UNIVERSITY OF BOTSWANA

Farmers and the eccentric weather: how they adapt to and mitigate climate change and variability in the Okavango Delta of Botswana

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Presentation outline

- The problem
- Objectives of the study
- Hypotheses of the study
- Methodology
- Major findings
- Conclusions and policy implications

The problem

- Traditional African cultures partly comprises an institution of 'rainmakers'
- Forecasting is based on skillful and deep art of observing the nature
- Local knowledge is often passed from one generation to another
- Accuracy of local weather forecasting
- Modernisation is now perceived as contributing to the erosion of local knowledge systems
- Africa's smallholder farmers are now overwhelmed by the scenario of climate change and variability.

Specific objectives

The specific objectives are to:

- analyze the demographic and socio-economic characteristics of farmers and scientists in the Okavango Delta of Botswana;
- identify and analyze how farmers negotiate scientific weather information;
- analyze farmers' knowledge of weather forecasting and how they mitigate climate variability;
- analyze farmers and scientists' perceptions about the nature of local and scientific weather knowledge;
- analyze how farmers produce local knowledge in weather forecasting
- determine the extent to which climate variability has affected agricultural production over the past ten years;
- identify local approaches used amongst Botswana small farmers in adapting to climate variability and change; and
- determine the extent to which farmers are guided in their decision-making by personal experience from the past and indigenous and scientific seasonal weather forecasts

Hypotheses of the paper

Hypotheses are stated in the null form viz:

- There is no significant relationship between socio-economic attributes of farmers and their perceptions about the nature of local and western knowledge in weather forecasting
- There is no significant relationship between farmers' knowledge of weather forecasting and their perceptions about the nature of local and western knowledge in weather forecasting
- There is no significant relationship between farmers' decision on farming practices and their perceptions about the nature of local and western knowledge in weather forecasting

Methodology

- Agriculture-related weather variables were analysed
- The utility of seasonal hydrological forecasting system [in relation to farmers' need] in the study area was assessed
- We used a multi-stage sampling procedure to select 592 farming households from 8 communities
- Correlation and regression analysis was used in testing the relationships between variables
- FGDs and key informant interviews were used in generating qualitative data

Methodology cont'd

- Study area map

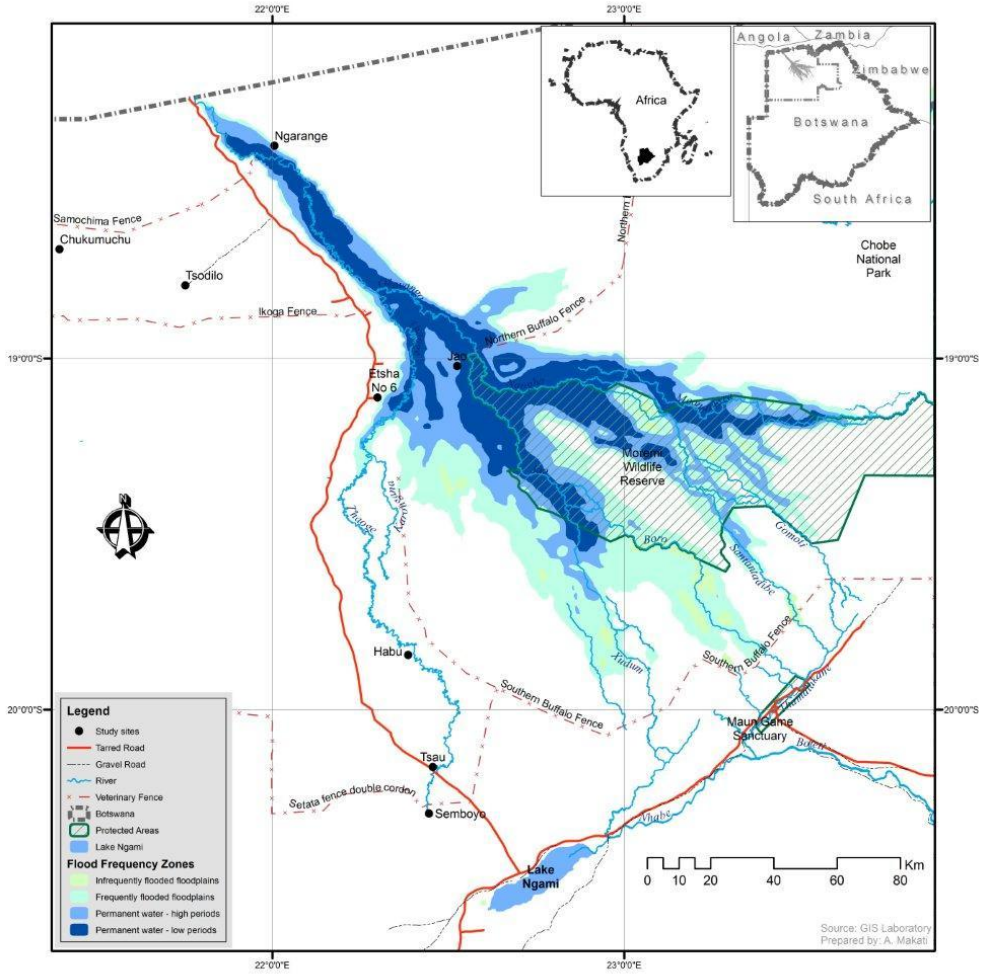


Table 1: Villages and total number of households sampled

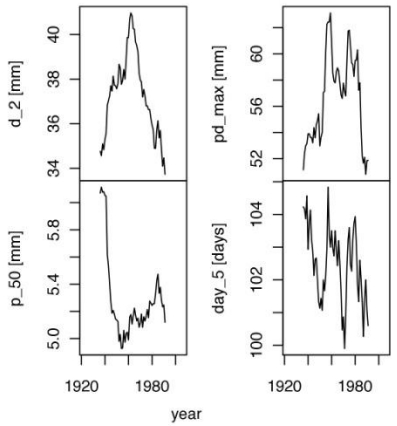
Village	Total number of households (HHs)	25-30% of HHs sampled
Semboyo	118	30
Habu	161	40
Tsau	494	124
Etsha 6	821	221
Jao	63	19
Ngarange	332	95
Tsodilo	78	23
Chukumuchu	128	40
Total	**2195**	**592**

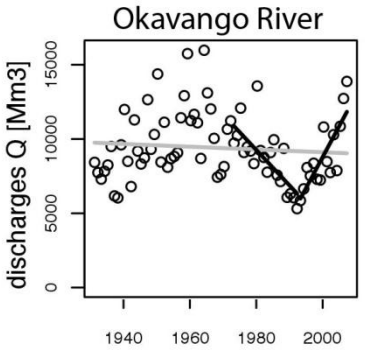
A key informant interview section AT Etsha 6 community

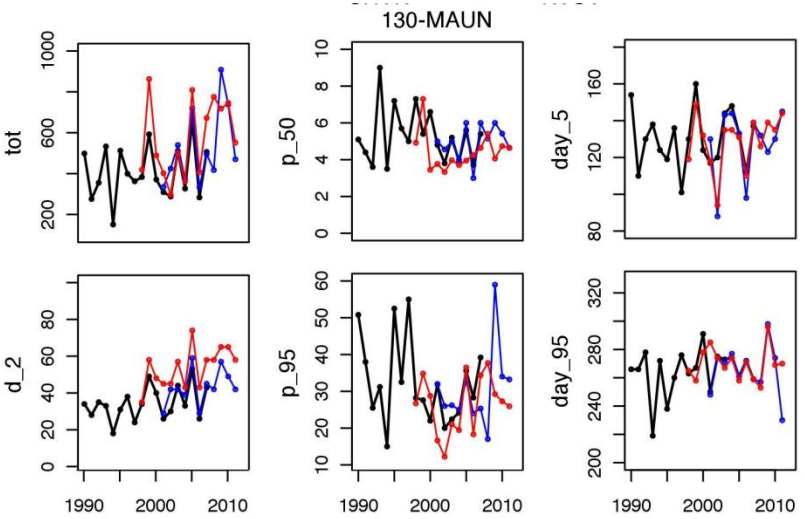
A key informant interview section at Jao community

Climate and hydrological variability

- ✓ assessment hampered by lack of ground measurements (also problems with data access)
- ✓ considerable work on making RS-based datasets work for us
- ✓ results:
  - ✓ considerable interannual variability in rainfall, with multidecadal component
  - ✓ magnified by hydrological processes
  - ✓ increase in total rainfall and number of rain days but not in other rainfall indices in recent years

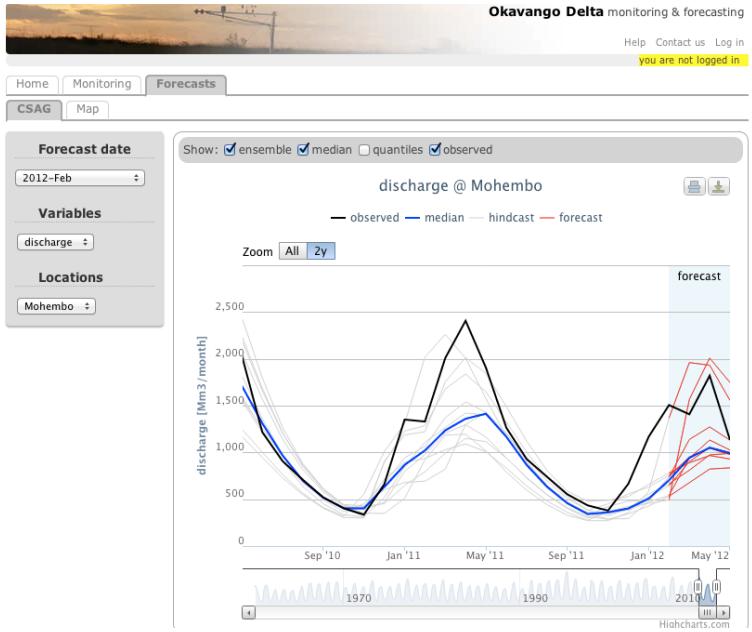


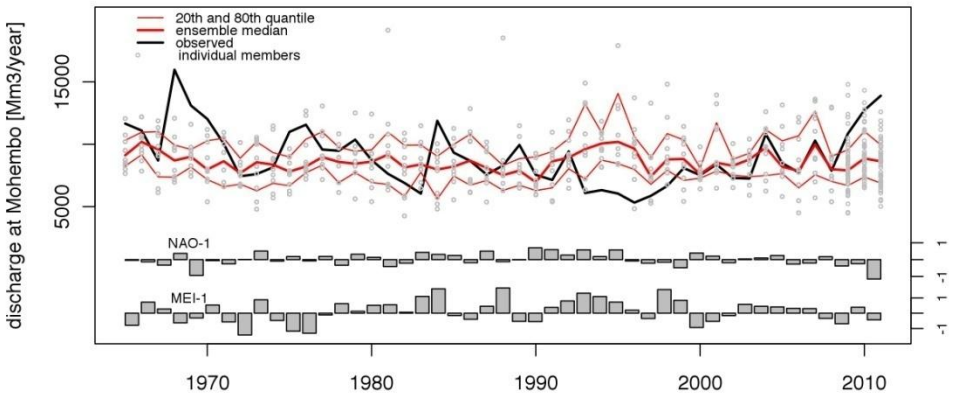




Hydrological forecasting

- ✓ importance of interannual hydrological variability in the Okavango Delta
- ✓ seasonal hydrological forecast based on ensemble seasonal climate forecast using HadAM3P
- ✓ published regularly on a website
- ✓ at this stage, skill not satisfactory – high floods of recent years not captured – thus results are difficult to pass to users
- ✓ work continues within associated projects to improve skill, and define conditions of applicability

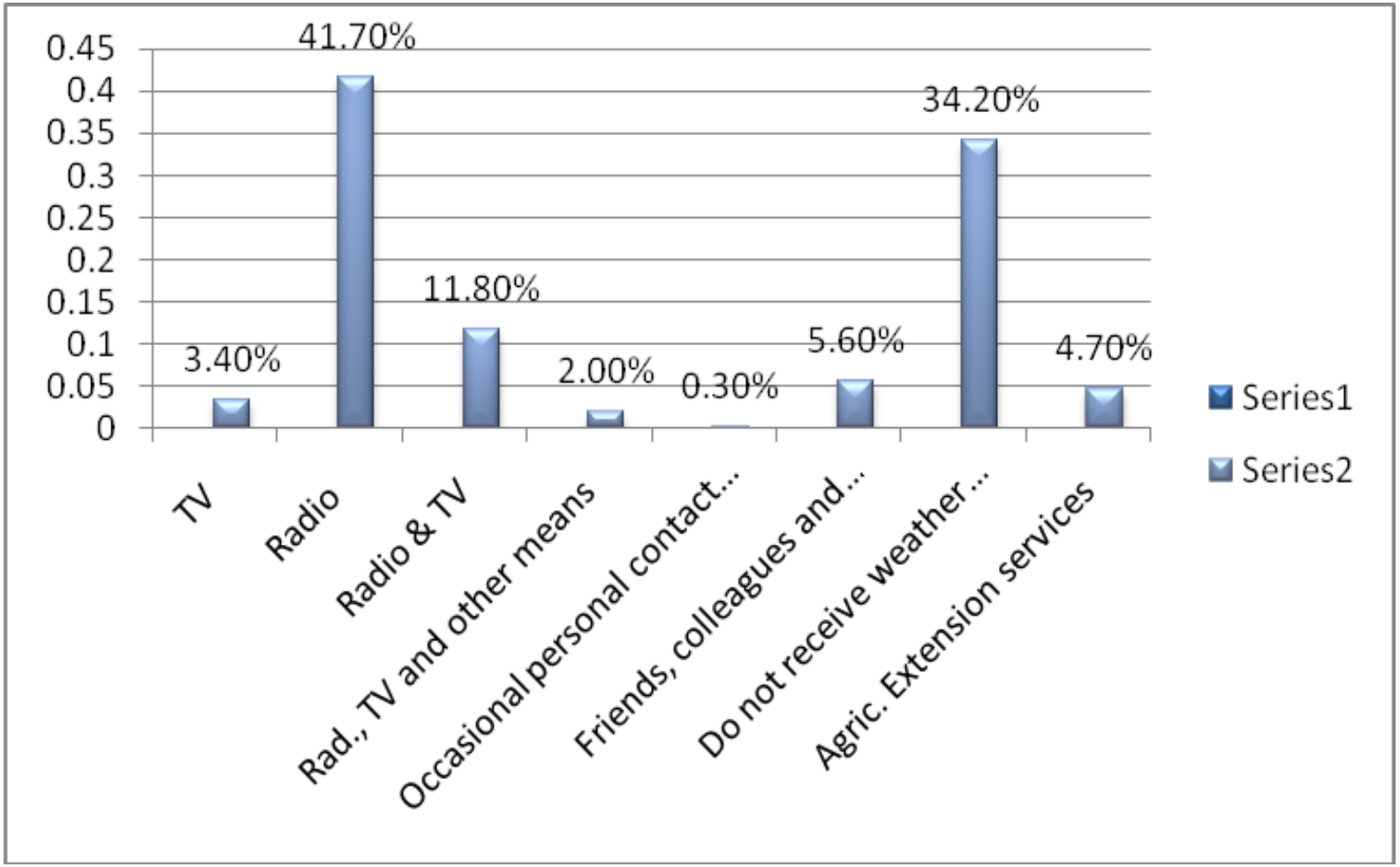




Demographic/socio-economic and psychosocial attributes of farmers and scientists

- ✓ Gender: farmers (male = 36%; female = 64%); scientists (male = 55.6%; female = 44.4%)
- ✓ Average age: farmers (56 years); scientists (46 years)
- ✓ Average income/month: farmers (BWP620.02); scientists (BWP10,686.00)
- ✓ Average household size of farmers: 4 members
- ✓ Radio is the only major medium through which farmers received weather information
- ✓ Majority of them did not use information from weather station because they do not have access or contact with DMS officers
- ✓ Average score of farmers' knowledge level : 3.58 ± 0.81
- ✓ Perception on the nature of both knowledge systems: Farmers' average (3.86 ± 0.58); Scientists' (1.96 ± 0.56)
- ✓ Farmers (75.8%) felt that persistent fluctuations in weather conditions had impacted negatively on farm yield over the last 10 years

Channels through which farmers receive weather information



Farmers' level of weather forecasting knowledge

Farmers knowledge level	Frequency	%
1.00 – 2.77 (**Low**)	99	16.7
2.78 – 4.38 (**Moderate**)	392	66.2
4.39 – 5.00 (**High**)	101	17.1
Total	**592**	**100.0**

Source: Field survey, 2011-2012

How they read the weather and mitigate climate change

- Farmers use natural indicators such as wind, cloud, stars, frogs, birds, movement of animals, etc. to forecast the weather
- They consult traditional herbalists (Dingaka) to get weather information
- They do crop selection and plant drought resistant varieties of sorghum and beans during dry spell
- They seek the advice of local custodians/chiefs (Dikgosi) about which crops to plants in a particular season

Correlation and regression analyses showing the relationship between farmers' attributes and their perceptions about the nature of local and western knowledge in weather forecasting

Variable	'r' value	Co-efficient of determination (r^2)	b	T- value
Age	0.209**	0.043	0.050	2.321**
Education level	-0.109*	0.012	0.133	1.548*
Number of years engaged in farming	0.105**	0.011	0.069	0.372
Household monthly income	-0.011	0.000	0.000	-1.578
Household size	-0.011	0.000	0.043	0.680
Source(s) of indigenous weather information	0.177**	0.031	0.720	2.333**
Knowledge of weather forecasting	0.392**	0.154	0.167	6.114***
Farmer's decision on farming practices	-0.464**	0.215	-0.337	-8.594***

Source: Field survey, 2011-2012

** Test statistic significant at $P \leq 0.01$ level
** Test statistic significant at $P \leq 0.05$ level
* Test statistic significant at $P \leq 0.10$ level
$R^2 = 0.303$
$R = 0.550$
Adjusted $R^2 = 0.288$

Conclusions and policy implication

- Age, education level, number of years engaged in farming, sources of weather information, knowledge of weather forecasting and farmer's decision on farming practices had significant correlation with the dependent variable 'Y'

- While the average score for the farmers in relation to their perception on the nature of local and scientific knowledge was 3.86, that of the weather scientists was 1.96.

- There is need to address the yearnings of farmers to work closely with scientists in the production of weather forecasting knowledge

- There is need to constitute a joint evaluation committee to assess local and scientific forecasts in relation to their effectiveness and use amongst farmers

Conclusions and policy implication

- Both farmers and scientists need to work together with a view to coming up with a common working tool; common indicators
- Contact workshops, public lectures and mass media: the right platforms for weather knowledge sharing
- Provision of advisory service
- Setting up of experimental stations, where scientists and farmers could work together to either filter, validate or foster both knowledge systems, particularly local weather knowledge – it is considered worthwhile to design a local experimental mode

Arriving from Jao Island

We passed through small channels...

We passed through smaller channels...

We were also on the 'lagoon': big channels...

Acknowledgements

We would like to thank START and the US National Science Foundation (NSF) for awarding us the 2011 Grants for Global Environmental Change Research in Africa.

Thank you

We are striving to

build capacity to put

Botswana on the map

through rigorous

scientific endeavours

and the application of

science to the

problems of humanity

THANKYOU..