National Agricultural Marketing Council

Strategic positioning of South African agriculture in dynamic global markets

Farmers' perceptions on climate change & use of weather forecasts in farm decision making: *The case of Makhathini Flats Cotton Farmers*

6th International Conference on Climate: Impacts & Responses

Reykjavik, Iceland
28 June 2014

Authors: Mr. Sifiso Ntombela & Dr Thula Mkhabela

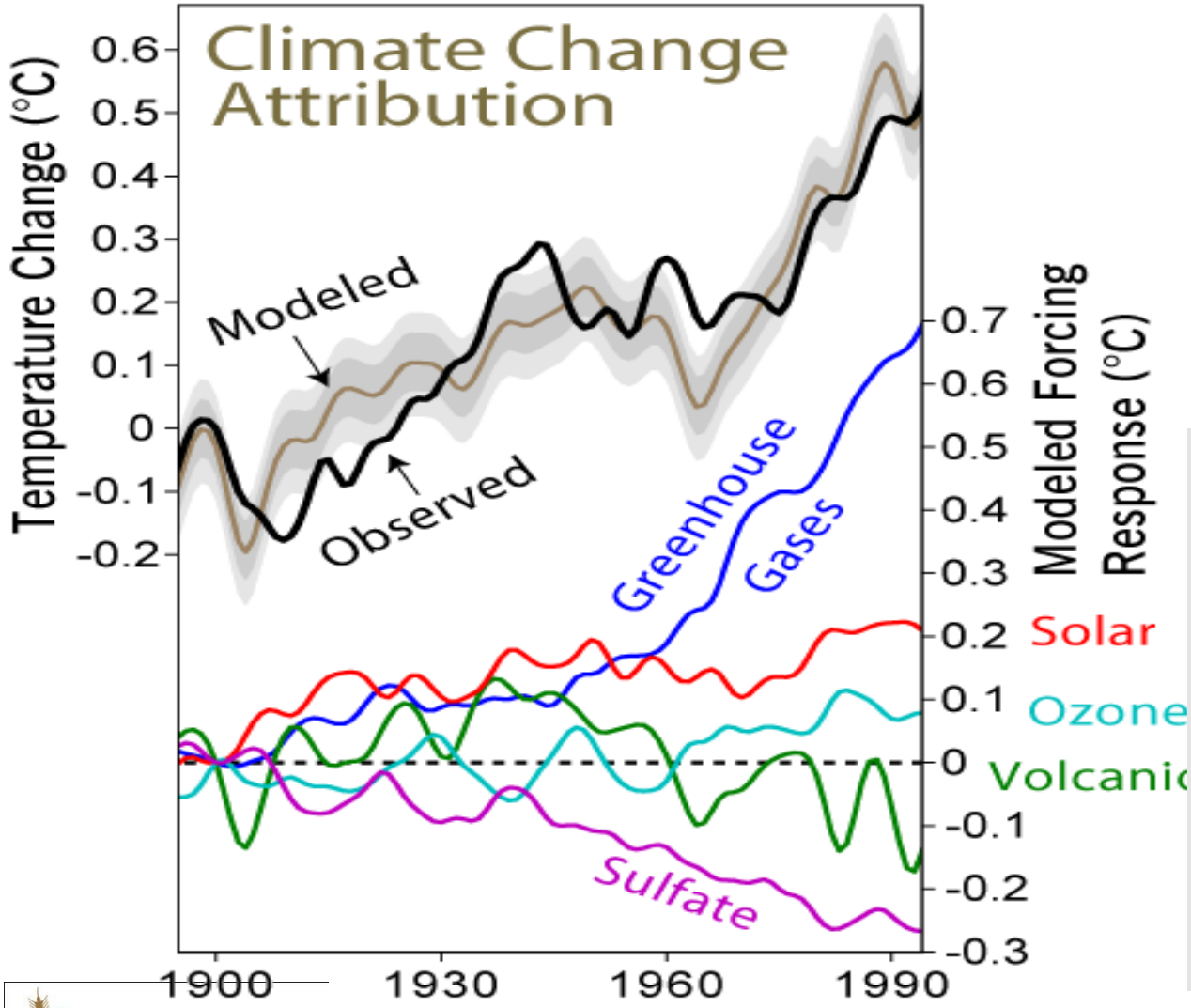
Presentation outline

1. Background on Climate Change
2. Problem Statement & Research Question
3. Study Objectives & Its Contribution
4. Study Area & Methodology
5. Results & Discussions
6. Conclusion & Recommendations

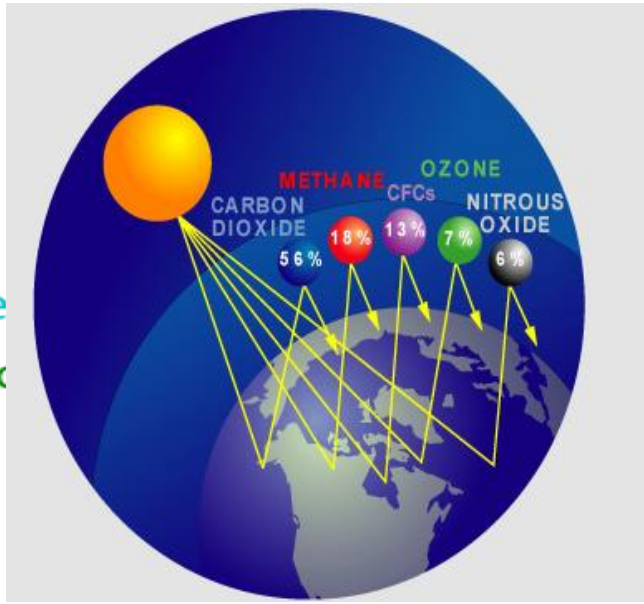
Background on Climate Change

- Evolved significantly last 25 yrs ~~~IPCC
- Gaining scientific & political momentum – UNFCC multilateral negotiations ~~~Kyoto Protocol
- Causes ~ natural & anthropogenic emissions
- Recent projections
  - Between 1861 – 2000 = 0.6°C annual average increases
  - Additional 1.4 to 5.8°C between 1990 and 2100 unless GHGs >550ppm
- Varying impacts across the world:
  - Regional ~~~ to be worse in Africa
  - Economically~~~5% of global GDP each year & could rise to 20% of GDP
  - Sectoral~~ ~agriculture in developing nations highly vulnerable
- Solution – mitigation & adaptation
  - Climate Policies – BTAs, PCFs and Carbon Market
- Many complex interdependent factors ~~~ view climate change scientific evidence as tentative projections open for modification wit new evidence

Causes and Projections



Post industrialization anthropogenic GHG emissions higher than Natural emissions



Fundamental Definitions

- **Weather** is a condition of the air or atmosphere at a particular space and time. Weather is usually measured in terms of wind, temperature, humidity, atmospheric pressure, precipitation, cloudiness and atmospheric pressure. **Weather Change** refers to shifts in atmospheric conditions

- **Climate** is the average weather in a given location over a long period of time. **Climate Change** refers to shifts in the climate (i.e. average weather) and this involves significant and relatively permanent changes of average weather in a geographical location.

- **Global Warming** is a scientific term referring to rising annual temperature of the air on the earth's surface over a long period.

Problem Statement & Research Question

- Recent projection warns of productivity decline & enhanced food insecurity
- SA agriculture (esp. subsistence) highly vulnerable
- Farmers' limited understanding on climate change and its potential impact
- Farmers not using climate forecast in decision making, **why?**

Therefore, research question: ***What factors influence farmers' perceptions on climate change and use of weather forecasts in farm decision making process?***

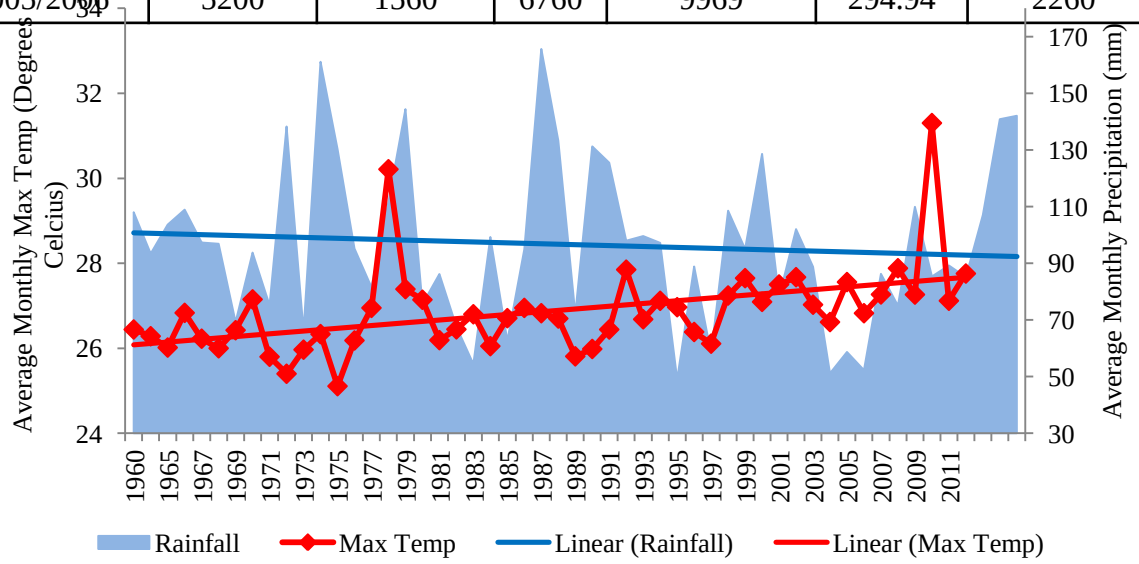
Study Objectives & Contribution

- Examine the level or degree to which cotton farmers in the Makhathini Flats integrate weather forecasts into farm decision making process
- Understand farmers' perceptions on climate change and its impact on agriculture

- **Therefore** study contribute to the understanding of factors that constrains farmers' ability to use weather forecasts optimally

Study Area

Seasons	Dry Land (Ha)	Irrigation (Ha)	Total	Production (Bales = 200kg)	Yields (Kg/Ha)	Estimated No. of Small Scale Farmers
2012/2013	1837	200	2037	4545	446.24	547
2011/2012	970	0	970	686	141.44	260
2010/2011	490	0	490	397	162.04	200
2009/2010	400	0	400	518	259.00	210
2008/2009	1200	0	1200	1470	245.00	750
2007/2008	860	440	1300	2744	422.15	2260
2006/2007	1900	1030	2930	6624	452.15	853
2005/2006	5200	1560	6760	9969	294.94	2260



National Agricultural Marketing Council

Strategic positioning of South African agriculture in dynamic global markets

Methodology

- Data collection ~~~Likert Scale questionnaire
  - Have advantages when measuring people's attitudes(i) it is relatively easy to analyze data (ii) Likert Scale questions use scales, therefore people are not forced to express either/or opinions.
- A Rank-Sum Test approach used to determine statistical significance of differences from respondents. Kruskal-Wallis-H Test" was chosen to determine the statically significance.

$$H = \left[\frac{12}{N(N+1)} * \sum \frac{Tc^2}{n_c}\right] - 3 * (N+1)$$

Where N is the total number of participants and T_c is a Rank total. The Chi-Square table used to determine the significance level.

- Simple descriptive analysis used to analyses perceptions

Results & Discussions

No School - Grade 0		Primary - Grade 1-7		Secondary - Grade 8-12	
Actual Grade	Rating	Actual Grade	Rating	Actual Grade	Rating
0	1 (4)	4	3 (16.5)	11	5 (24.5)
0	1 (4)	5	3 (16.5)	12	5 (24.5)
0	1 (4)	1	2 (10.5)	8	4 (21)
0	1 (4)	2	2 (10.5)	10	4 (21)
0	1 (4)	1	2 (10.5)	11	5 (24.5)
0	1 (4)	7	3 (16.5)	10	5 (24.5)
0	1 (4)	4	3 (16.5)	9	4 (21)
		3	2 (10.5)		
		5	3 (16.5)		
		2	2 (10.5)		
		3	2 (10.5)		
		7	3 (16.5)		
Mean Rating	**1**	**4**	**3**	**10**	**5**
Mean Rank	**4**		**13.5**		**23.4**
Sum of Ranks (Tc)	**28.00**		**162.00**		**161.00**
Note	**Scale: Grade 0 = 1; Grade 1-3 = 2; Grade 4-7 = 3; Grade 8-10 = 4 & Grade 11-12 = 5**				

Descriptive analysis reveals 3 educational levels In Makhathini Flats i.e. never attended school – 27%, primary education - 46%, and secondary education - 27%.

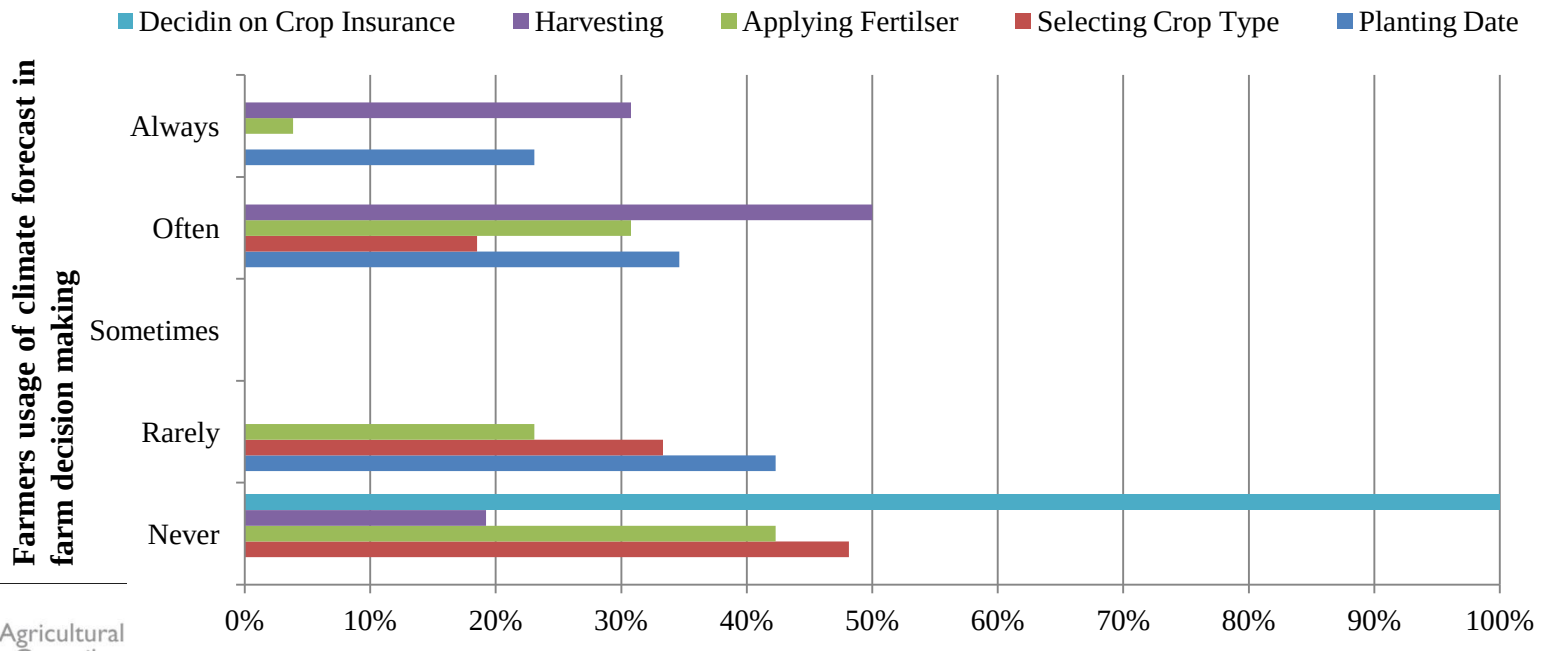
H = 21.59 & df = 3 -1= 2

	P vlaues										
DF	**0.995**	**0.975**	**0.20**	**0.10**	**0.05**	**0.025**	**0.02**	**0.01**	**0.005**	**0.002**	**0.001**
1	0.0000393	0.000982	1.642	2.706	3.841	5.024	5.412	6.635	7.879	9.550	10.828
2	0.0100	0.0506	3.219	4.605	5.991	7.378	7.824	9.210	10.597	12.429	13.816
3	0.0717	0.216	4.642	6.251	7.815	9.348	9.837	11.345	12.838	14.796	16.266
4	0.207	0.484	5.989	7.779	9.488	11.143	11.668	13.277	14.860	16.924	18.467

Large H value at p = 0.001 indicates a strong statistical significance which means that the probability of H value to be calculated by chance is less than 1%. Therefore education levels is one of the factors that influence farmers perceptions and use of weather forecasts in decision making.

Results & Discussions: Cont…

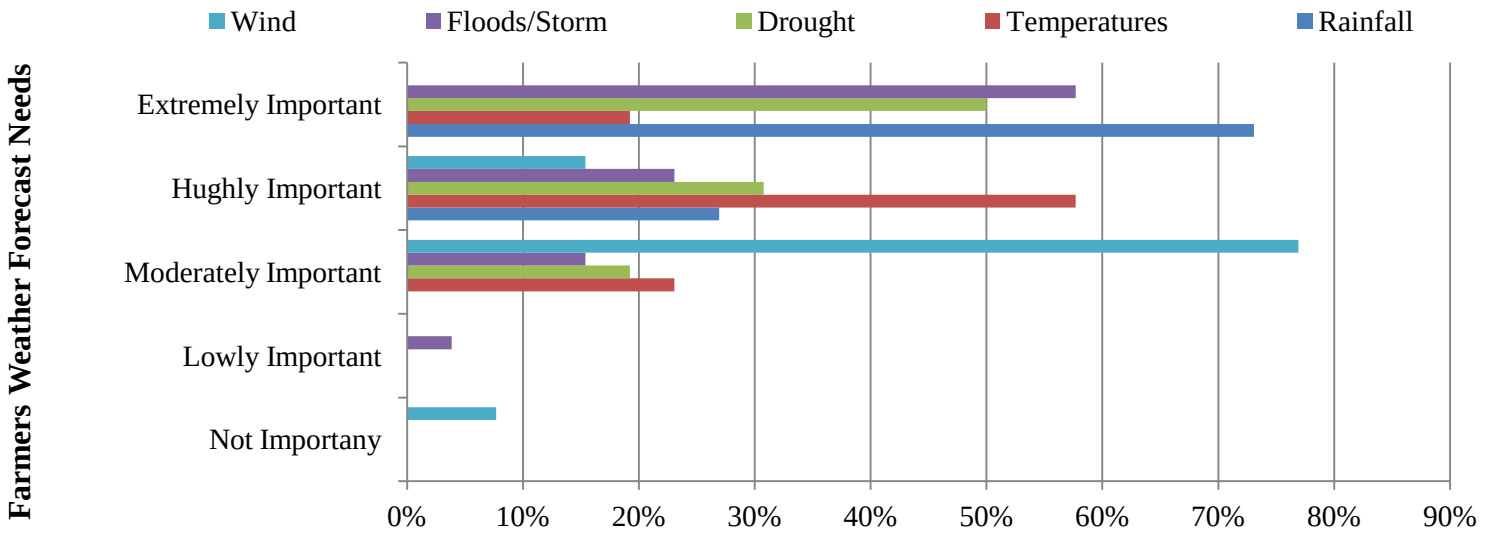
Farmers' knowledge of Climate Change				Perceived Impact of Climate Change on Agriculture			
	Scale	**No**	**%**		**Scale**	**No**	**%**
I do not understand	1	0	0%	Extreme negative impact	1	8	31%
I understand poorly	2	11	42%	Partial negative impact	2	15	58%
I understand fairly	3	11	42%	No impact	3	2	8%
I understand well	4	4	15%	Partial positive impact	4	1	4%
I understand completely	5	0	0%	Extreme positive impact	5	0	0%
		26	**100%**			**26**	**100%**

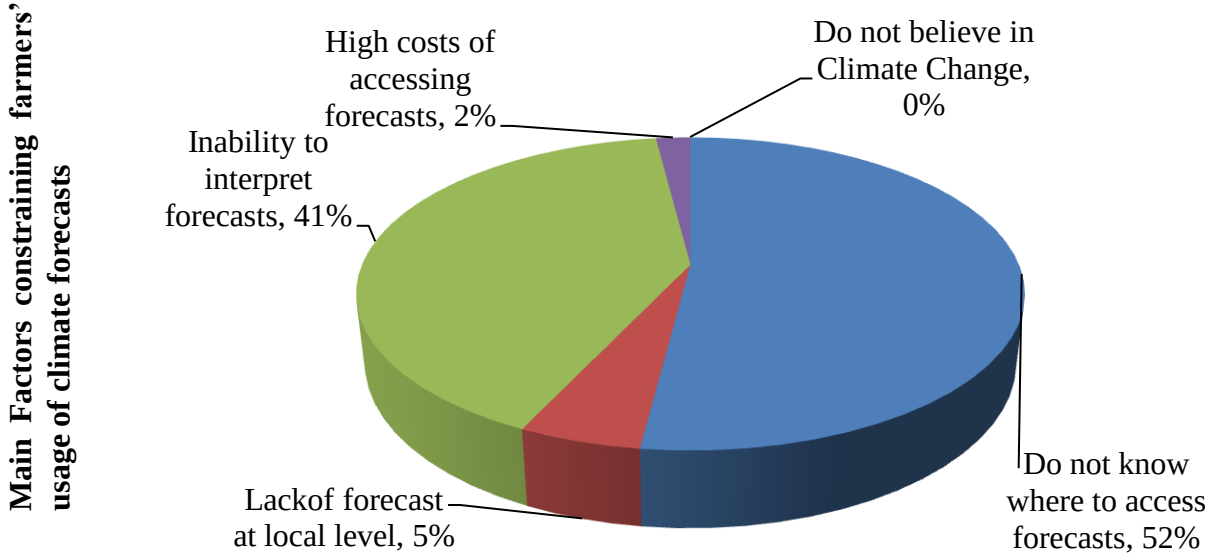


National Agricultural Marketing Council

Strategic positioning of South African agriculture in dynamic global markets

Results & Discussions: Cont…





National Agricultural Marketing Council
Strategic positioning of South African agriculture in dynamic global markets

Conclusion

- The Kruskal-Wallis H test revealed farmers with different educational levels have different perceptions on climate change.
- Farmers were aware of rising temperatures and declining precipitation.
- Farmers' use of weather forecast is very limited.
- Lack of access to reliable and downscaled weather forecast a key constrain.
- Inability to interpret forecast and climate change scientific information another constrain factors to farmers usage of forecasts in decision making process.

Policy Recommendations

Based on the analysis, this paper recommends following policy interventions:

- Producer educational campaigns to increase awareness and importance of using forecast in making strategic decisions;
- Investments in generating reliable and accurate weather forecast at district level
- Encourage farmers to attend adult-based education and training (ABET) as this would better equip them to cope with threats and risks associated with climate change and variability.