Miombo Network Meeting

27 - 29 July 2016 – Maputo – Eduardo Mondlane University

SASSCAL achievements and plans in Miombo woodland research

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(with contributions from Fernanda Lages, Francisco Maiato, Valter Chissingui, Virginia Lacerda Quartín, Patrick Matakala, Malunga Mwape, Lishomwa Mulongwe, Markus Burgener, Priscilla Sichone, Stephen Syampungani, Marion Stellmes, Achim Röder, Manfred Finckh, Rasmus Revermann, Norbert Jürgens)

SASSCAL, Regional Secretariat
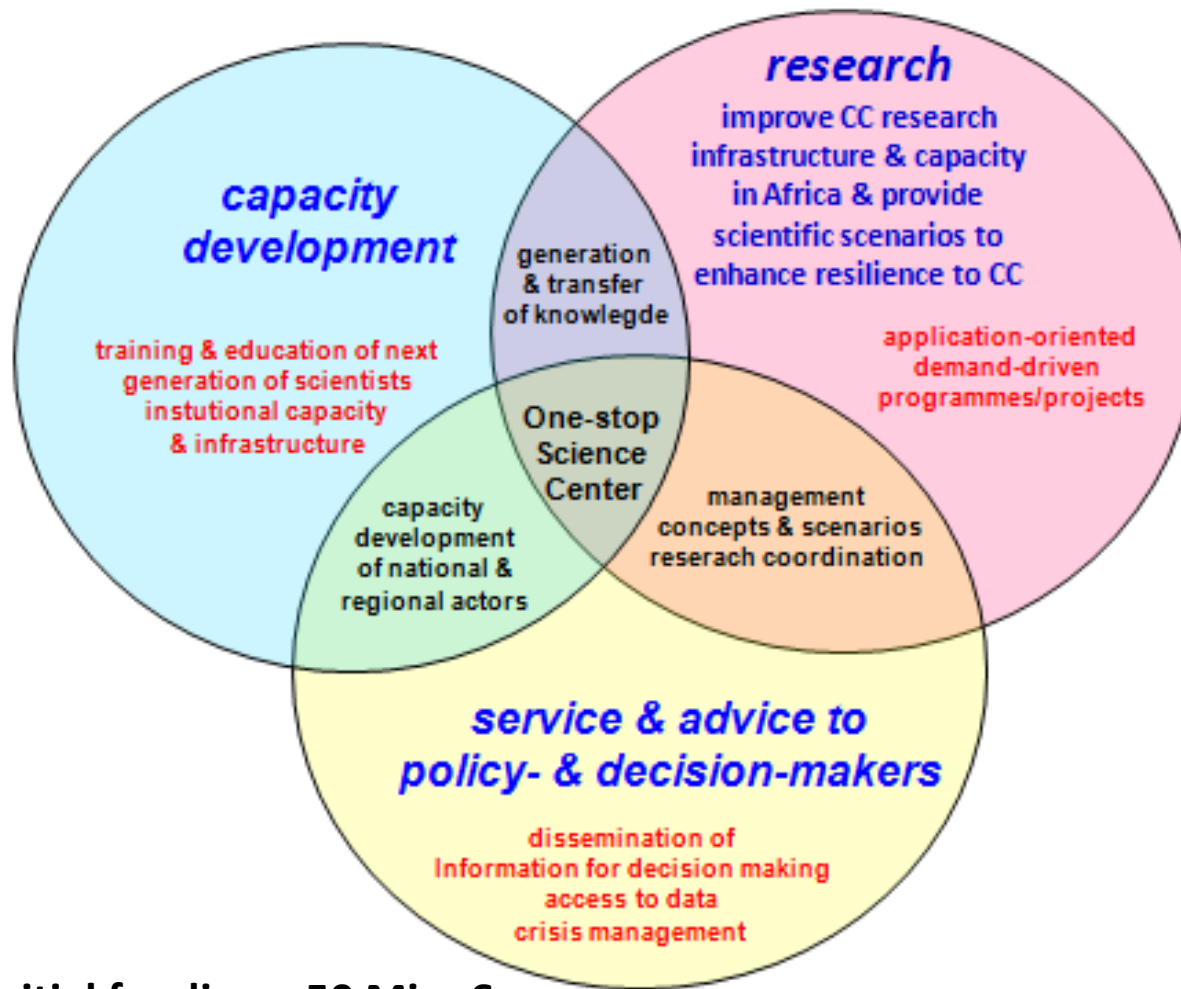joerg.helmschrot@sasscal.org

SASSCAL Vision

"SASSCAL is the **REGIONAL** driver for innovation and knowledge exchange to enhance adaptive land use and sustainable economic development in a highly vulnerable region of Southern Africa under global change conditions."

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SASSCAL Pillars of Operations

SASSCAL
Southern African
Science Service Centre for
Climate Change and
Adaptive Land Management

capacity development

training & education of next
generation of scientists
instutional capacity
& infrastructure

research

improve CC research
infrastructure & capacity
in Africa & provide
scientific scenarios to
enhance resilience to CC

application-oriented
demand-driven
programmes/projects

generation
& transfer
of knowlegde

One-stop
Science
Center

capacity
development
of national &
regional actors

management
concepts & scenarios
reserach coordination

service & advice to policy- & decision-makers

dissemination of
Information for decision making
access to data
crisis management

Thematic area	Angola	Botswana	Germany	Namibia	South Africa	Zambia	Total
Climate	1	3	3	2	1	1	11
Water	3	2	6	3	2	2	17
Forestry	1	2	2	3	1	3	12
Agriculture	3	2	8	3	1	4	21
Biodiversity	4	3	2	6	1	2	18
Cap-Dev	1	2	1	2	0	2	8
Total	13	14	22	19	6	14	88

Initial funding + 50 Mio. €

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SASSCAL Miombo research

Various Miombo related research projects

- Deforestation monitoring (Angola, Zambia)
- Forest inventory (Zambia, Angola, Botswana)
- Long-term biodiversity monitoring (Namibia, Zambia, Angola)
- Perception of natural forests by local communities (Angola, Zambia)
- Climate change adaptation strategies in dryland forests (all)
- Forest resource utilization and assessment from community perspective (Botswana, Zambia)
- Extent and impact of char coal production on woodlands and communities (Angola, Zambia, Botswana)
- Timber trade (Angola, Namibia)
- Ecosystem Services (Zambia, Angola, Botswana
- Human-Wildlife conflicts (Zambia, Botswana)

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Methodologies and approaches

- Set up of standardized observatories for long-term monitoring
- Mapping forest resources across scales (field, province, national, regional)
- Ecosystem research (e.g. pollinator studies, fire impact, genetics)
- EO-based technologies for inventories and assessments
- Fire detection/analysis using time series of EO-products
- Valuation techniques for economic assessments
- Stakeholder involvement (Household interviews, institutional analyses)
- Analysis of legal frameworks and policies
- Various training efforts

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Forest density maps (e.g Zambia)

- Merging various high-resolution EO-based data products (e.g. crown density, tree height) with Landsat composite to derive vegetation densities (operational routines)
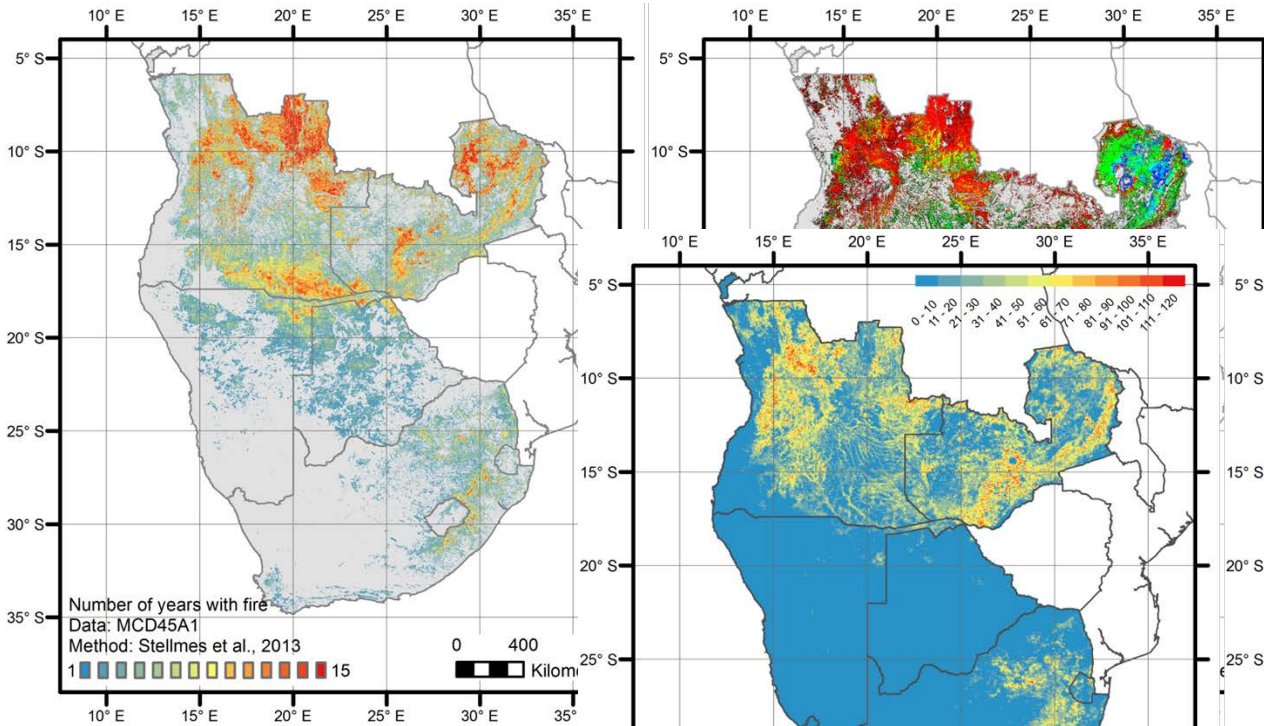
→ base for inventories and disturbance assessments
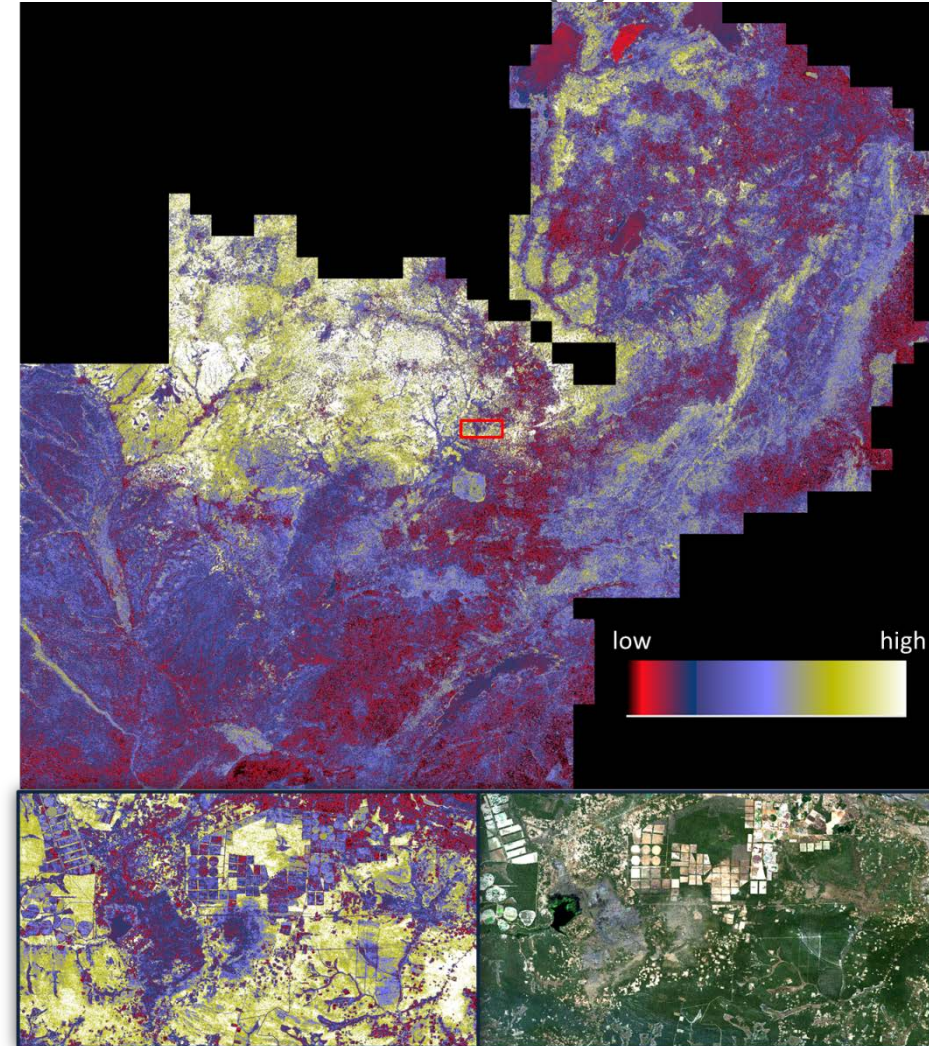
Density map for Zambia, derived from ICESAT-GLAS Full Waveform Laserscanning Data and a Landsat-based composite (2008, ±2 Years, Stellmes et al. 2015, in prep.)
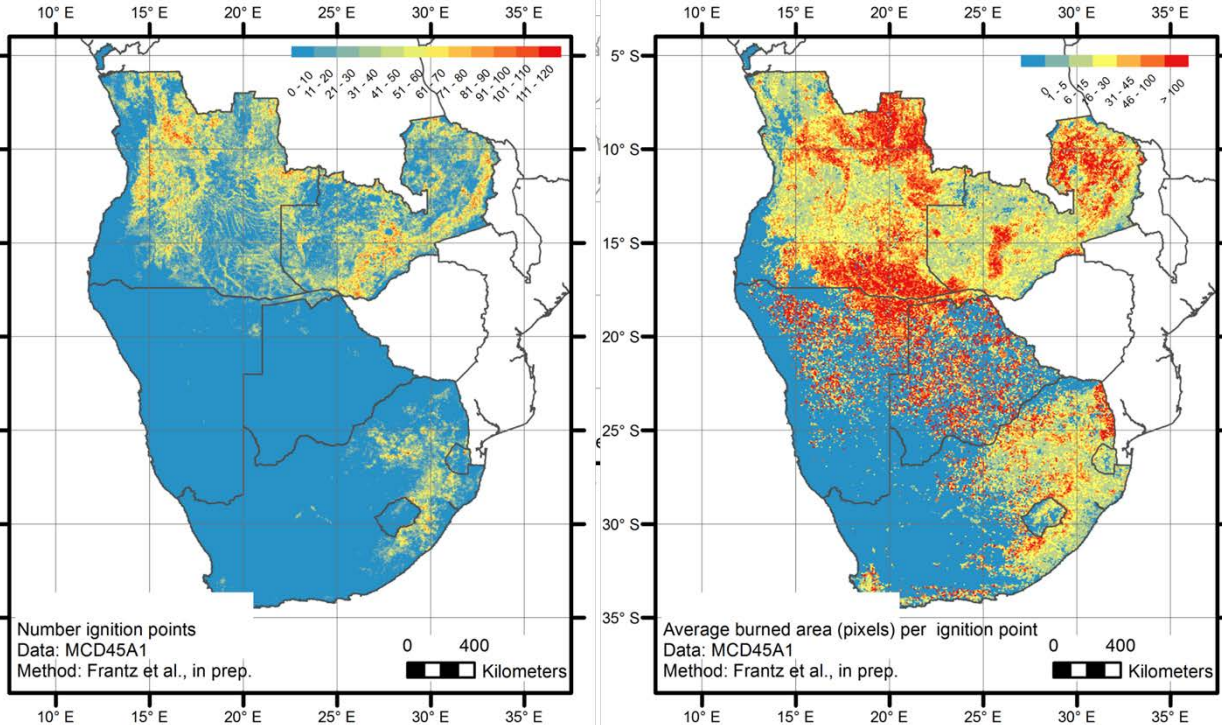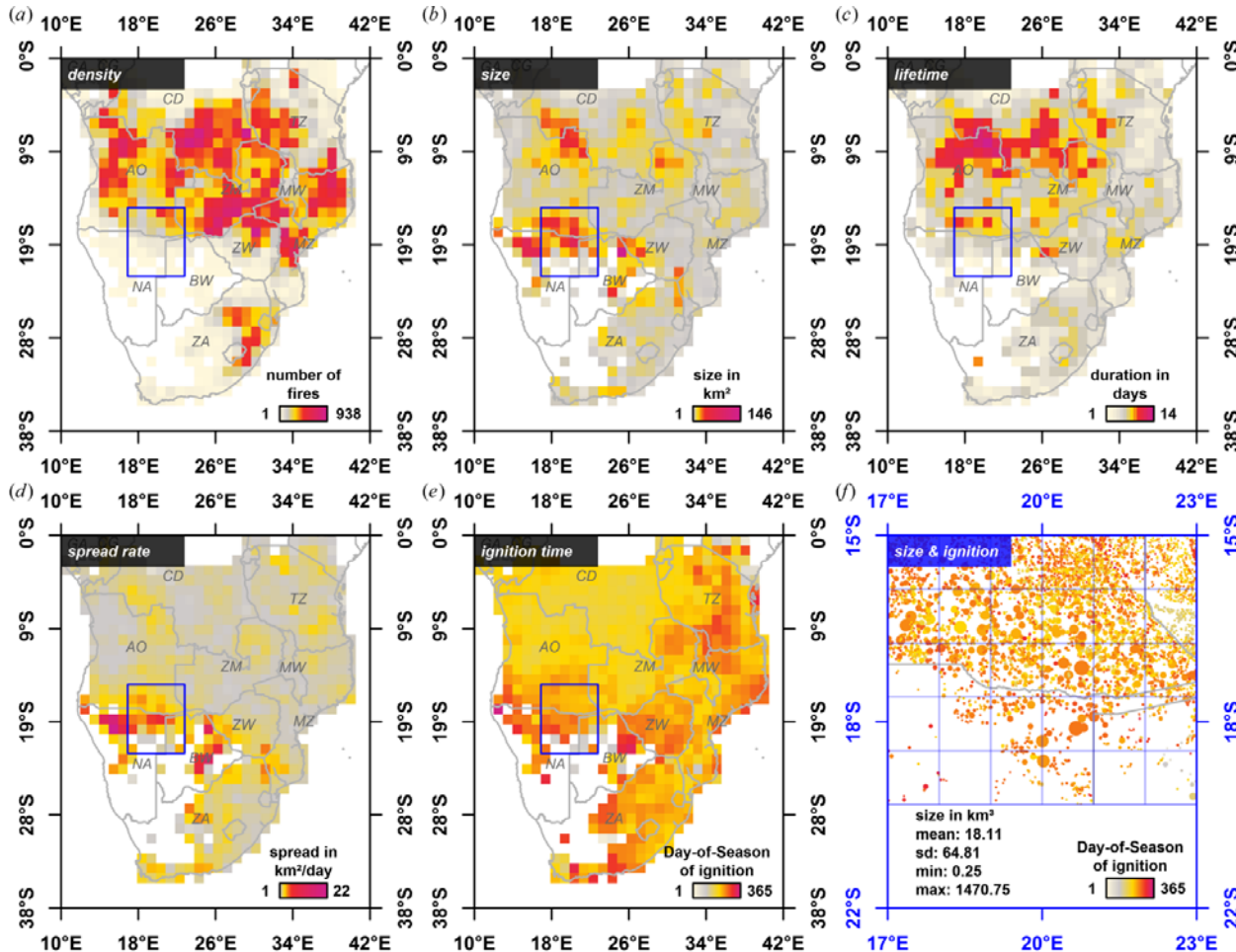
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Fire monitoring

Fire frequency and saisonality

Number of fire ignition points and av. burned area/ignition point

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Fire monitoring and assessment

Aggregated fire descriptors based on object-based analysis (2006): 1-degree cells were used for averaging

Frantz et al. (in review): Fire spread from MODIS burned area data: obtaining fire dynamics information for every single fire. International Journal of Wildland fire.
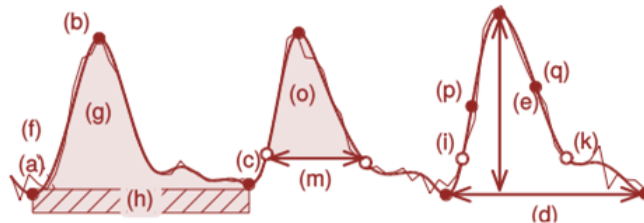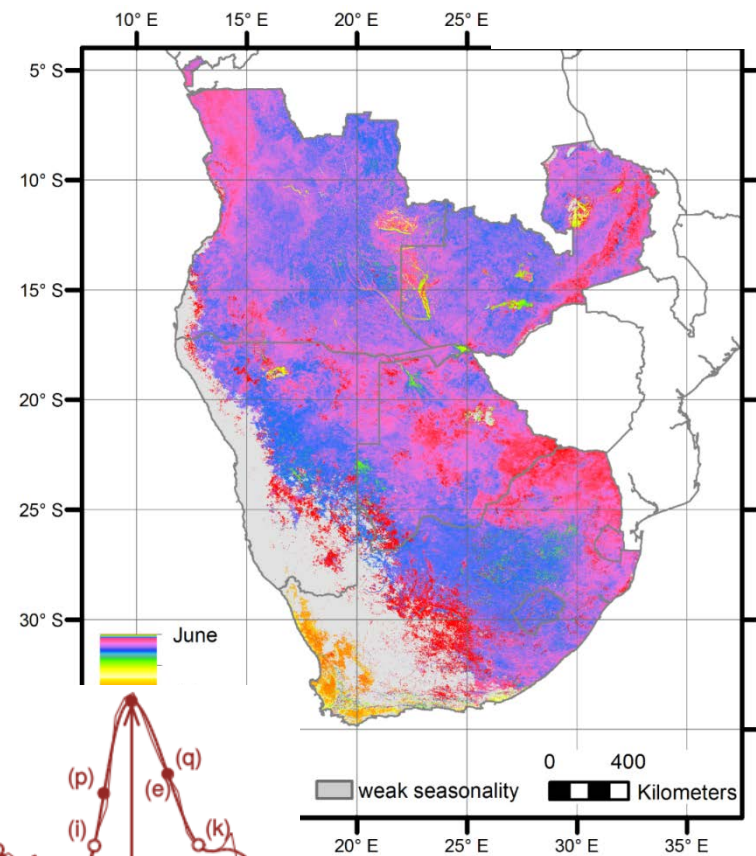
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Phenological cycles

DOY start season
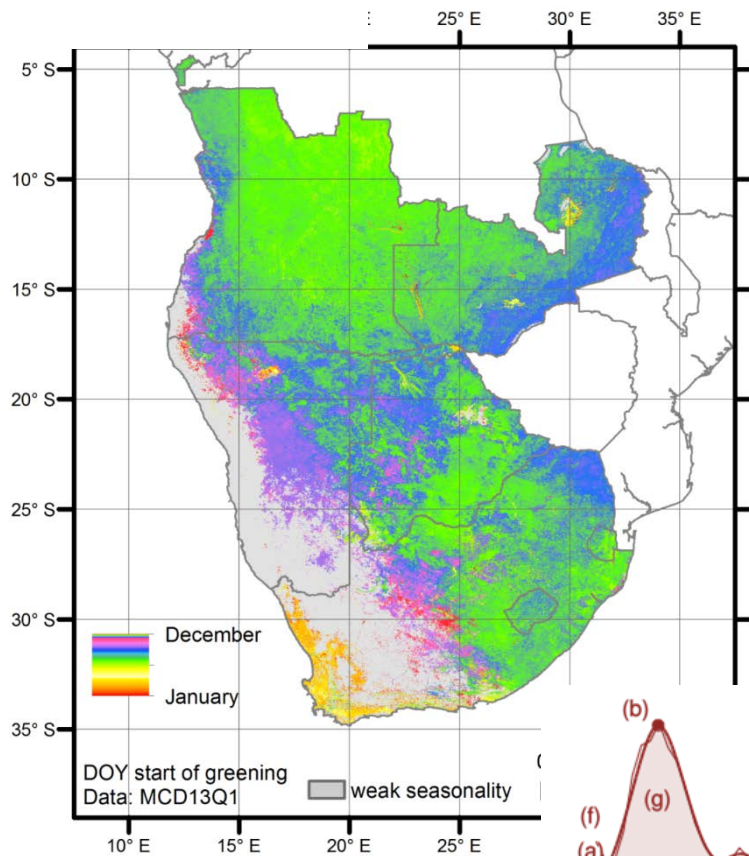
DOY end season

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a) sieving of soil b) identification of seeds in soil seed bank c) planted *Pterocarpus angolensis* seedling
d) subplot after sieving of the soil (photos C. Mubita)

- Studies on supported regeneration of native timber species in Namibia and Zambia
- Capacity development for students and local communities
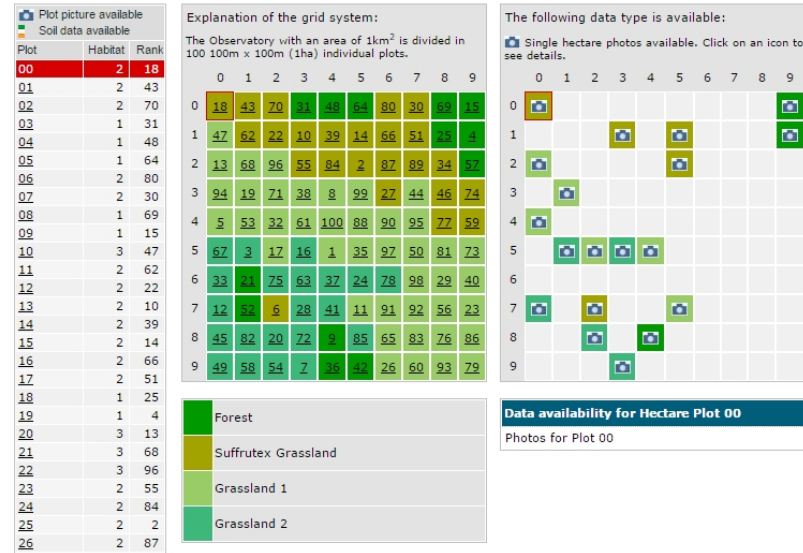
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SASSCAL ObservationNet

Cameia National Park (S76) - Infosheet

General Data

Number	Name	Alternative Name
S76	Cameia National Park	n.a.
Implementation	**Country**	**Province/ Region**
May 2016	Angola	Moxico
District/ constituency	**Locality**	**Farm Name**
Cameia	n.a.	n.a.
Latitude	**Longitude**	**Altitude**
-11.5269772 S	20.91333872 E	1132 m a.s.l.
Rainfall Season	**Biome**	**WWF Ecoregion**
Summer	Western Zambezian Grasslands	AT0724

Cameia National Park (S76) - Ranking of the 1ha plots

- Longterm Biodiversity Monitoring on > 45 Observatories

- > 25 000 vegetation relevés in the SASSCAL region

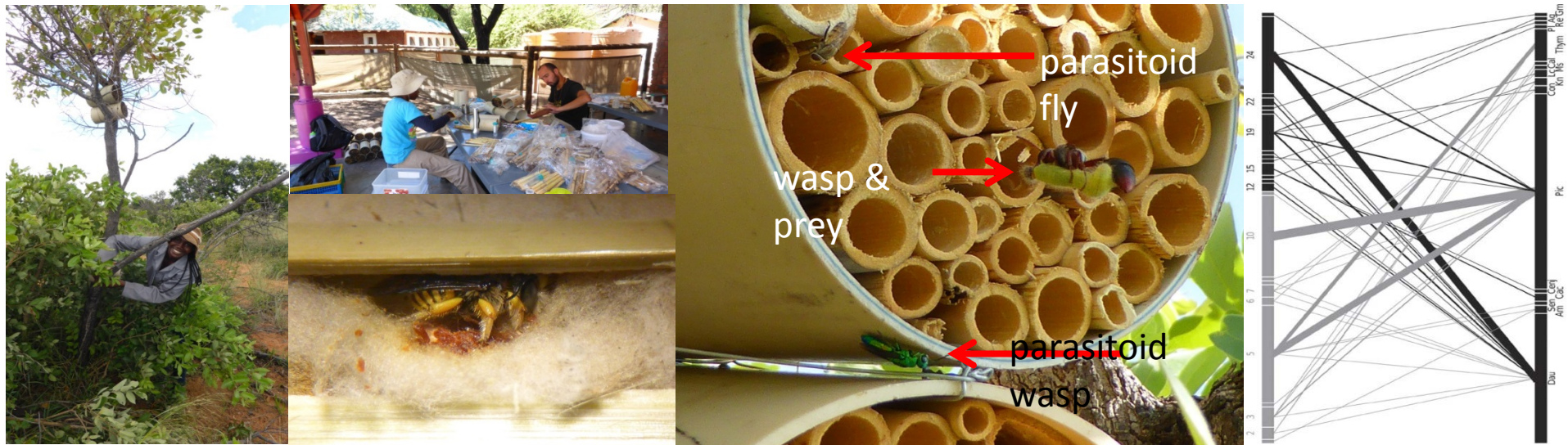- a wide spectra of information on species, environmental conditions

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SASSCAL Miombo research

Deforestation in Huambo Province

- Combined EO-products analysis and field work
- Results:
  - Species richness evaluated and reported;
  - Assessment of charcoal production (incentives, quantitities)
  - Fast deforestation due to a lack of a sound forest management plan;
  - Continuous Degradation of the Miombo forest;
  - Low biomass potential;
  - Low charcoal production potential due to overexploitation.

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SASSCAL Miombo research

parasitoid fly

wasp & prey

parasitoid wasp

Pollinator studies from diversity of native pollinators to improve honey production for local smallholders

- Predator and pollen feeder inventories, food webs, pollination of native plants and crops.
- Several projects conducted in Angola, Germany, Namibia and Zambia

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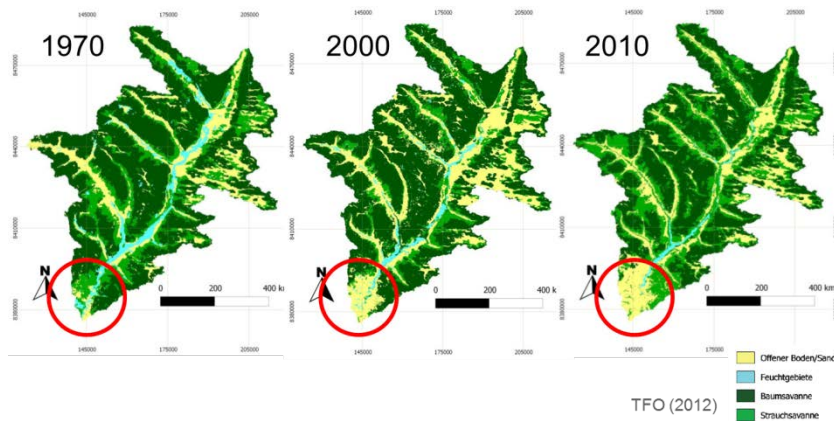Adaptive Land Management

Honey production in Zambia

- 130 kg of comb honey harvested in 2015
- Draft Beekeeping Manual produced
- Preliminary findings on effect of hive position on bee occupation and guidance for local bee-keepers
- Hygiene standards for bee yards to reduce pest or disease attacks

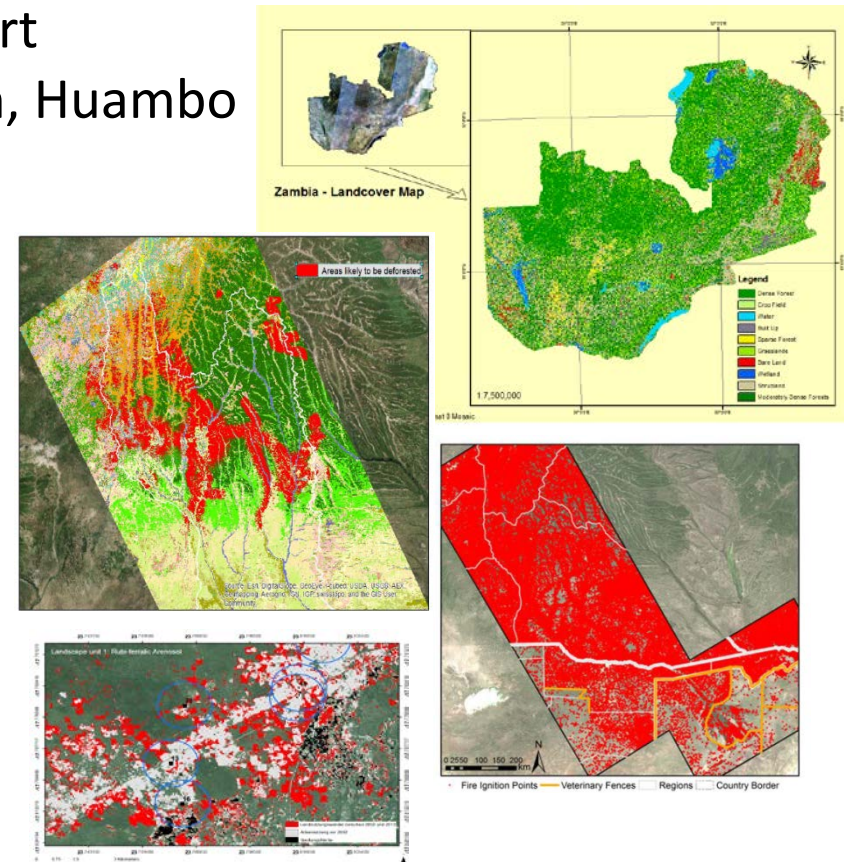## Woodland/Forestry perception (Angola, Zambia)

- Agricultural development is accepted as concept for future, thus strong focus on agricultural expansion
- Increasing demand from urban areas (main driver)
- Immediate monetary value of forest resources
- Afforestation (Eucalyptus) as political instrument

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SASSCAL Cross-cutting

LULC change mapping and assessment

- Preliminary nationwide landcover mapping results with true colour mosaic (432 band combination) insert
- Deforestation mapping (KAZA region, Huambo Province and other areas)
- Detection of land cover change and urban sprawl in Angola (below) and Zambia

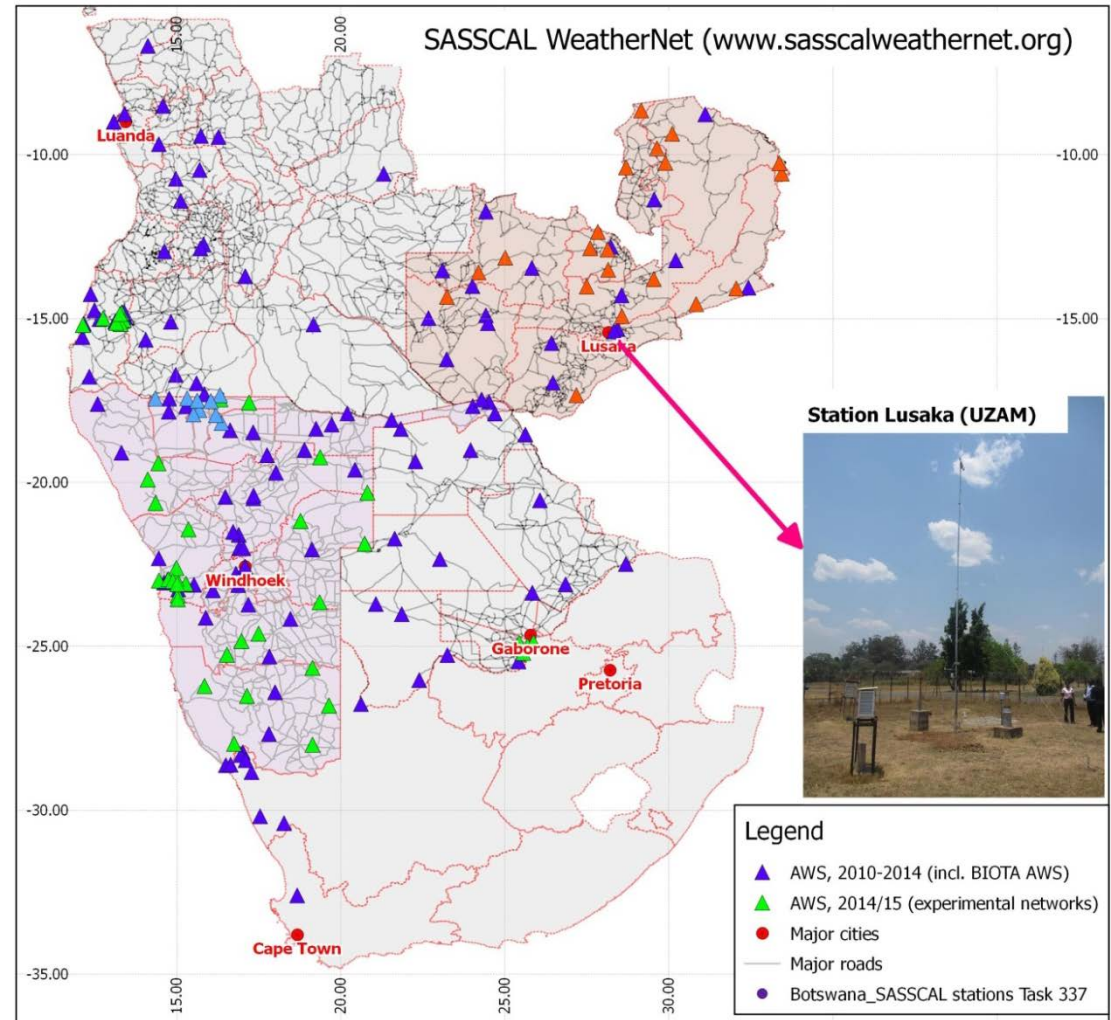Land cover change, Cuebe River Basin (1970-2010)

SASSCAL Services

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SASSCAL WeatherNet

- Regional coverage
  - 161 AWS in operation
  - 129 online (2016)
  - Additional M/AWS on observatories

- 3 experimental networks
  - Rio Giraul (10 AWS+)
  - Gobabeb (10 AWS)
  - Notwane (5 AWS)

→ Detailed assessments on flash flood generation, sedimentation and fog

SASSCAL WeatherNet (www.sasscalweathernet.org)

Station Lusaka (UZAM)

Legend
- ▲ AWS, 2010-2014 (incl. BIOTA AWS)
- ▲ AWS, 2014/15 (experimental networks)
- ● Major cities
- — Major roads
- ● Botswana_SASSCAL stations Task 337

SASSCAL Capacity Development

Graduate training and MSc programmes

- Supervision of BSc (35), MSc (37), PhD (3) and Post-Doc students

- International Programme on 'Applied Science on Earth Observation, Geographic Information Systems and Remote Sensing' (UNZA, NUST, UB, CPU)

- Dryland Forestry at University of Stellenbosch (SUN Forest Science 880, 7 modules completed)

Other study/training programmes:

- Climate Change related courses → Accreditation of the Curricula for MSc 'Meteorology' through ZASTI, Zambia

- Monitoring, Evaluation and Management of Biodiversity

- Community capacity for NRM and Monitoring, e.g workshops on best practices, forest conservation etc.

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Conclusion

Multi-scale Research on Miombo woodlands

- Interdisciplinary research addressing a wide range of aspects
- Linking basic research (observation & system understanding) and frontier science (modelling and (change) assessments)
- Improving data situation (incl. data rescue), developing innovative tools (EO fire products) and new knowledge

Challenges

- Poor technical infrastructure and human capacities
- Lack of legislations (law enforcement weak)
- Community involvement, training and acceptance
- Approaching decision making level (interest, willingness)
- Multinational activities → policy advice

SASSCAL – The way forward

→ next phase**: 2017 - 2020/21**(funding by BMBF secured, add. funding expected → EU, WFP, BMBF …), additional infrastructural developments/investments

→ Establishing the institution SASSCAL as a **research management facility**

→ continuation with **graduate programmes** and focused **research projects** (research agenda SASSCAL 2.0)

→ strengthening and further establishing **partnerships** at all levels (local/national/regional/continental/global) → through joint research and HRCD efforts (additional programmes and fundraising)

→ strengthening the SASSCAL **OADC** to become a strong data/information/knowledge broker in the region

→ strong focus on the **service component** for decision support (stakeholder interaction)

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SASSCAL – The way forward

Socio-economic/anthropogenic drivers	1. Linkage between biodiversity, ecosystem services and human well-being (e.g. poverty, lack of equity) 2. Sustainable biodiversity utilisation (e.g. Poaching, reed harvesting, logging) 3. Land use management (e.g. agricultural intensification, land grapping, energy demand)
Bio-physical drivers and processes	1. Population dynamics (e.g. diseases, predation, resource competition, genetic biodiversity) 2. Land cover change (e.g. deforestation, habitat connectivity, wildlife mobility, bush encroachment, 3. Functional heterogeneity 4. Fire pattern 5. Climate variability (e.g. drought/floods induced mortality)
Institutional/Management Drivers	1. Sustainable land management (e.g. DSS, policies, Integrated Ecosystems Assessment) 2. Economic valuation of biodiversity and ecosystems services 3. Biodiversity observation (incl. assessment) 4. Conservation management (trans-boundary)

Thank you for your attention!
Muito Obrigado!

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W³: www.sasscal.org

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