Cooperation in the commons? Evidence from a cross-cultural field experiment on common-pool resource management

Sebastian Prediger (1), Bjørn Vollan and Markus Frölich (2)

(1) **University of Marburg**; Department of Economics; Institute for Co-operation in developing Countries; Am Plan 2, D-35037 Marburg, Germany.

(2) **University of Mannheim**; Department of Economics; Chair of Econometrics; L7,3-5, D-68131 Mannheim, Germany.

Source: Vollan

Common-pool resources

- Resources characterized by rivalry in consumption and costly exclusion of other users (e.g.pastures, water, community forests, biodiversity)

- **Proposition for many decades**: The conflict between indiviudal and common interest will lead to resource degradation (Hardin, 1968)

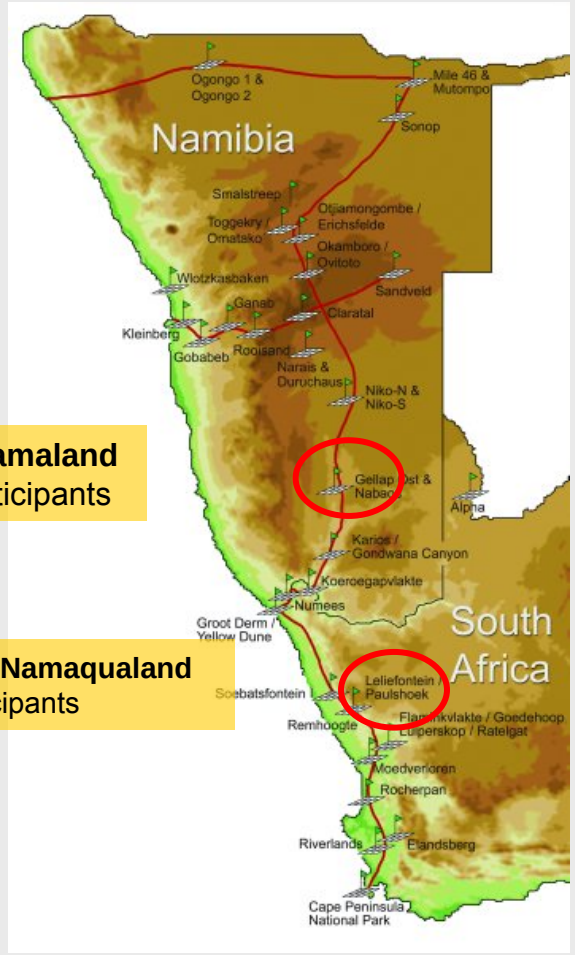
- But Ostrom (Nobel prize 2009) has demonstrated that sustainable management of CPR is possible
  - Depending on (evolved) **norms of cooperation** shared by the resource users
  - ‚informal' rules (often unobserved by politicians)

- CBNRM initiatives partly base on these ideas

Research Questions

- Are norms of cooperation present in the study areas?
- Is there a cross-cultural difference between the Nama in Namibia and South Africa, as results from earlier experiments suggest?
- Are there rules (institutions) which can increase economic and ecological performance?
- What rules do resource users implement, and why?
- What makes people follow rules (not presented here) ?

Subjects‘ economic background



Berseba in Namaland
(NAM): 60 participants

Leliefontein in Namaqualand
(RSA): 60 participants

Communal areas

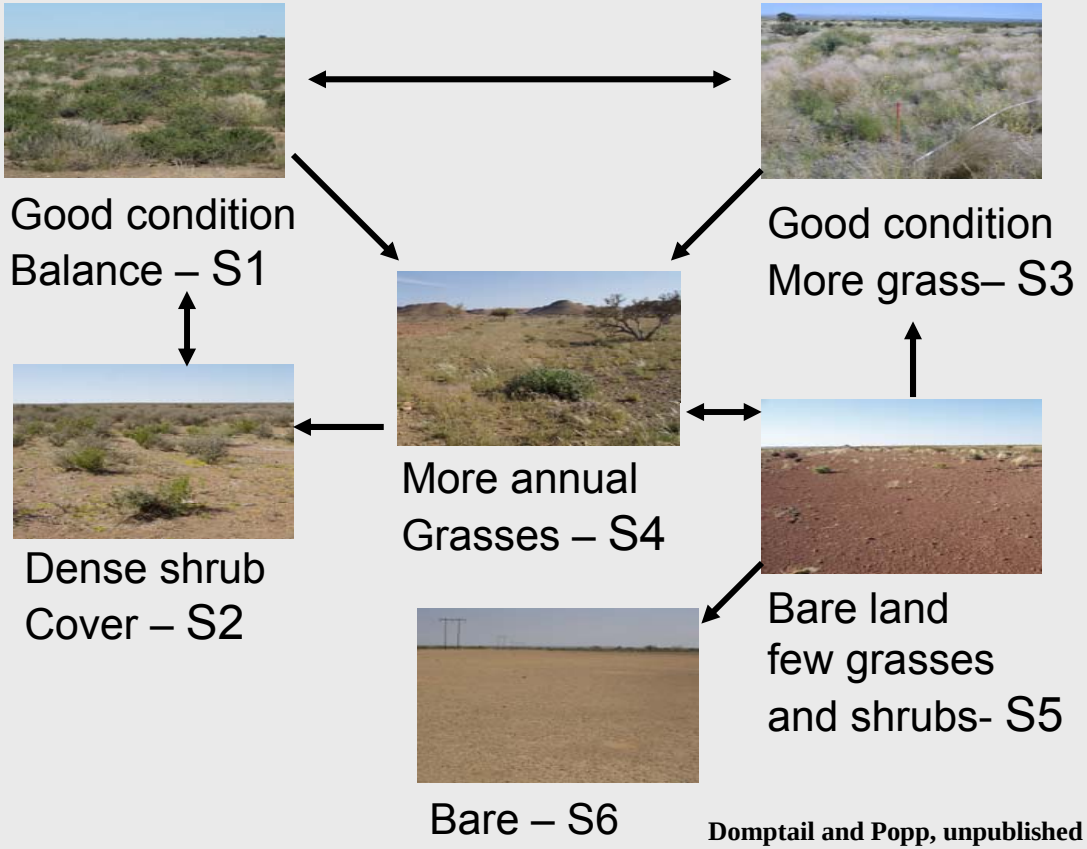
- Both study areas mainly populated by the Nama people
- Small stock herding on subsistence level
- Livestock is kept on commonly used pastures
- High unemployment
- High pressure on resource base (risk of degradation)

Ecological Motivation: State and transition model

Vegetation ecological modeling

Transition probabilities depend on:

- **Rainfall**
- **Stocking rate**
- **Breed**



Domptail and Popp, unpublished

- Strong evidence that many parts of our study areas switched into a different ecological state

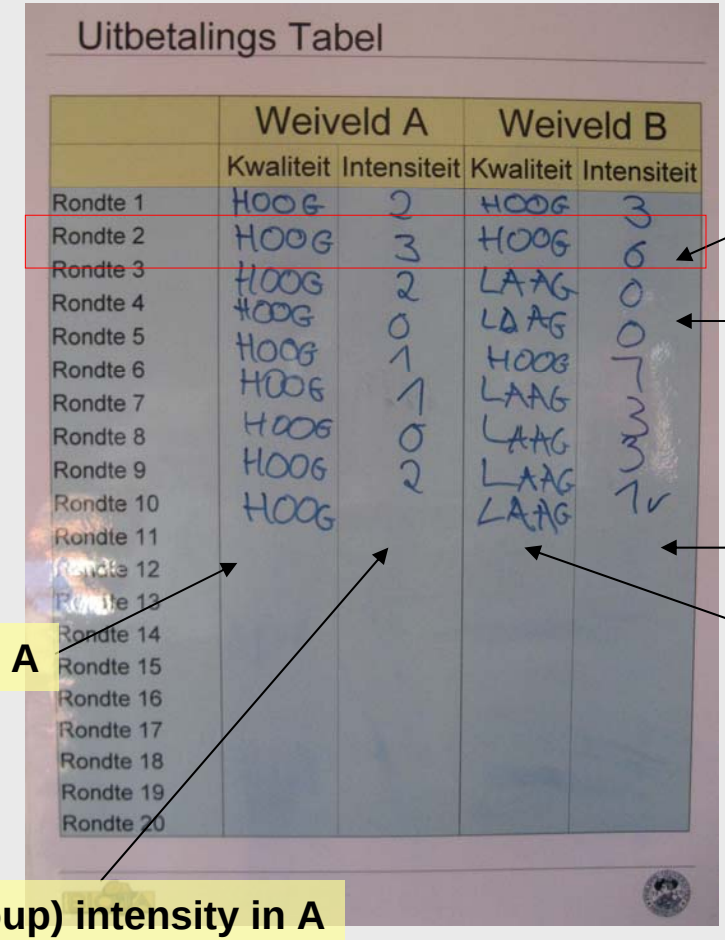
Experimental design of the Grazing Game

- **5 Players** per session
- Each session lasts for **20** rounds (round = grazing season)
- Players choose one of **two grazing areas [A or B]** …
- … and chose the farming **intensity [0, 1, or 2]** in each round

The **earnings** depend on the **chosen intensity** AND the **resource condition** of the chosen location

Intensity / *Condition*	Earnings		
	0	**1**	**2**
GOOD	0	7	8
BAD	0	**2**	**3**

- The grazing condition depends on the group intensity in the previous round: If **group intensity >4** unit → **Degradation**!



Degradation (Group intensity > 4)

Recovery (intensity ≤ 1 for 2consecutive rounds)

Total intensity in B

Quality in B

Quality in A

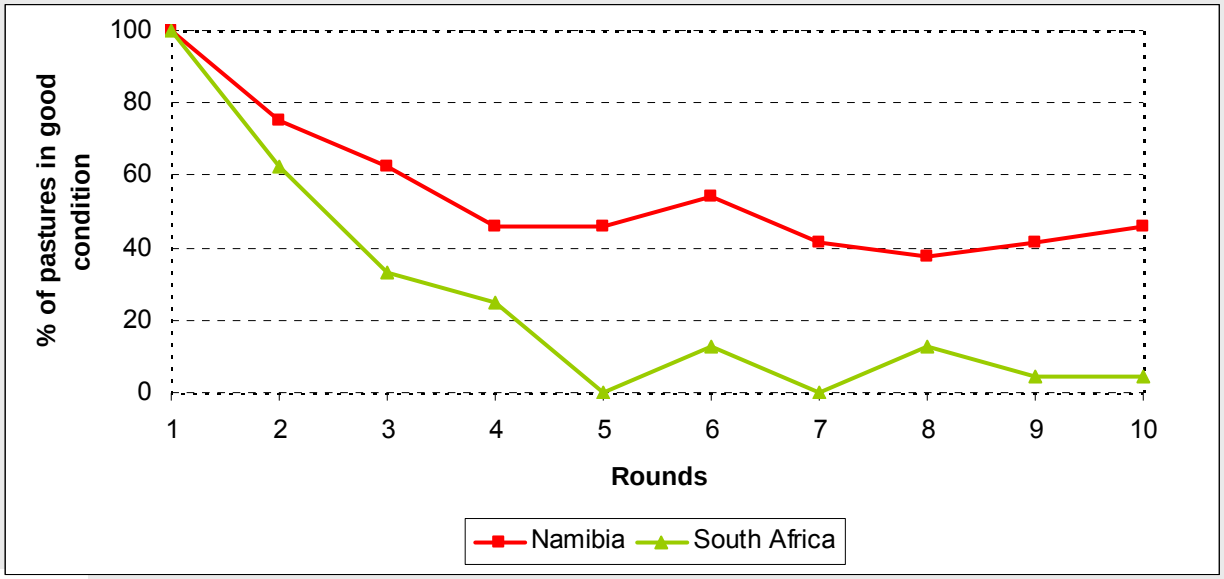
Total (group) intensity in A

- Group intensity determines grazing quality in next round
- Recovery is possible, but requires low group intensities (max. 1) for 2 successive rounds

Co-operation problem: Every player has an incentive to choose highest intensity which will lead to degradation and thus lower earnings

No rules (Rounds 1-10)

- Substantial difference between Namibia and RSA
- In RSA the groups got stuck into a situation where both grazing areas were bad
- In RSA, none of the groups could manage to recover back to HH
- In Namibia a higher share of the land is maintained in a good condition (42% vs 4% for RSA)
- RSA same results as in Thailand and Colombia



- Analysis of behaviour under different resource scenarios reveals that Namibians have a much higher propensity to cooperate
- Namibians apply significantly lower grazing intensities in all scenarios
- Namibians are significantly less frequently faced with resource degradation
- The country difference remains highly significant if we consider socio-demographic variables in a multivariate regression analysis (not shown)

	Resource abundance		**Spatial resource availability**		**Resource scarcity**	
	Mean Intensity	Obs	Mean Intensity	Obs	Mean Intensity	Obs
RSA	**1.64**	**80**	**1.49**	**145**	**1.28**	**375**
NAM	**1.30**	**175**	**0.86**	**310**	**0.70**	**115**
Difference	0.34		0.63		0.58	
p-value	>.000		>.000		>.000	

Historical differences as explanation

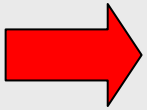
Different historical developments in both areas

Namaqualand (RSA):

- Colonization in 16th century
- Dispossession of land
- Abandonment of traditional lifestyle
- Strong western influence:
    - circulation of money
    - adoption of Afrikaans
- Maladministration and corruption
-‚Economic units‘ (Privatization)

Namaland (NAM):

- Colonization in 1884
- Nama Uprising
- Appropriation of their ancestral lands
- Only the Nama tribe in our study area could preserve its territory
- Could retain local institutions largely intact
- Managed by captaincy until independence



The relative strong western influence, corruption and the attempt to privatize the commons may have eroded norms of co-operation in RSA

The Rules tested

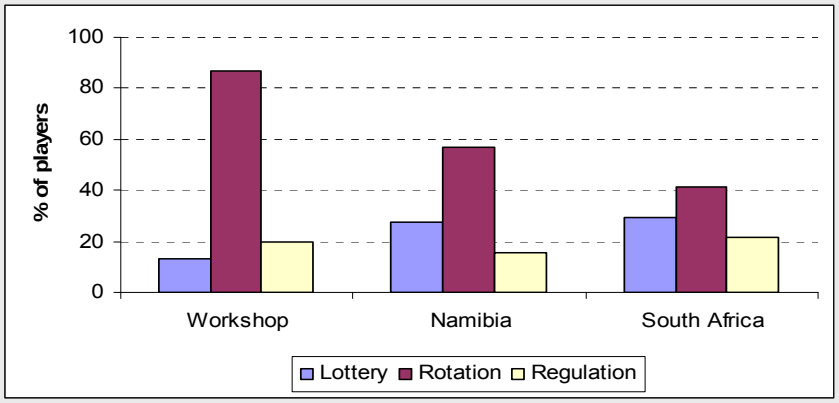
After round 10 a ‚community meeting' was held, players could choose one from 3 different rules which had to be implemented for the last 10 rounds

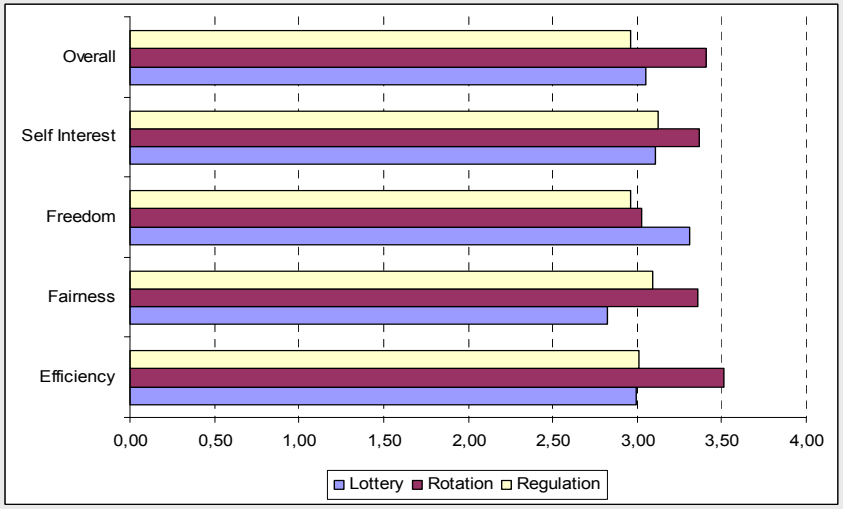
•**Rotation rule**: Each round one location is banned from grazing: A in rounds 11 and 12, B in rounds 13 and 14 etc. If a participant is caught grazing illegally the points need to be returned.

• **Regulation rule**: The indiviudal grazing intensity is limited to 1 unit per round. In case a participant is caught putting an intensity of two, the participant need to pay back the points.

•**Lottery rule**: Random determination of the location where each player has to graze in each round. When a participant graze in a location illegally, a throw of a six of the dice leads to paying back the points.

Voting Results (rule choice)





- Rotation is the preferred rule among all players.
- No difference whether farmer or not or being from Namibia or South Africa.
- Rotation is perceived as the ‘fairest’ and most ‘efficient’ rule.
- Rotation is seen as the rule which advances ‘self interest’ best by the players

Rule Efficiency

- Compared to Lottery, Rotation and Regulation significantly increase the number of good grazing areas available to the group

Number good grazing	Pooled	South Africa	Namibia
Lottery	-0.486	-0.018	-0.943**
	(0.340)	(0.331)	(0.442)
Rotation	-0.343	0.629**	-0.965**
	(0.328)	(0.311)	(0.377)
Regulation	0.427	1.429***	-0.147
	(0.358)	(0.287)	(0.363)
Cumulated until last round			
lag_group_mean_earn_cum	-0.013*	-0.017	-0.019*
	(0.007)	(0.013)	(0.010)
lag_stddev_earn_cum	-0.013	0.003	-0.009
	(0.009)	(0.014)	(0.009)
Last round			
lag_ord_graz_cat_h	0.524***	-0.250***	0.894***
	(0.127)	(0.086)	(0.113)
lag_ord_graz_cat_l	0.481***	0.358***	0.457***
	(0.097)	(0.107)	(0.135)
Round	0.093**	0.042	0.168***
	(0.039)	(0.061)	(0.050)
round_20	-0.427***	-0.136*	-0.620***
	(0.122)	(0.082)	(0.191)
Constant	0.048	0.205	-0.644***
	(0.288)	(0.237)	(0.239)
Observations	192	96	96
r2_o	0.489	0.705	0.462
r2_w	0.361	0.697	0.428
r2_b	0.663	0.726	0.523

Comparison to the first 10 rounds:

- Strong country difference!
- In South Africa Rotation and Regulation increase number of good grazing
- In contrast to Namibia, where non of the rules increased grazing availability
- Crowding out effect of intrinsic motivation to cooperate in Namibia

Summary

- Namibians reveal a much higher propensity to cooperate than their relatives from South Africa (due to historical differences)
- Our results provide evidence that social norms of cooperation are relatively strong in Namibia (but challenges)
- The majority of participants from both countries prefer the Rotation rule which is also recommended by extension officers
- Rotation is perceived as the rule which is most efficient, fairest and most likely to advance self-interest
- The implementation of rules, especially of Rotation and Regulation increases earnings and the grazing conditions in South Africa significantly (but negative effect in Namibia)
- Rule breaking can be substantially reduced if people are monitored regularly

Thank you very much for your attention!

Ecological differences as explanation

- **Leliefontain in Namaqualand (RSA):**

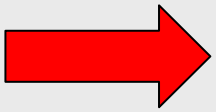
SUCCULENT KAROO

- Biodiversity hotspot
- Av. rainfall 150-400 mm
- Rains relatively predictable
- Droughts occur only seldomly

Namaland (NAM)

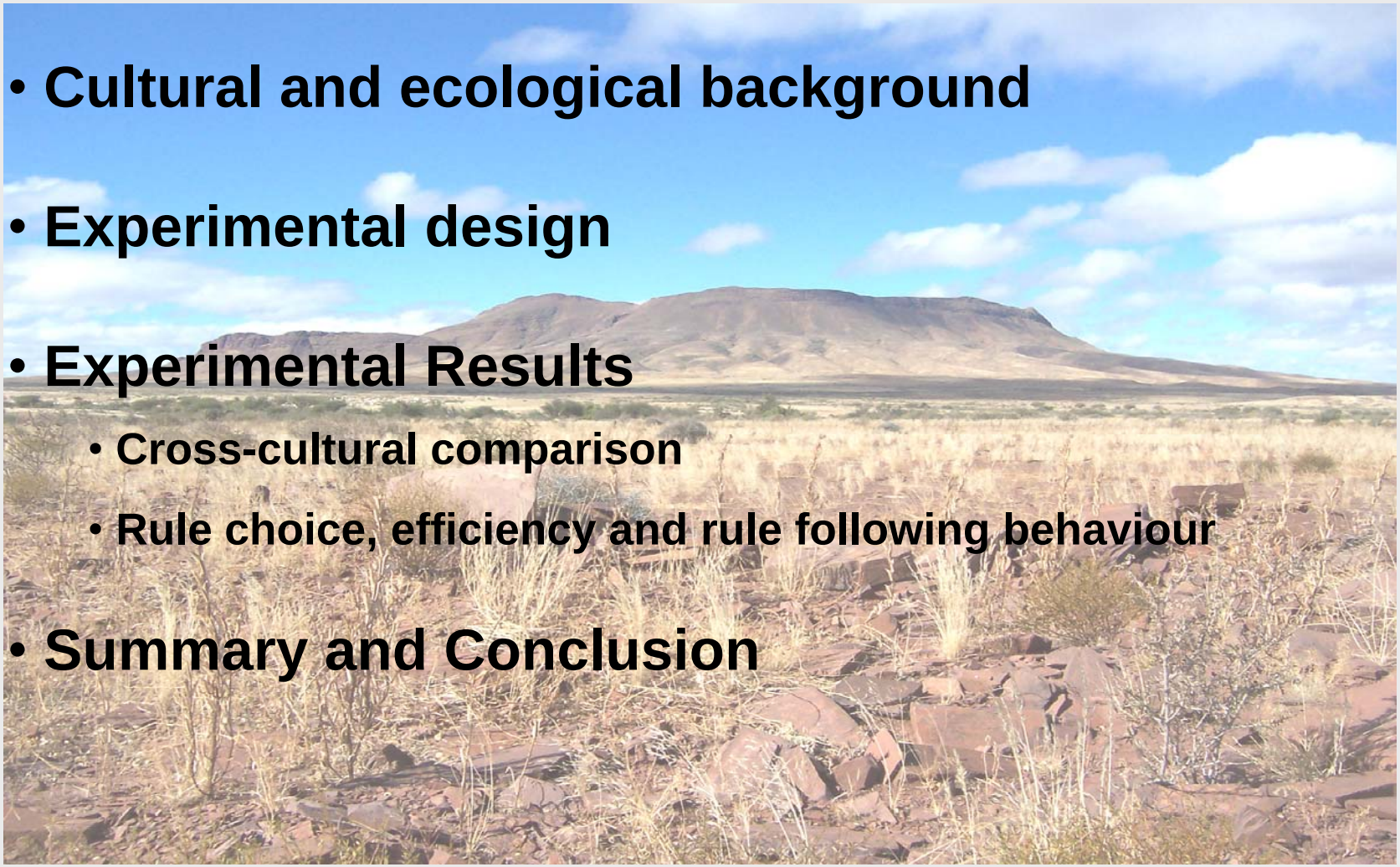
NAMA KAROO

- Av. rainfall 50-200mm
- Rainfall unpredictable, spatially variable and highly erratic
- More responisve to grazing
- Severe droughts are common



Namibians may have a good ecological knowledge and know that heavy overgrazing can make pastures useless for many years

Overview of the talk



- **Cultural and ecological background**
- **Experimental design**
- **Experimental Results**
  - **Cross-cultural comparison**
  - **Rule choice, efficiency and rule following behaviour**
- **Summary and Conclusion**

- **HH-survey 2004:** 65 % agree, that *"I would get more money from farming if I and everybody else would reduce the amount of animals.*

- More than 50% of communal farmers believe it is possible to practice **rotational grazing** in communal areas. Almost 40% see **co-operation** between farmers as main problem