{income} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \ldots\ldots\ldots \beta_n X_n + U_i$$

$$Y_{water} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \ldots\ldots\ldots \beta_n X_n + U_i$$

$$Y_{diversification} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \ldots\ldots\ldots \beta_n X_n + U_i$$

Parameter	Estimated coefficients	Standard error	t-statistics	Significance
Constant	4.778	0.479	9.975	0.002*
Age	0.001	0.002	0.328	0.765
Gender	-0.326	0.128	-2.540	0.085***
Marital status	0.112	0.114	0.986	0.397
Education	-0.147	0.059	-2.475	0.090***
Income class	8.769	0.000	0.473	0.668
Household size	0.008	0.014	0.552	0.619
IndividualsY	0.078	0.025	3.166	0.051***
HHAveY	0.000	0.000	-2.867	0.064***
Garden size	0.777	0.191	4.079	0.027**
RFRGRWCRPGADN	0.015	0.028	0.534	0.630
Field size	-0.041	0.035	-1.164	0.329
SOWTERFRCROPS	-0.034	0.047	-0.723	0.533
GovSupport	-0.367	0.056	-6.541	0.007*
Organization	0.012	0.049	0.255	0.815
Distance	-0.038	0.013	-2.944	0.060***
Adequate/Unreliable	-0.431	0.194	-2.228	0.112
Assets	-0.038	0.047	-0.806	0.479
NMBEROFLIVSTKOWND	-0.019	0.022	-0.171	0.438
Infrastructure	-0.149	0.077	-1.940	0.148
	ANOVA: SS = 0.945; df = 19; MS = 0.050; F-value = 13.349; Sig. = 0.027			
	Model summary: R = 0.994; R^2 = 0.988; Adjusted R^2 = 0.914			

Parameter	Estimated coefficients	Standard error	t-statistics	Significance
Constant	-1.825	0.916	-1.992	0.064***
Age	0.009	0.004	0.328	0.034**
Gender	-0.035	0.124	-0.280	0.783
Marital status	0.013	0.122	0.106	0.917
Education	0.139	0.076	1.814	0.089***
Household size	0.077	0.017	4.549	0.000*
IndividualsY	-0.019	0.033	-0.577	0.572
HHAveY	-8.862	0.000	-1.339	0.199
Garden size	-0.049	0.153	-0.320	0.753
RFRGRWCRPGADN	-0.106	0.058	-1.839	0.085***
Field size	-0.039	0.041	-0.949	0.357
SOWTERFRCROPS	0.088	0.055	1.583	0.133
GovSupport	0.062	0.083	0.749	0.465
Sources of water	0.205	0.051	4.038	0.001*
Distance	-0.023	0.011	-2.092	0.053**
Assets	0.020	0.072	0.274	0.778
NMBEROFLIVSTKOWND	0.012	0.025	0.458	0.653
	ANOVA: SS = 2.249; df = 16; MS = 0.141; F-value = 4.708; Sig. = 0.002			
	Model summary: R = 0.908; R^2 = 0.825; Adjusted R^2 = 0.650			

Parameter	Estimated coefficients	Standard error	t-statistics	Significance
Constant	1.056	0.975	1.082	0.296
Age	-0.003	0.004	-0.758	0.460
Gender	0.020	0.118	0.169	0.868
Marital status	-0.052	0.117	-0.445	0.663
Education	0.002	0.080	0.022	0.983
Household size	-0.001	0.024	-0.031	0.975
IndividualsY	-0.010	0.032	-0.328	0.748
HHAveY	5.937	0.000	0.893	0.386
Garden size	0.325	0.147	2.220	0.042**
RFRGRWCRPGADN	-0.059	0.060	-0.979	0.343
Field size	0.012	0.040	0.305	0.764
SOWTERFRCROPS	-0.035	0.057	-0.609	0.551
GovSupport	0.034	0.081	0.419	0.681
Sources of water	-0.063	0.069	-0.922	0.371
Distance	-0.002	0.012	-0.155	0.879
Assets	0.020	0.069	0.285	0.780
NMBEROFLIVSTKOWND	-0.020	0.024	-0.818	0.426
	ANOVA: SS = 0.075; df = 17; MS = 0.044; F-value; 1.628; Sig. = 0.174			
	Model summary: R = 0.805; R^2 = 0.648; Adjusted R^2 = 0.250			

Conclusion

- Sample rural households are resource-dependent, poor and less developed
- There is lack of human capital
- Poor ownership of valuable resources
- They are vulnerable to climate change
- Empirical results were consistent with descriptive results
- Reliability of income and reliability of water were good indicators of vulnerability to climate change
- This understanding is expected to inform future planning

End of the presentation

Thank You