

Sustainable Biomass Production

in South Africa

Thomas Funke & Arne
Schuffenhauer

07/07/2009

Overview

- **Introduction**
- **Results (WP 2, WP 3 and WP4)**
- **Conclusion and Findings**

Team

Composition

- Arne Schuffenhauer – Agronomist and Project Manager
- Thomas Funke and Peter Prussat (UP/BFAP) – Agricultural Economists and Researchers
- Fanie Ferreira from GTI – Agronomist and GIS expert
- On demand: Helen Watson (UKZN) and Anne Sugrue (RTSBF) – Environmental and Social Scientists

GIS data used

National data

- NLC 2000
- RSA land type database
- RSA Land capability
- SANBI

Global data

- GLADA
- GlobCover
- WDBPA
- Harmonized World Soil Data Base
- FGGD
- IBAT

Intro

Quality of GIS data is good – abandoned and unused land
could not be identified

Study focus 1

Degraded land

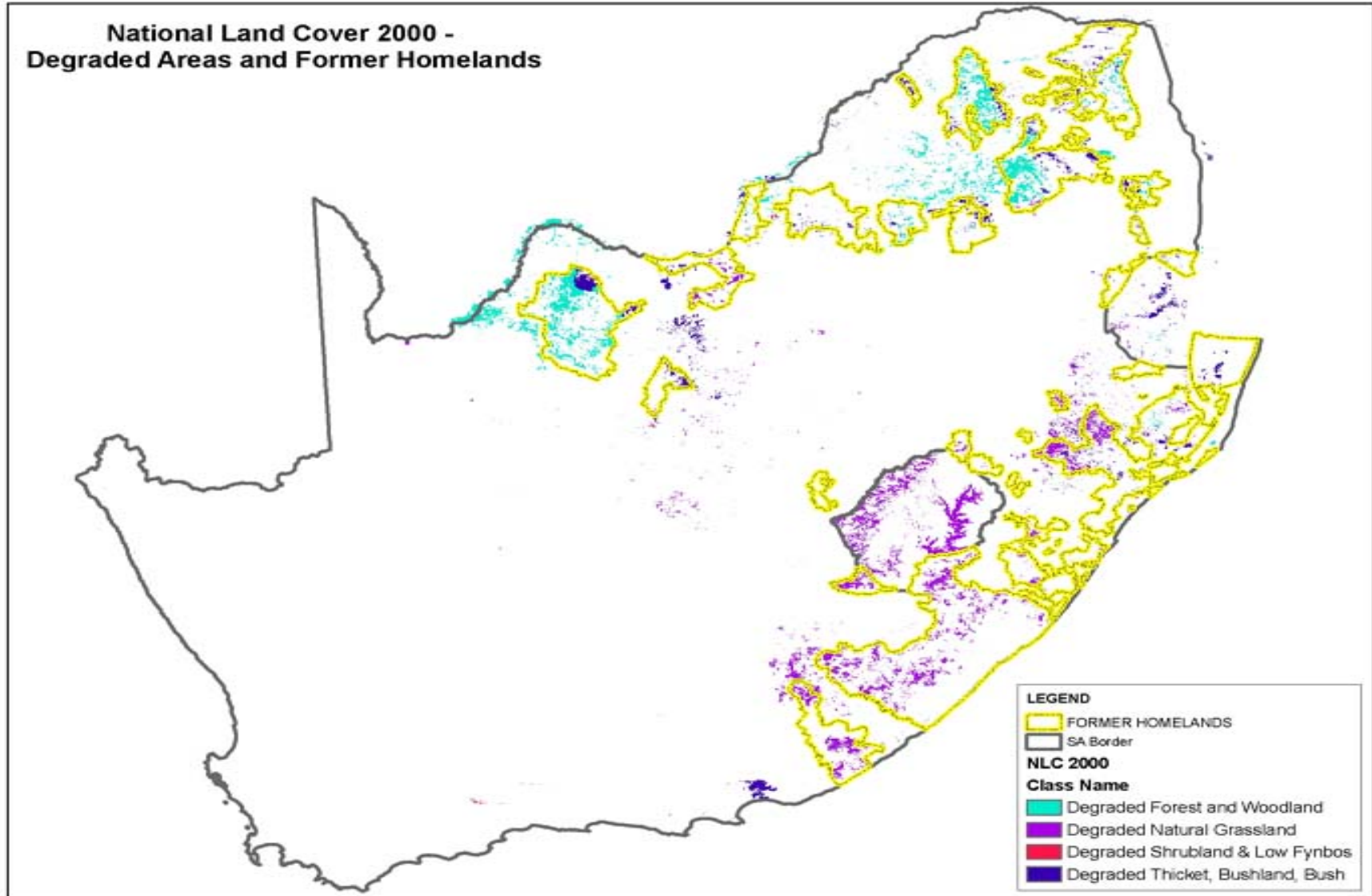
- **Assumption that...**
 - degraded land is not cultivated
 - area selection does not affect food production
 - degraded land is available
- **Different view on defining degraded land:**
 - Loss of function of ecosystem (UNEP 2007)
 - Loss of biodiversity (UNCBD)
 - Deterioration of biomes in dryland areas (UNCCD, Hoffmann et al 1999 for SA)
 - Loss in productivity, reduction of plant growths
- **Problem in defining the state of degraded land (in GIS data):**
 - No specification of degree, time horizon, system recovery, cause of induction
 - No thresholds

Identification of degraded land via GIS limited to definition
(SANBI dataset)

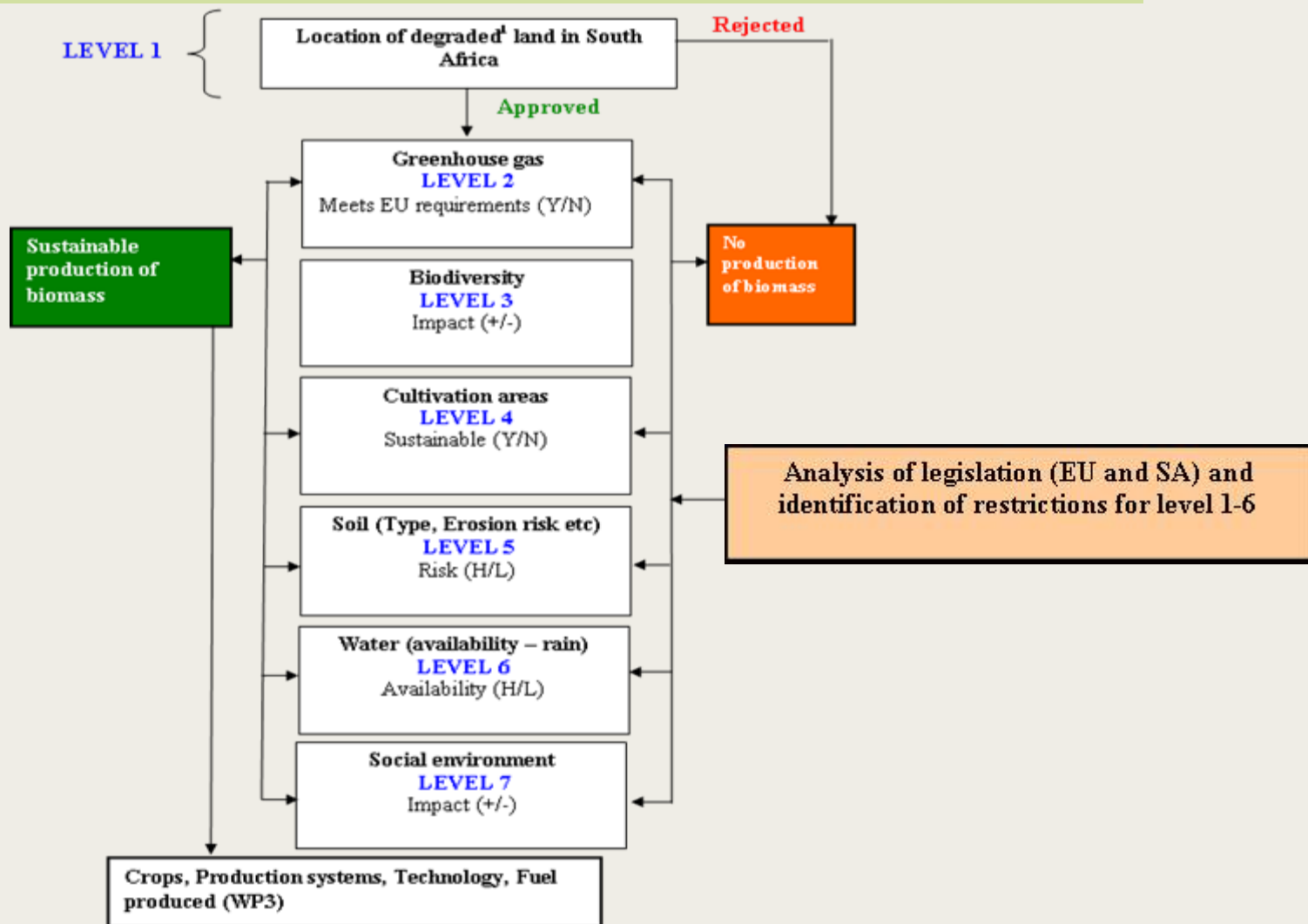
Study focus 2

Suitability of cultivation on degraded land

- **Assumption that crops must**
 - eventually be financially viable on degraded land
 - be cultivated with best agricultural practices to improve soil standards
 - fit into existing land use patterns (summer rainfall)
- **4 Main Issues Identified: Crop cultivation systems**
 - Level of knowledge
 - Availability of financing
 - Level of mechanisation
 - Access to market and technical information



Areas for bioenergy crop production

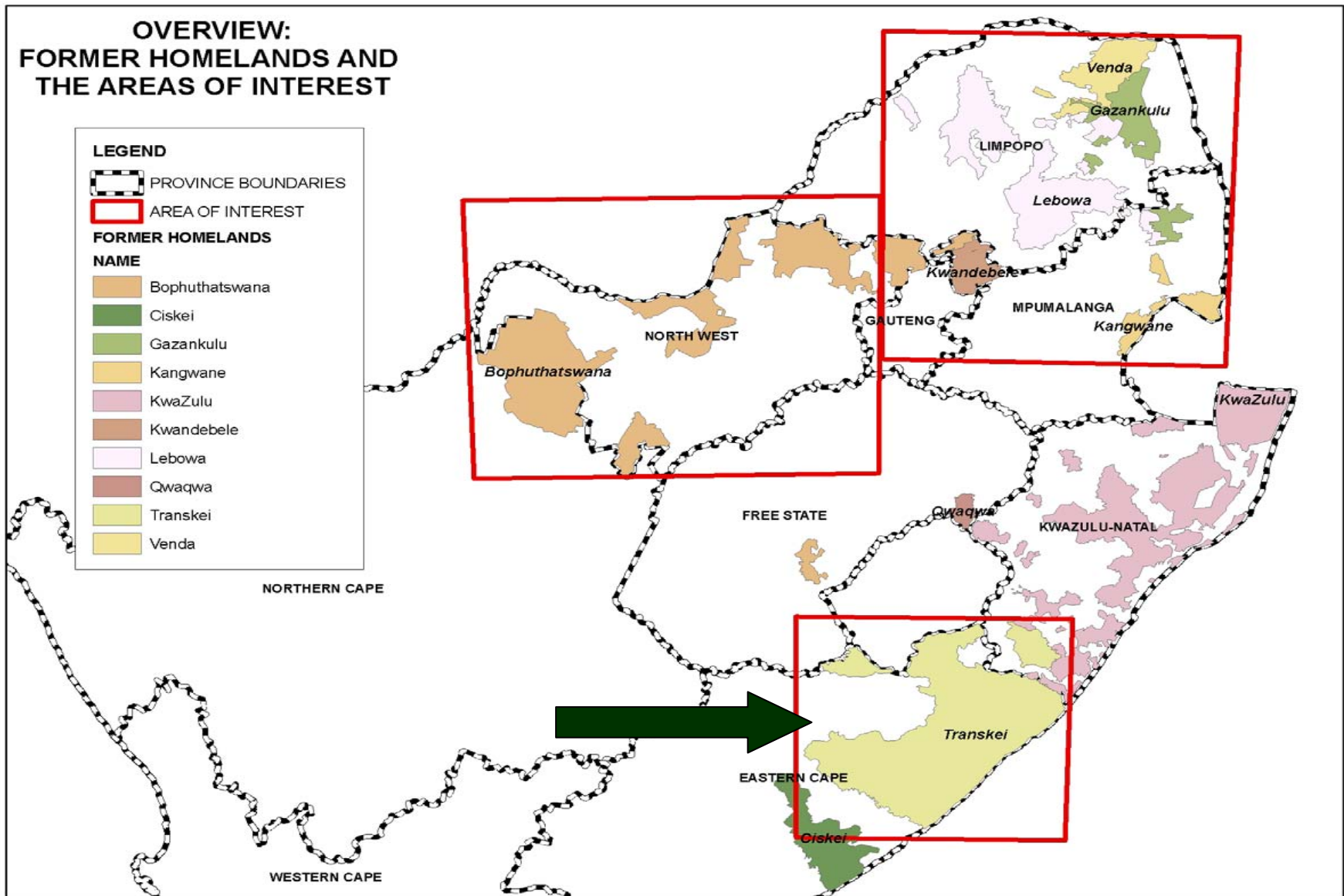


WP 2

Areas for bioenergy crop production

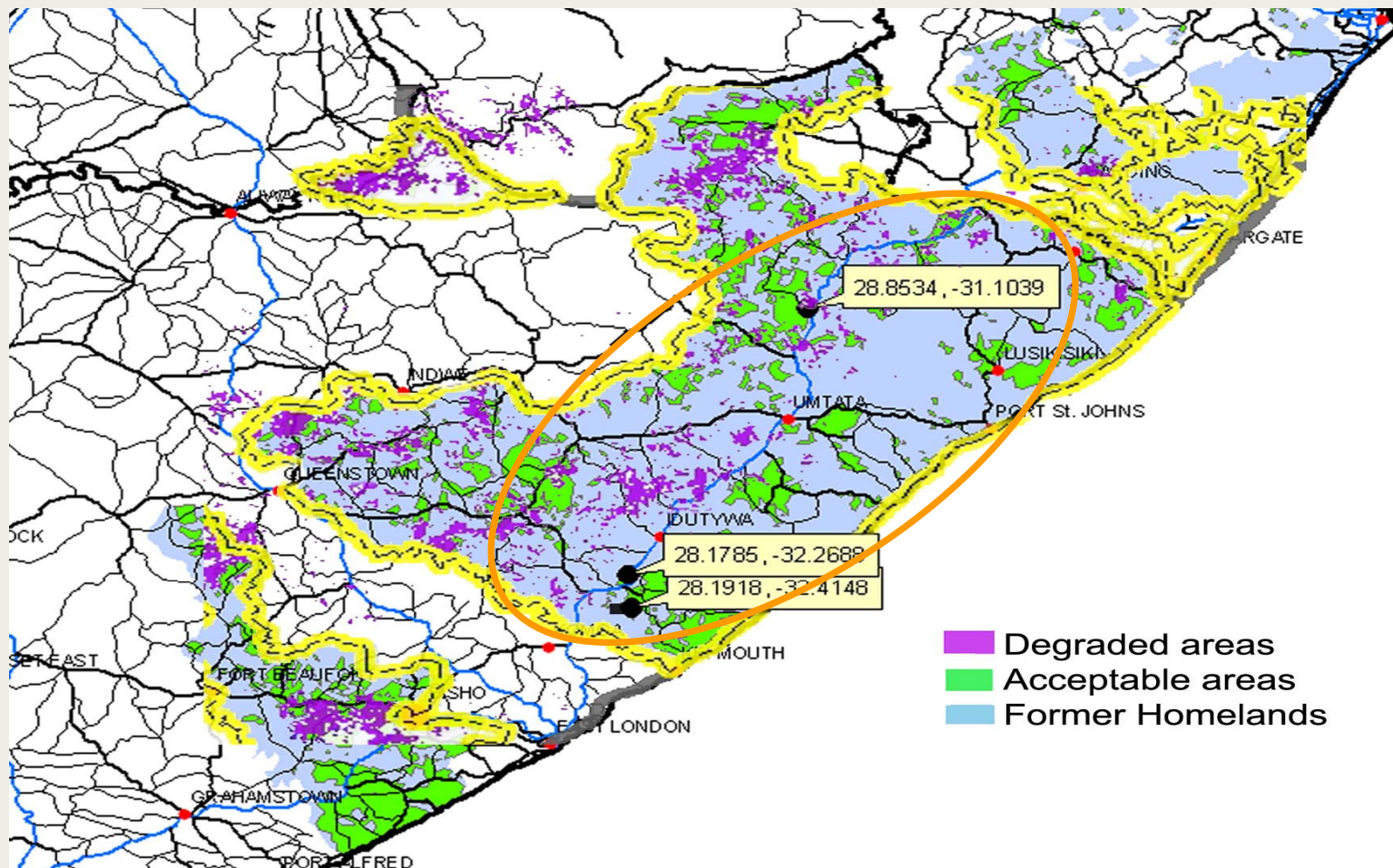
Outcome of iterative process

- **Level 1:** Only degraded land is included
- **Level 2:** Greenhouse gas emissions (GHG) is taken into consideration through mapping out carbon stock areas
- **Level 3:** Biodiverse areas such as primary forests, wetlands, nature protection areas are excluded
- **Level 4:** Cultivation areas are limited to former homelands
- **Level 5:** Soil characteristics are not factored in for exclusion, but slopes are taken into consideration
- **Level 6:** Water is the most limiting factor for the identification of areas, as approval to use irrigation water is unlikely



Areas for bioenergy crop production

WP 2



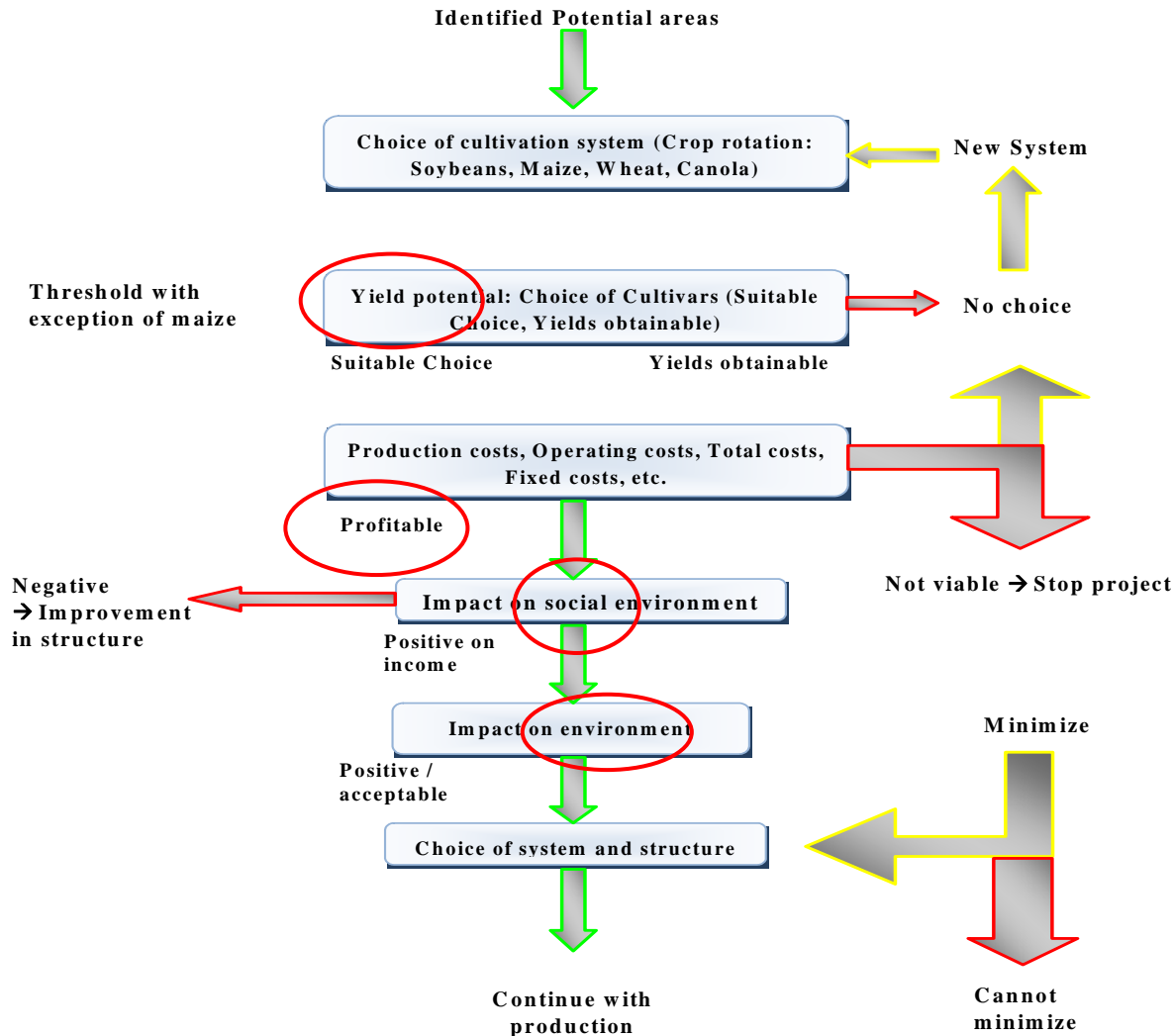
Sustainable cultivation systems

Conditions for cultivation system selection in South Africa

- **SA specific legislation - legally compliant crops are...**
 - soybeans, sunflower, canola, sugar cane/ beet
 - other crops such as sorghum, cassava etc. are also allowed but not necessarily supported
- **Legally non-compliant or non suitable crops are...**
 - Jatropha (invasive plant and toxic)
 - Maize (sensitive crop for food security)
- **Central crop in food cultivation system is maize** for both small scale or communal agriculture and should not be excluded

Sustainable cultivation systems

W P 3



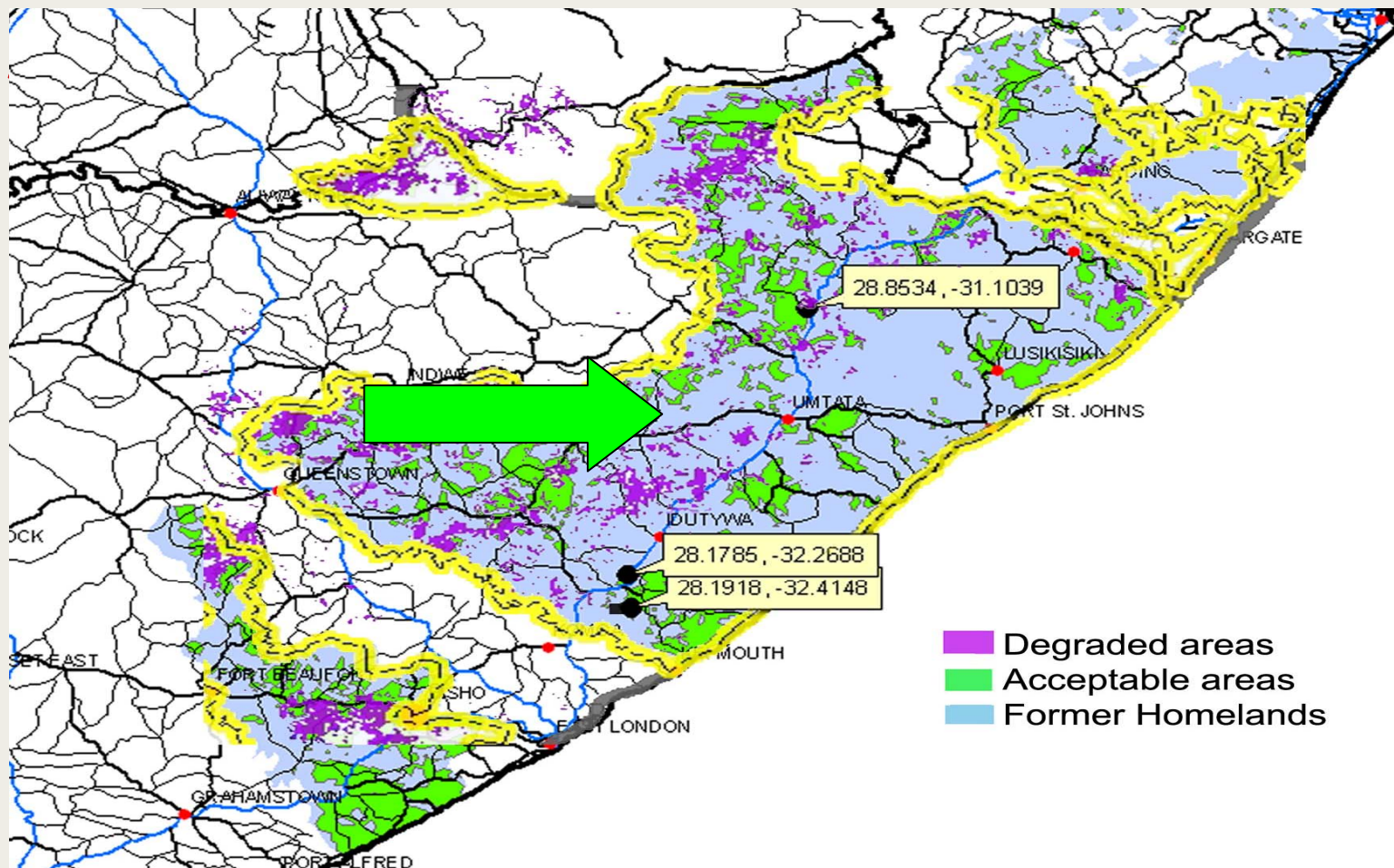
Sustainable cultivation systems

Outcome of iterative process

- **Level 1:** Suitable and sustainable crops are selected for degraded areas and existing cultivation systems
- **Level 2:** Yield potential for crops in rotation with existing crops is established (if any) – highest potential for soybean/ maize and possibly canola (rainfall might be an issue)
- **Level 3:** Profitability of rotation systems is calculated for degraded and improved land
- **Level 4:** Social impact of rotation systems is assessed (food security vs income level)
- **Level 5:** Environmental impact of rotation systems is discussed with respect to production systems that can be used

Ground truth

WP 4



WP 4



CO₂: some forests in valleys used for fire wood

Ground truth

Findings related to cultivation systems

- Crops: Maize, Sorghum and Canola (failed due to mechanisation)
- Yield potential: 250 – 600 kg per ha (up to 5.5 t/ha)
- Profitability: Very poor, farming not profitable on a small scale (alternatives: Contracting, Co-op based)
- Social impact: Dependent on maize as a staple but also on the market price – overproduction has a negative impact
- Environmental impact: Poor management practices result in high erosion and unsustainable production systems

Conclusion

For researchers

- The term “degraded” must be further specified (time horizon and degree) and combined with land capability criteria to allow conclusions on potential
- GIS data on abandoned and unused land is needed
- Alternative crops for which hard data is not yet available should be further tested on profitability in SA (eg. 2nd generation bioenergy crops)

Conclusion

For development planners of bioenergy projects...

- Projects must go hand in hand with improving good agricultural practice (on degraded, underutilized land)
- Productivity per ha must increase, as available land is limited
- Production and marketing requires access to capital, markets and market information to succeed (2 production models)
- On a larger scale, only government supported programmes can tackle the 2% bioenergy target (few farmers have entrepreneurial skills and spirit)
- Profitability is just as important as the social relevance of the crops (food and income source)

Conclusion

For policy makers

- Agricultural support programmes must enable and stimulate individual farmers to invest in agriculture and not to make them dependent on further help (80% of income from government!)
- Land tenure in homelands (permission to occupy) must change, as farmers cannot use land as a collateral for credits
- Other areas outside the homelands should be taken into consideration for a broad based roll-out strategy (joint ventures on land reform areas?!)

Questions?



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