

Ecological Surveys for Sustainable Livestock Production

04 Applications: Quantitative Ecosystem Analysis

Quantitative Ecosystem Analysis

Areas of application:

- Inventories, mapping
- Prediction of succession under varying conditions
- Nature and species conservation
- Environmental impact studies
- Resource analysis for land use planning

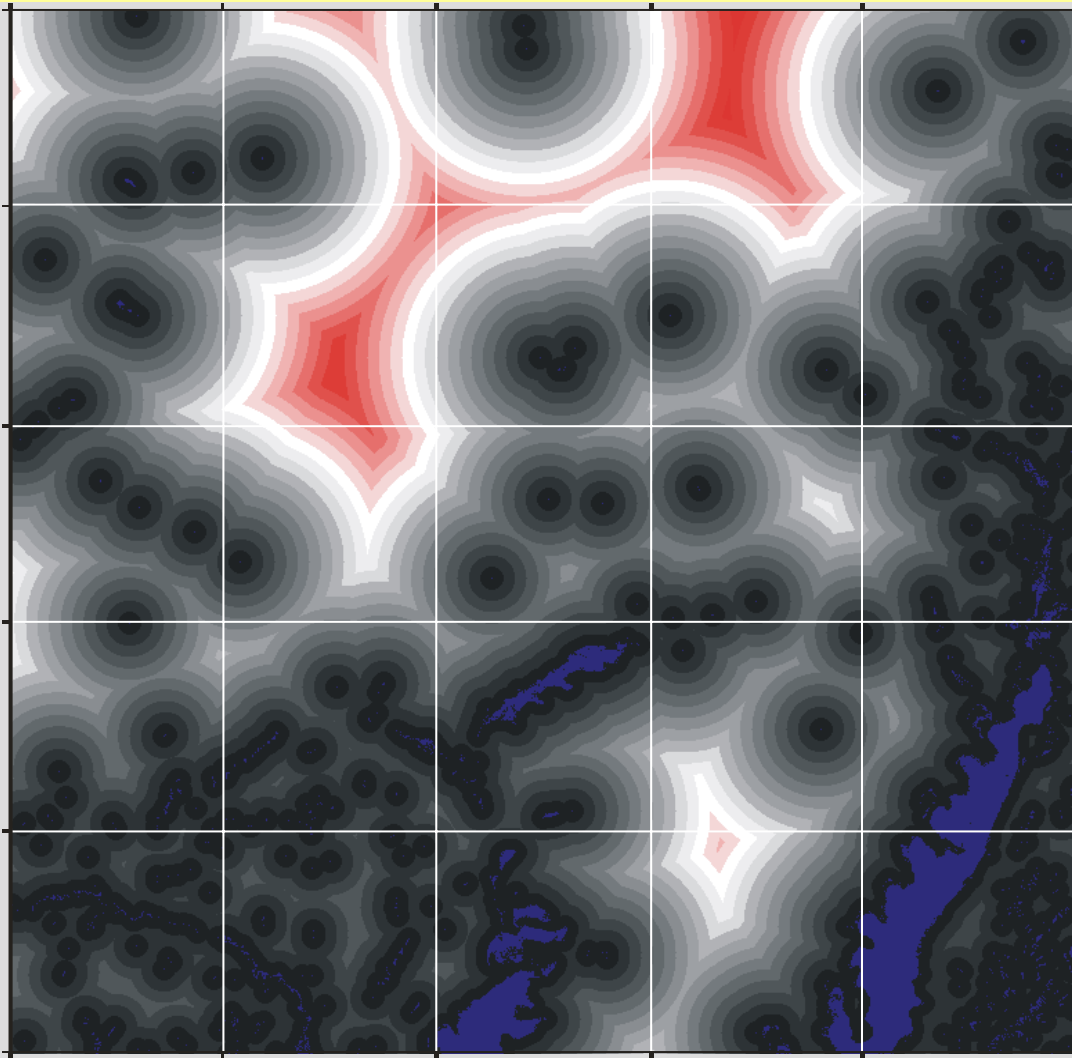


Example: Cattle and water

Deep borehole &
watering troughs
for about 20 000
cattle per day

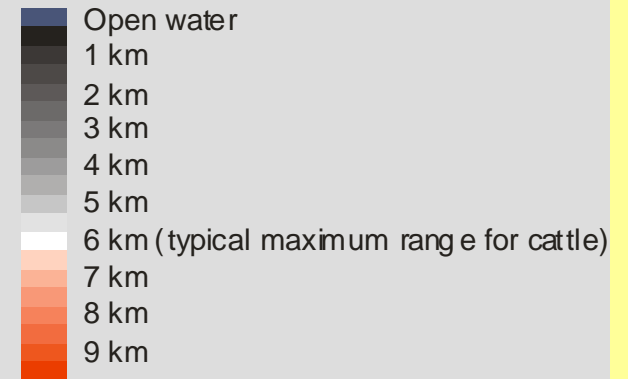


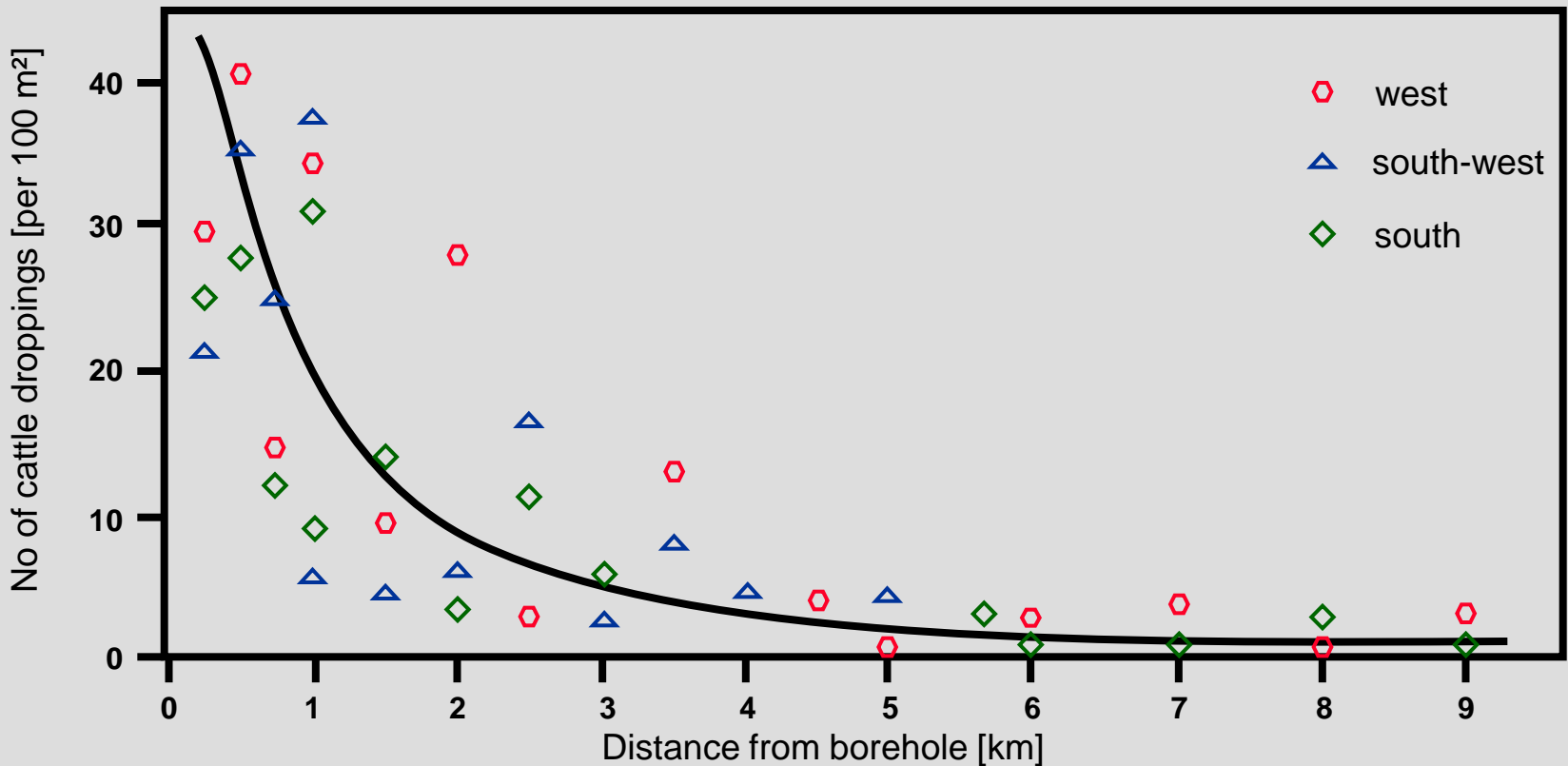




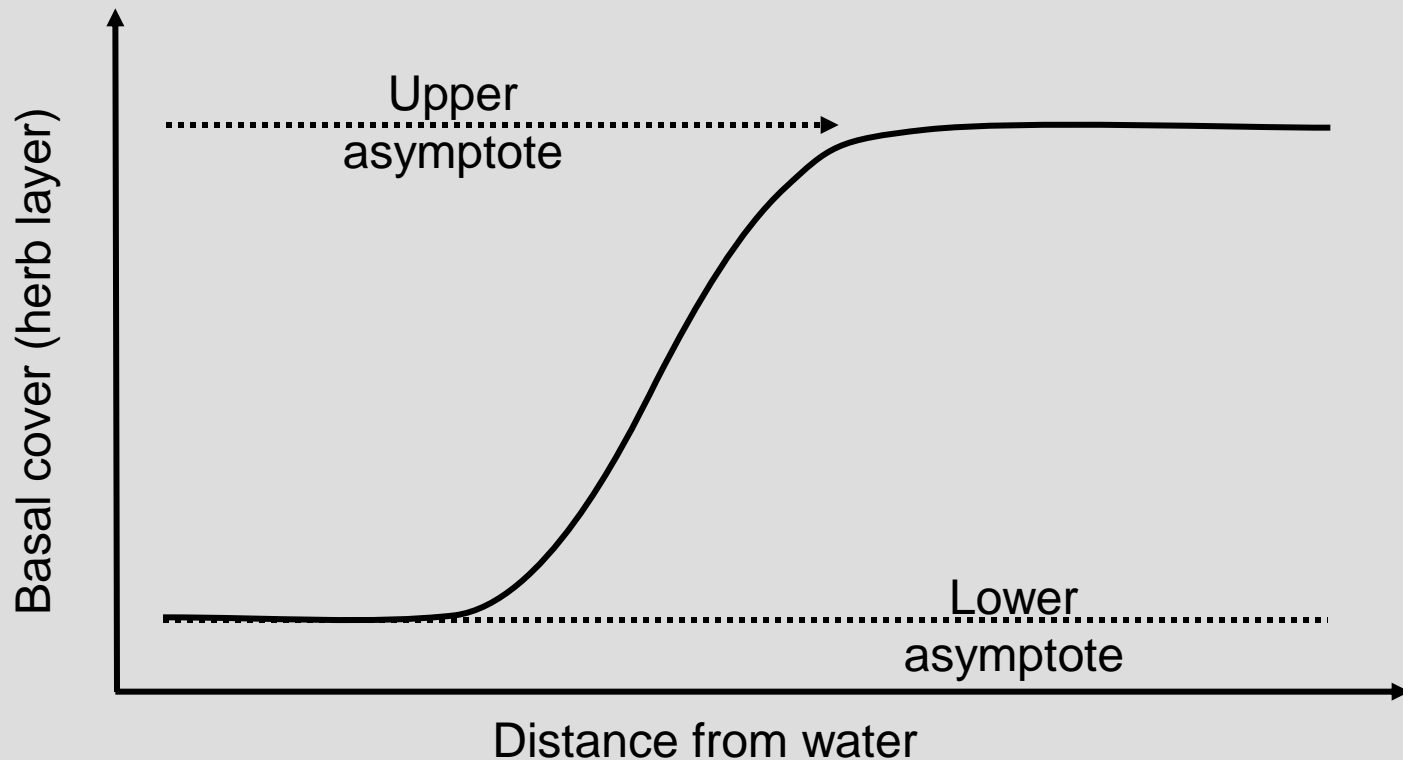
Distance from water for permanent and major semi-permanent waters in a range area. Water sources are shown in blue.

Distance to Water



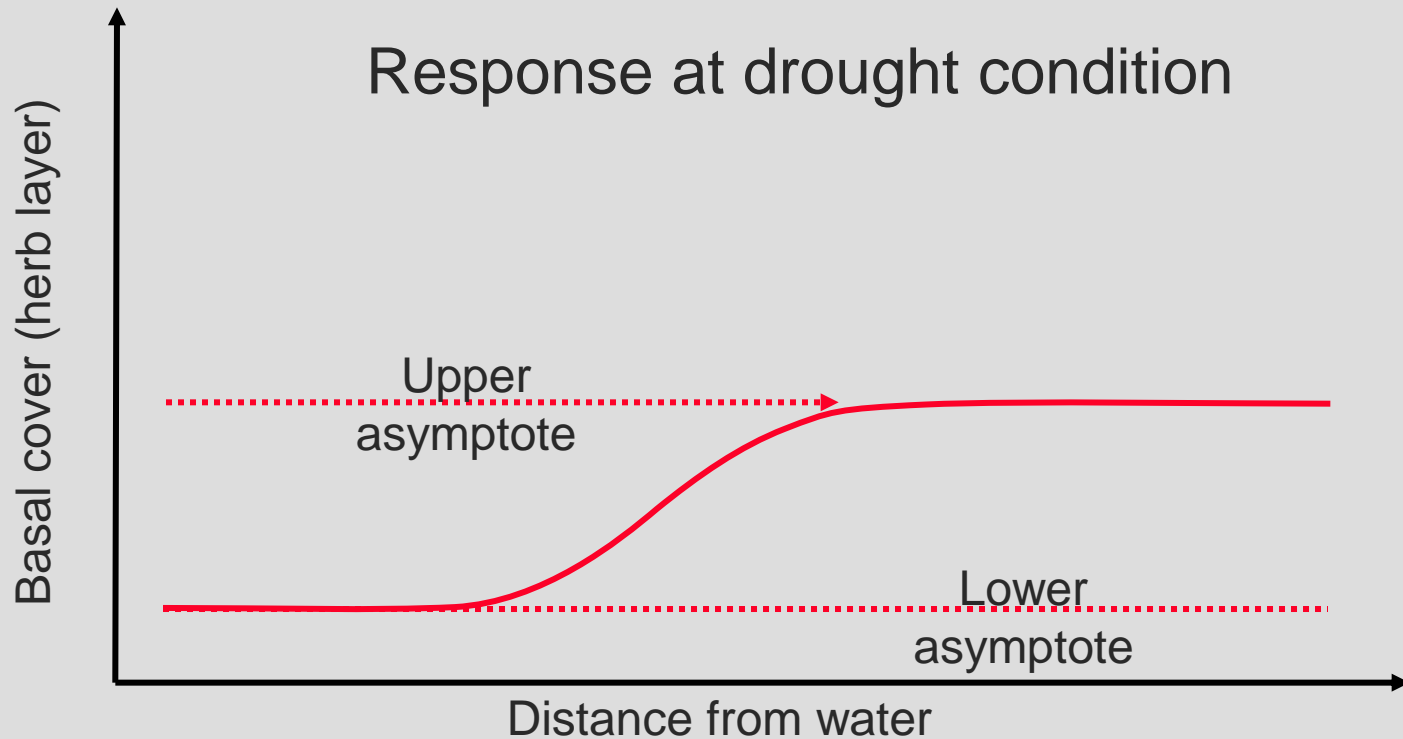


Influence of distance from water on cattle dropping density counted along three transects from the Kargi borehole



Schematic and idealized form of the response curve of an index of rangeland condition with distance from water

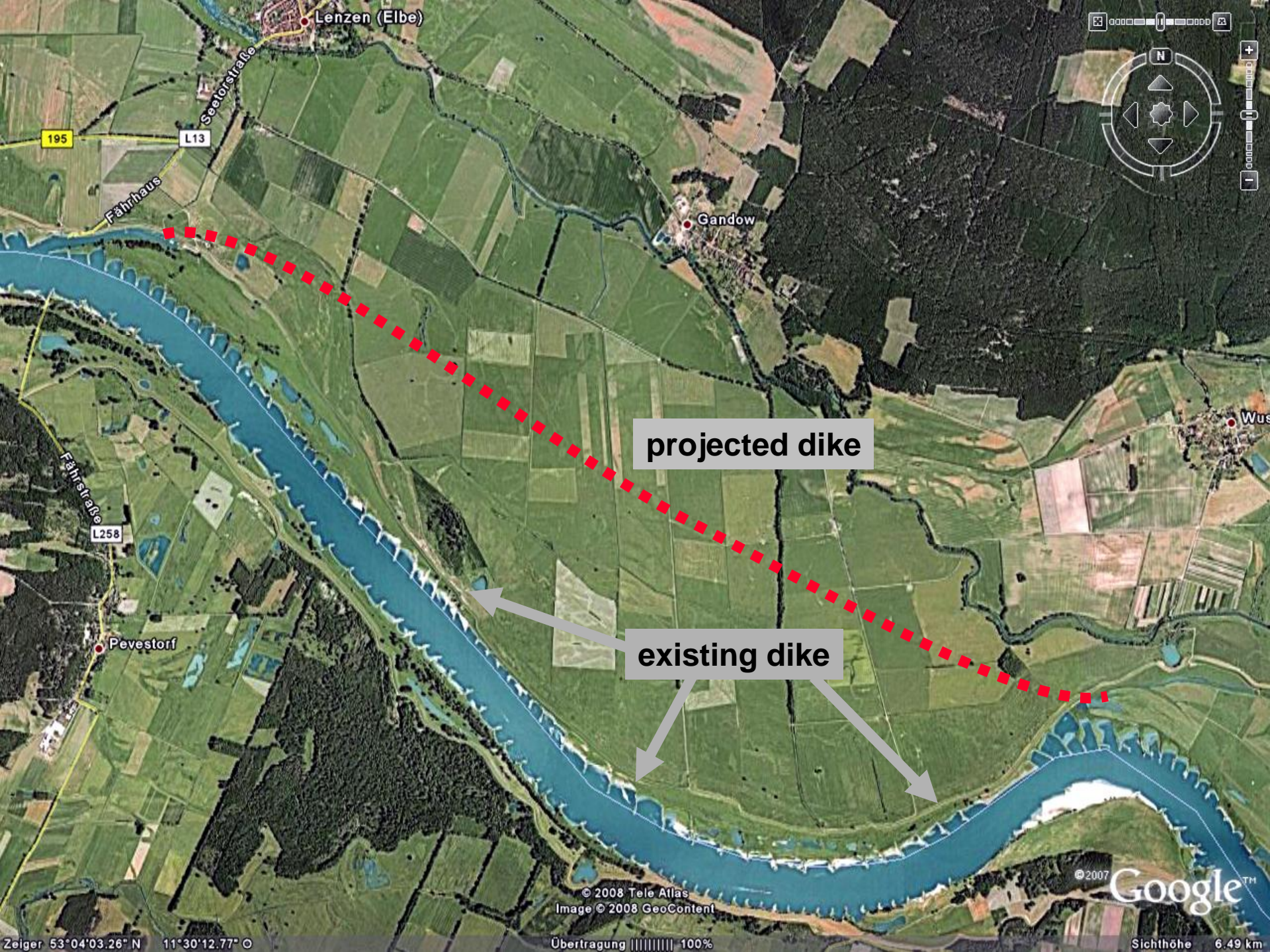
Source: Thrash, I. (2000)



Schematic and idealized form of the response curve of an index of rangeland condition with distance from water

Source: Thrash, I. (2000)

Example:
**Prediction of yield potential under
changing production conditions –
floodplain restoration**



Lenzen (Elbe)

Gandow

Fährhaus

195

L13

Fährstraße

L258

Pevestorf

projected dike

existing dike



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Image © 2008 GeoContent

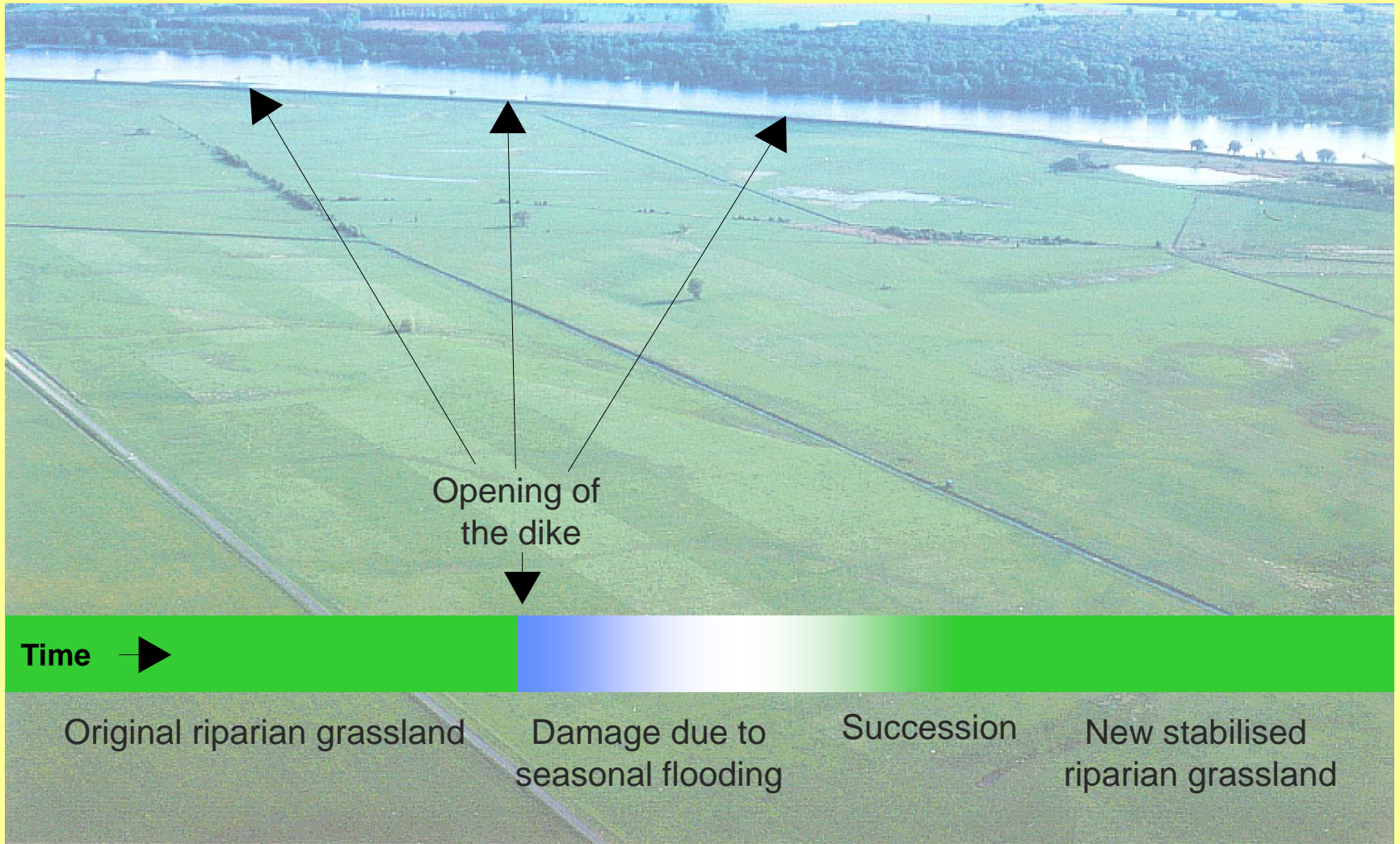
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Zeiger 53°04'03.26" N 11°30'12.77" O

Übertragung 100%

Sichthöhe 6.49 km



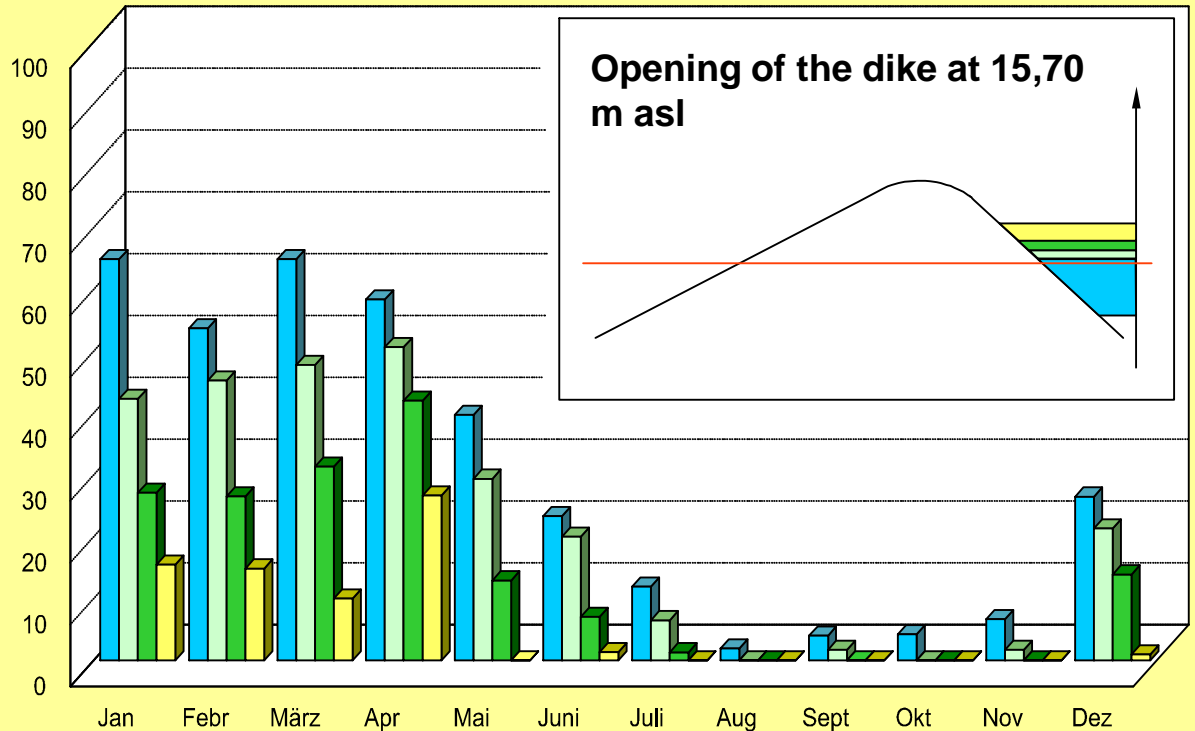


Develop flooding model for affected landscape

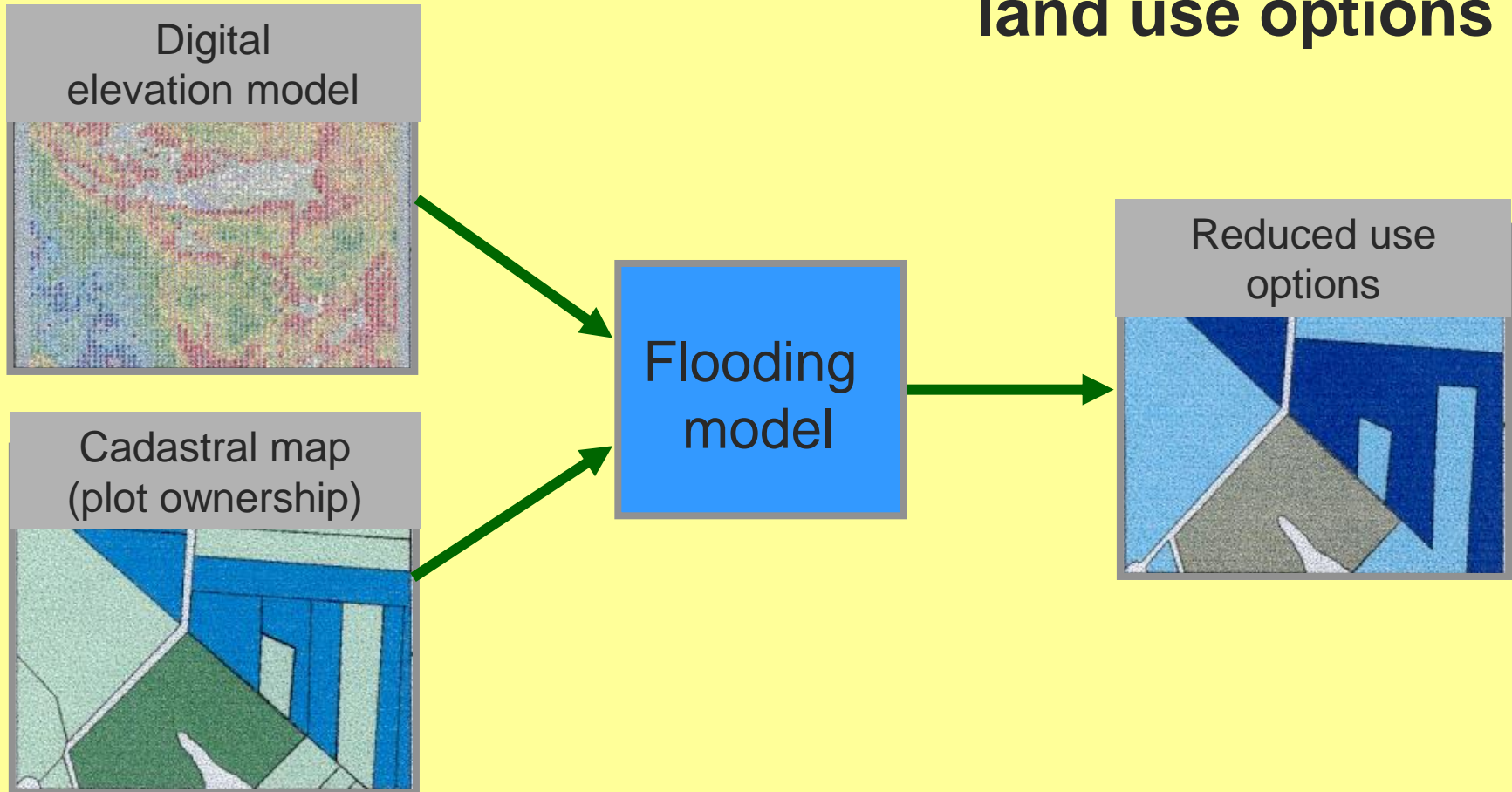
Flooding model

Ten-year probability of flooding of elevation classified plots [m asl]

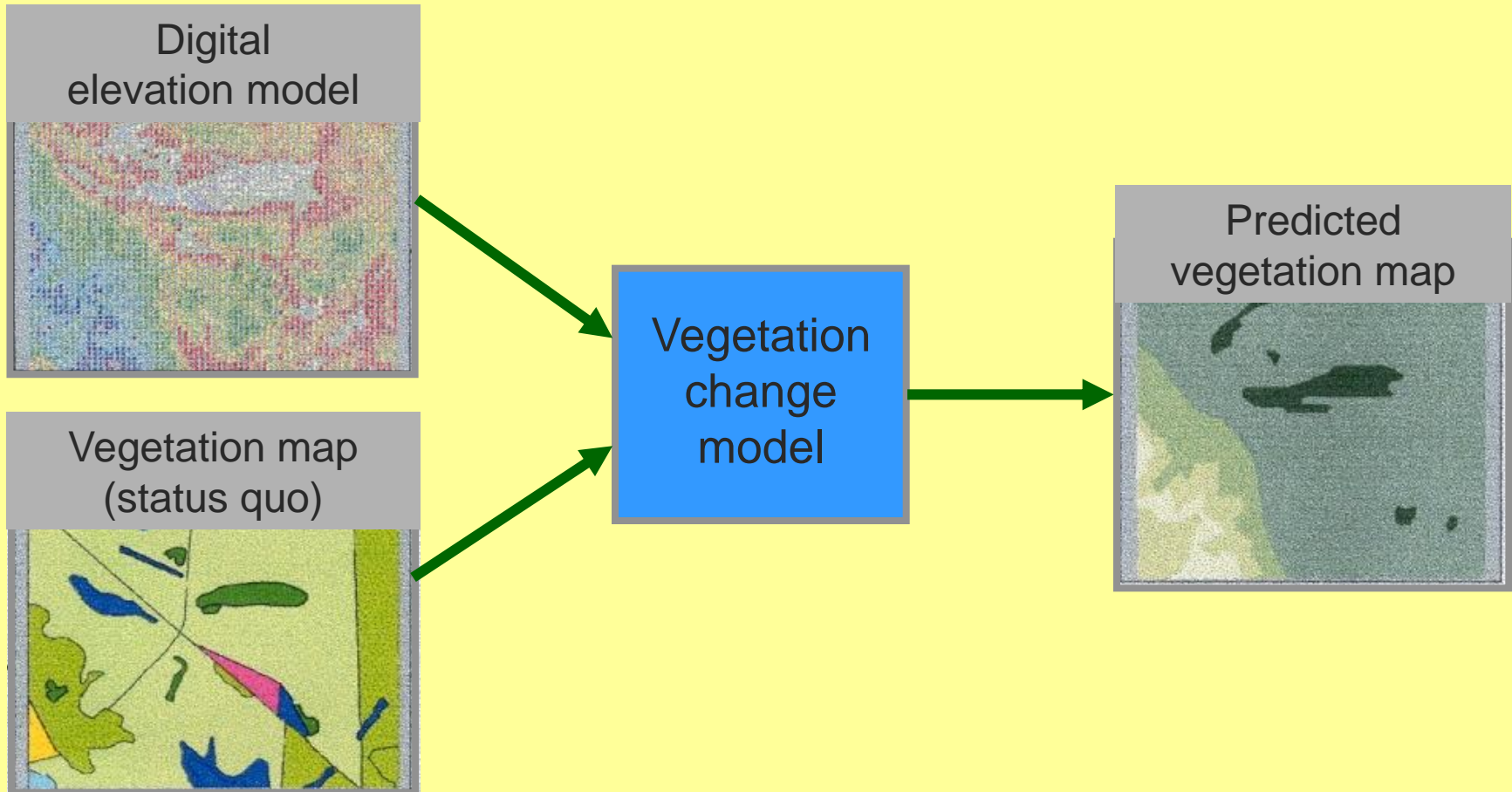
1	12,0 – 16,0
2	16,1 – 16,6
3	16,7 – 17,3
4	17,4 – 18,5



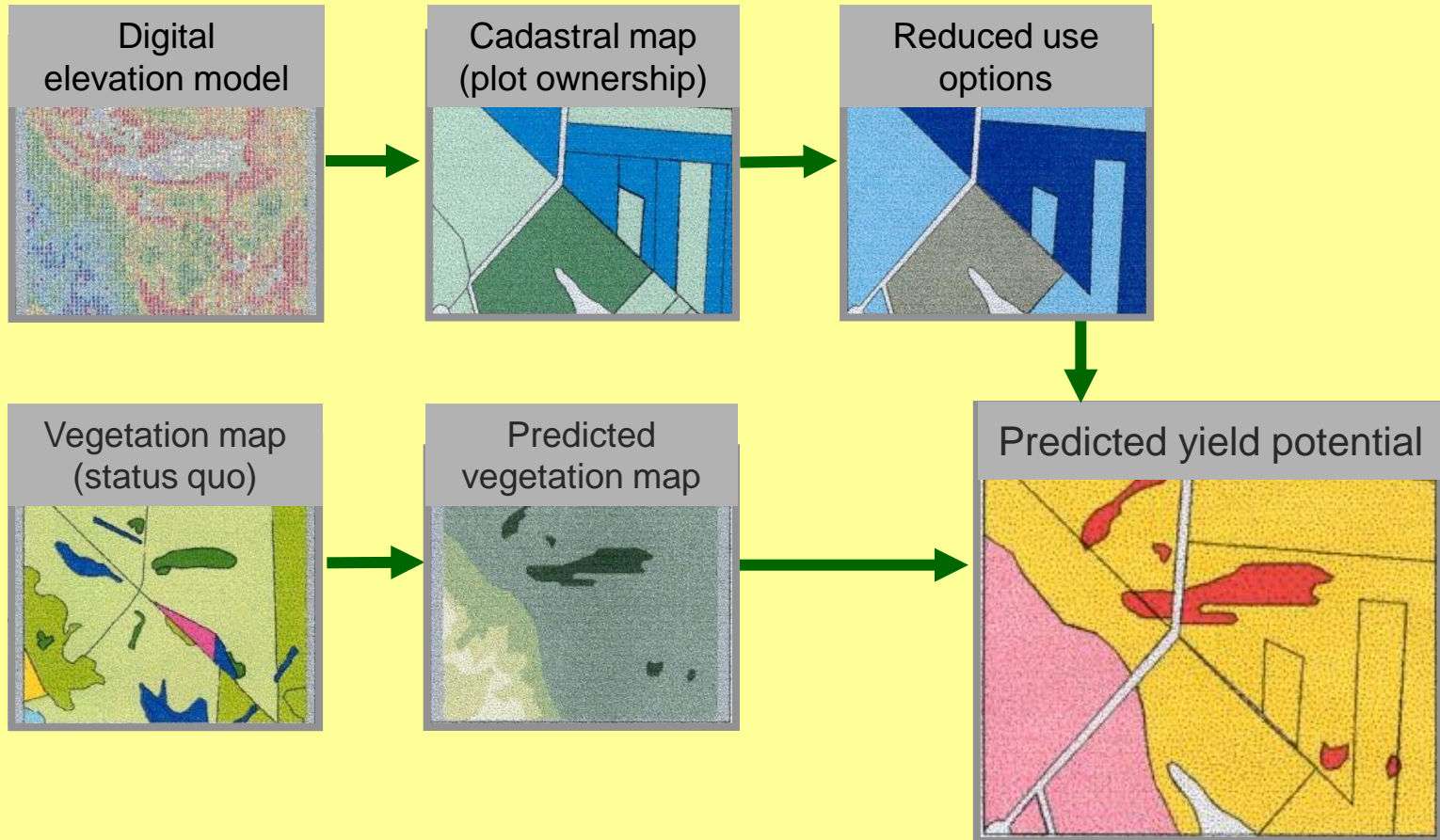
Determine reduced land use options



Predict vegetation change



Prediction of yield potential after opening of the dike



Example: Nature Conservation

Lake Mburu National Park (LMNP)

Agricultural enterprise types in the vicinity of LMNP

Ranches

Sedentary pastoralism (Smallholders)

Migratory pastoralism

Subsistence cultivation

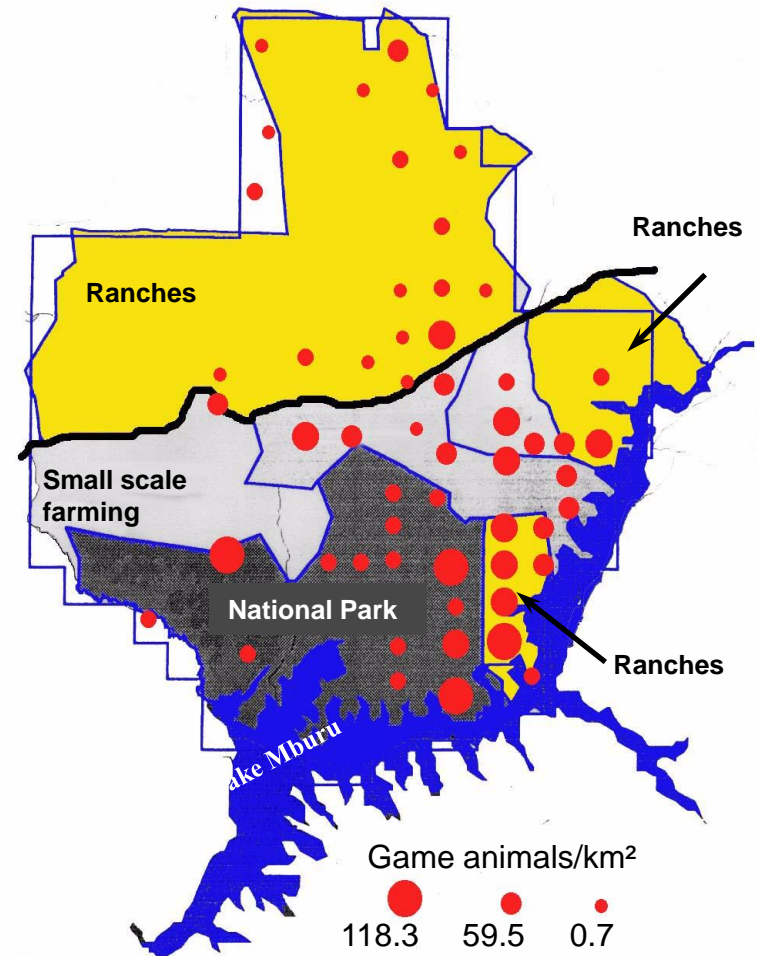
Small scale farming

Market horticulture

Charcoal production

**Wildlife densities in and around
Lake Mburu National Park**

*Source: Ministry of Tourism and Wildlife, 1996



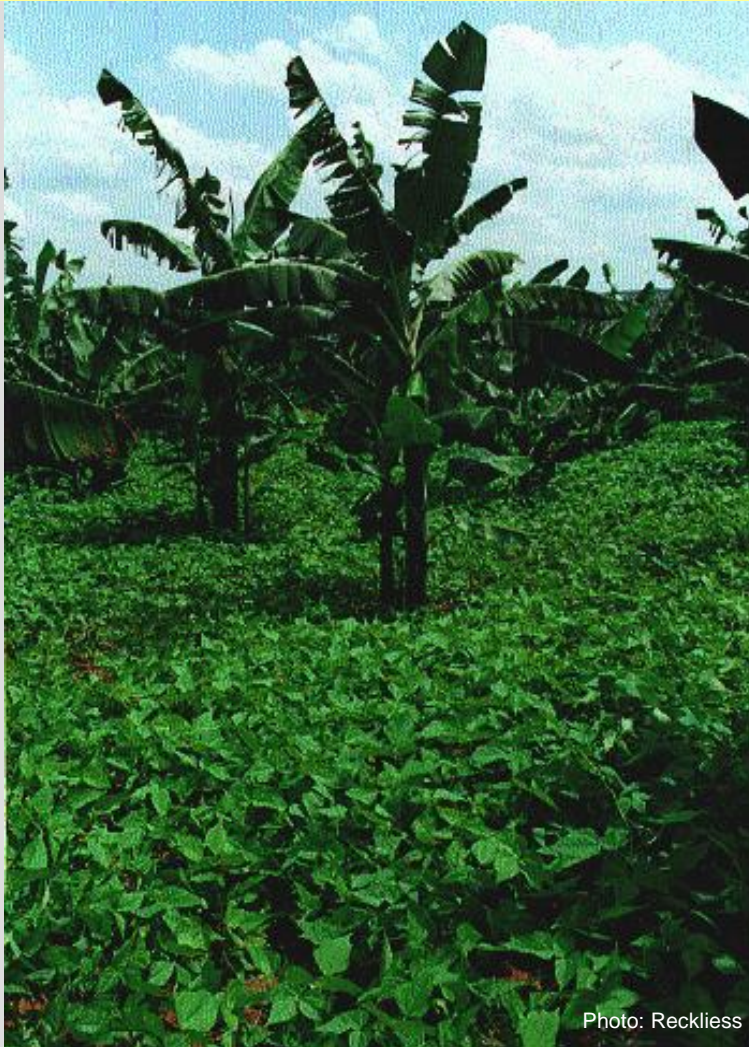


Photo: Reckliess

Lake Mburu National Park

Dominant crops in the local farms

Maize

Zea mays

Bananas

Musa ssp.

Sweet potato

Ipomea batata

Cassava

Manihot esculanta

Beans

Phaseolus vulgaris

In addition other crops like Papaya, passion fruit, pineapple, pumpkin, ground nuts and tobacco

Typical mixed cropping of bananas, beans, and maize

Lake Mburu National Park

The most important crop raiders

	rank*	preferred* crop
Bushpig	1	all crops
Porcupine	2	all crops
Baboon	2	bananas, maize
Bushbuck	3	beans
Oribi	4	maize, beans
Waterbuck	5	maize, beans
Warthog	5	all crops

In addition there are birds like Guinea fowl, dove, francolin, various water birds, and rodents

- Results of an interview action with 30 farmers close to the borders of LMNP, Reckließ & Faschina 1999



Warthog



Waterbuck

Lake Mburu National Park

Grazing systems

Ranching: sedentary cattle grazing with for beef production Ankole-Longhorn and Ankole crosses, occasionally extensive milk production; ranch sizes 1- 5 km², natural pasture

Small livestock holdings: Milk production with Ankole-Friesian crosses; farm size 50 - 150 ha, partly on improved pastures

Migratory pastoralism: traditional cattle raising for subsistence production of beef and milk, without land titles, seasonal movements, natural pastures



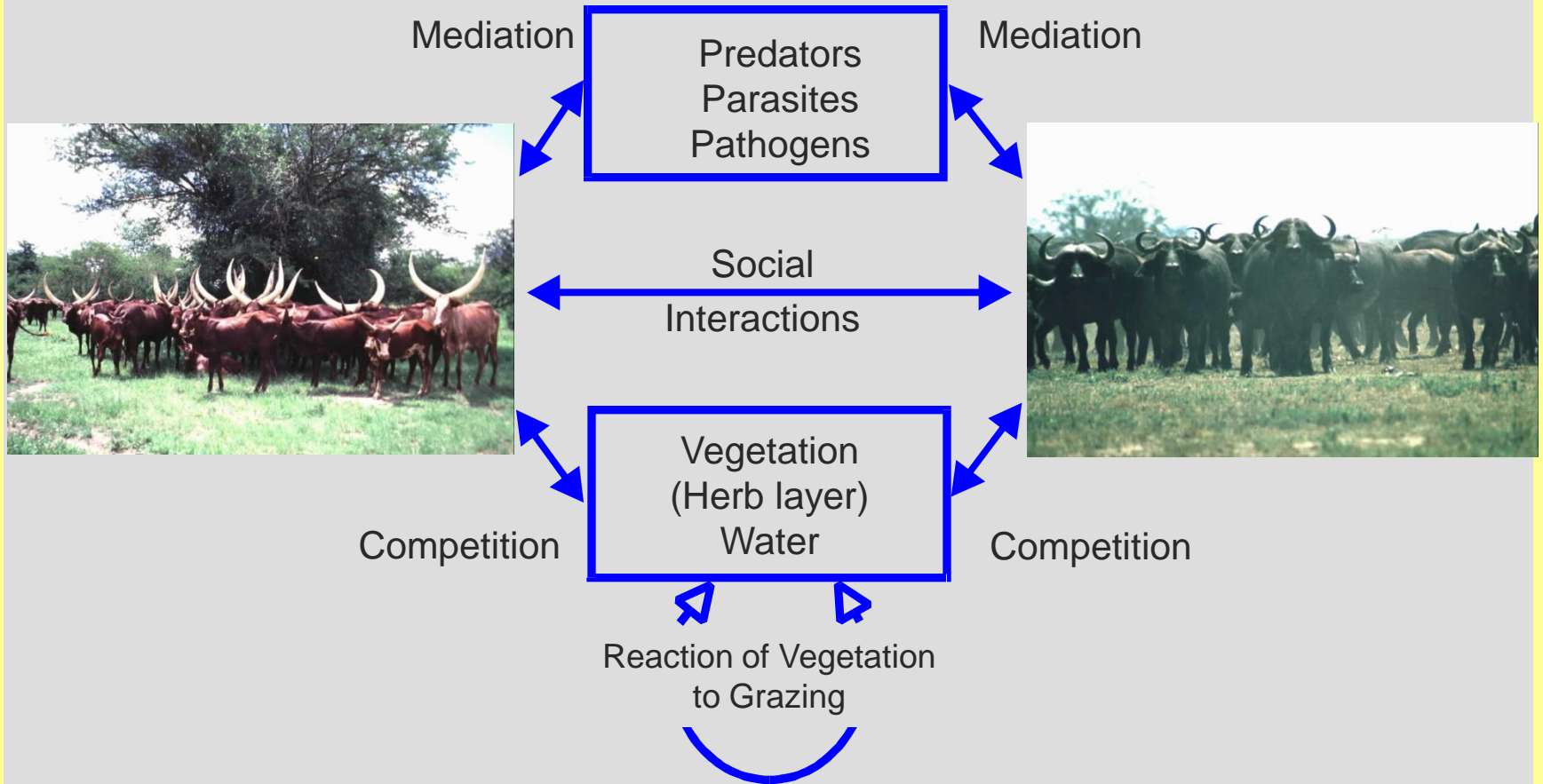
Ankole Longhorn



Ankole-Friesian crosses

Lake Mburu National Park

Interactions between domestic and wild herbivores in a grazing system



Lake Mburu National Park

The most important competitors
for grazing

Species	Numbers*
Cape buffalo	1200-1500
Zebra	3000
Impala	10000-15000
Eland	800
Waterbuck	3000
Kongoni/Topi	few
Warthog	5000
Hippos	300-500

* Estimates by the LMNP administration for
the park and the surrounding lands



Impala-Antelope

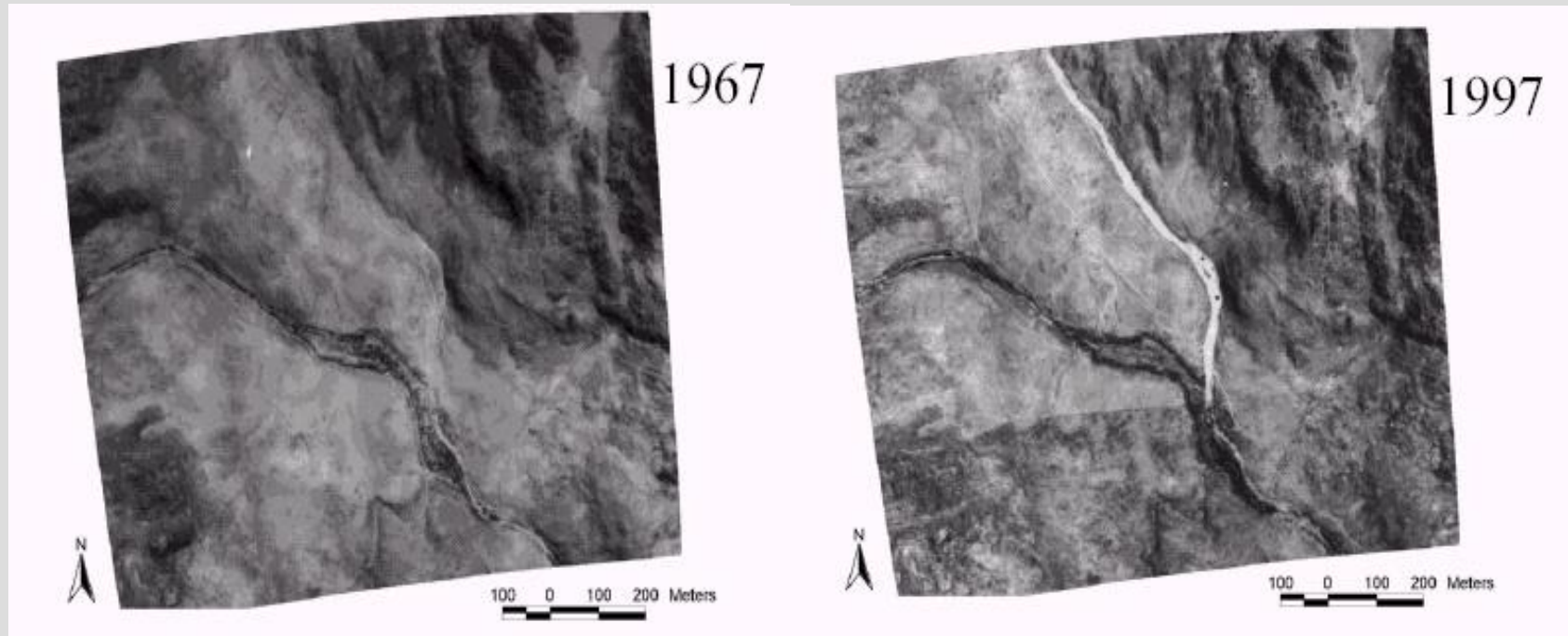


Burchell's Zebra

conflict and mitigation

Example: Environmental Impact Studies

Plant cover changes within 30 years on communal and commercial rangeland



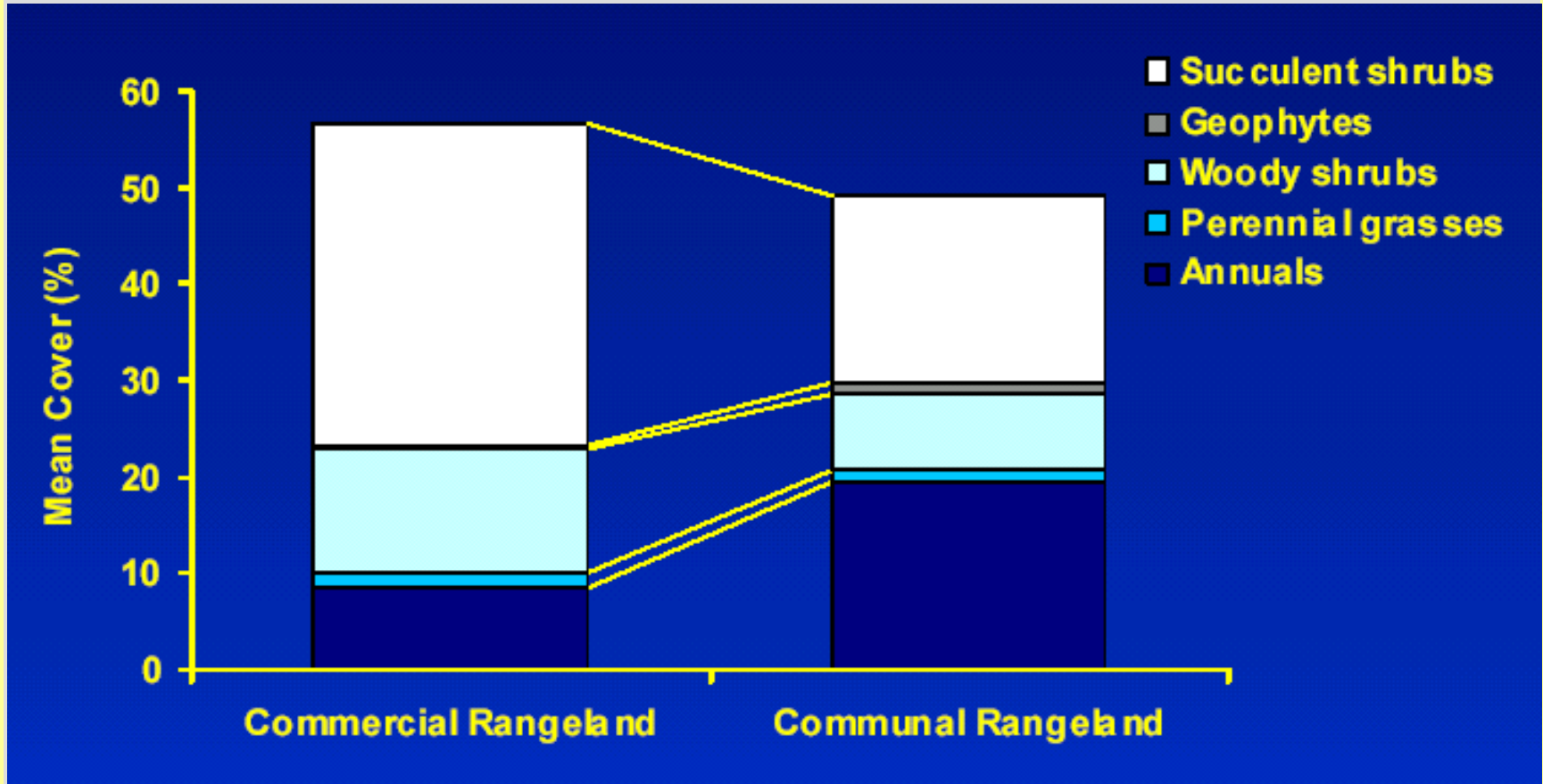
Source: Todd & Hoffmann, 1999

Difference in plant cover on communal and commercial rangeland



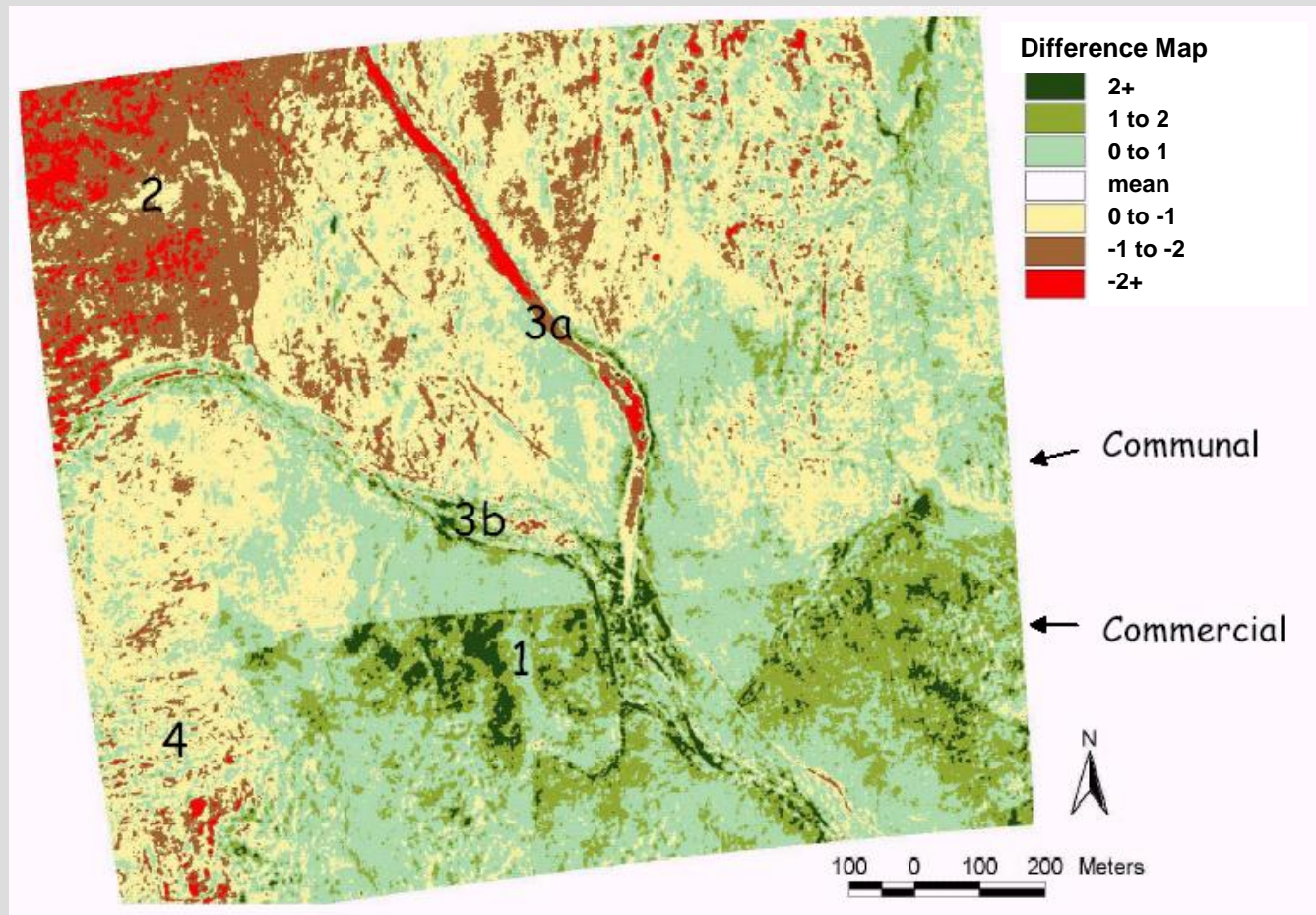
Source: Todd & Hoffmann, 1999

Difference in plant cover on communal and commercial rangeland



Source: Todd & Hoffmann, 1999

Difference in plant cover (std. dev. of mean cover) on communal and commercial rangeland



Source: Todd & Hoffmann, 1999

Example: Resource Analysis for Land Use Planning



Heavy wind erosion after conversion of perennial grasslands (African savannah) into rainfed wheat cultivation



Settlement of small scale farmers on semi-arid rangelands

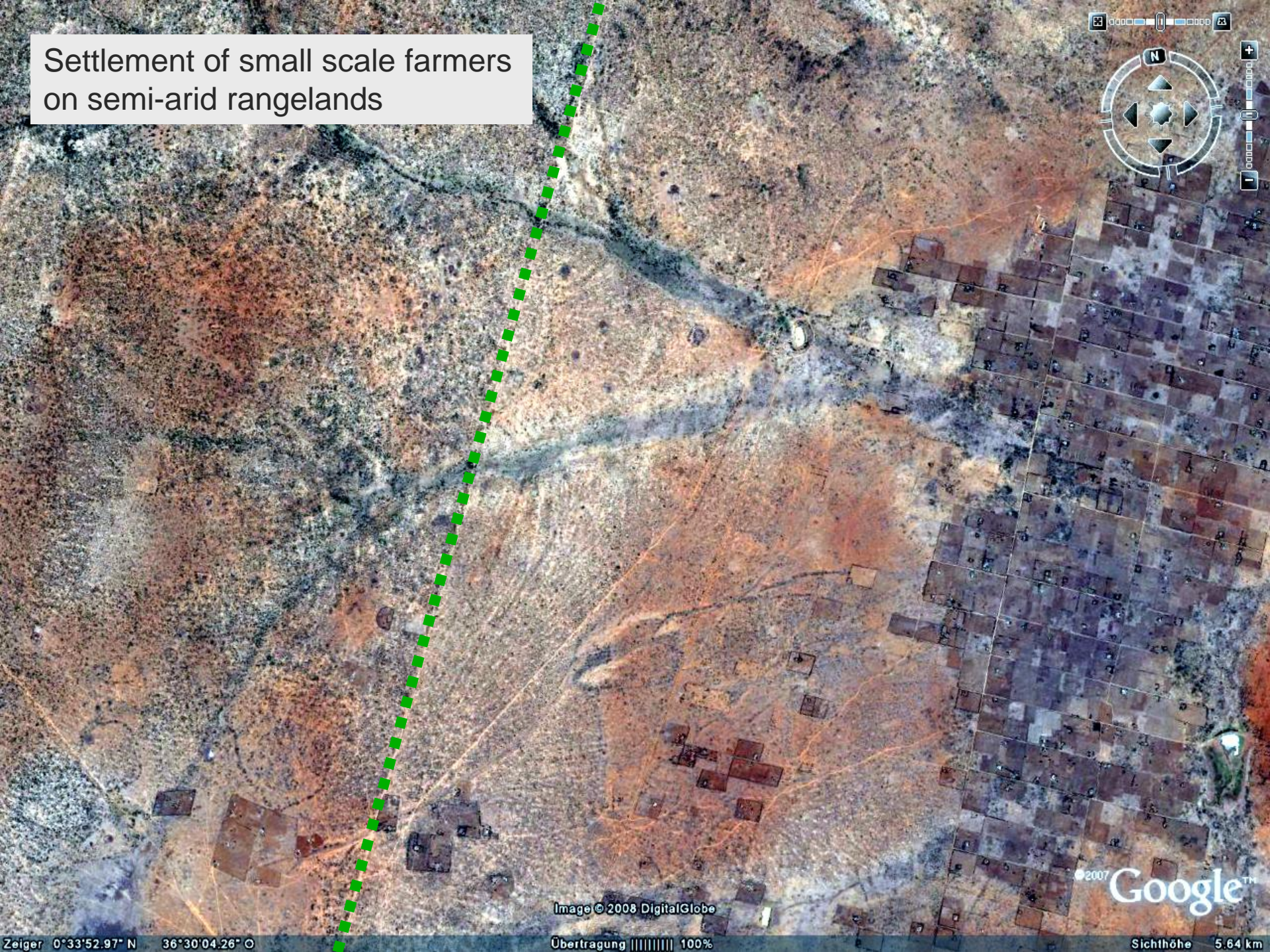


Image © 2008 DigitalGlobe

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Zeiger 0°33'52.97" N 36°30'04.26" O

Übertragung ||||| 100%

Sichthöhe 5.64 km



Fence line effect