SALLnet Newsletter, November 2020

Dear SALLnet members,

in September our 2nd Annual Meeting was conducted online. It was good to see all of you at the meeting, and we are very glad to have had the opportunity to invite at least some of our key stakeholders and to have so many fruitful discussions with you: Thank you very much!
To facilitate further exchange, we will use the current newsletter mainly to document the meeting. Apart from that we have included everything in this document that might be of interest for you.

Take care and stay well!

The current issue contains:

SALLnet's 2nd Annual Meeting

Not all of our 35 participants on the first meeting day could have been viewed on one screen. But we managed to take a screenshot at least of some of us.

Sallnet's 2nd Annual Meeting was held online on the 14th & 15th September 2020.

In our interdisciplinary research project, we ask **how the resilience of the multi-functional landscapes in southern Africa can be enhanced under the conditions of climate change**.
Focusing on the Limpopo region because of its diverse land-use, biodiversity and high spatiotemporal climatic variability, we are developing and testing new approaches and methods for more sustainable land-use, with a focus on the interactions between the connected land-use types: arable lands, rangelands and tree orchards.

In SALLnet, six German and five South African partner institutions cooperate, researchers from different disciplines contribute and stakeholders from different spheres are involved. To reach SALLnet's main objective, developing feasible and acceptable land-use scenarios and sustainable management options the **2nd SALLnet Annual Meeting** served:

- to assess and monitor the scientific progress made in SALLnet,
- to plan and strengthen further collaboration,
- to discuss general project as well as scientific issues, and
- to exchange with each other and with stakeholders on important topics and developments.

After a brief welcome and general introduction from the German and South African project coordinators, Reimund Rötter, Kingsley Ayisi and Peter Taylor, we started with a reporting session followed by some discussion on collaborative activities and project issues.

2nd Annual Meeting: Progress reports, collaborative activities and project Issues, 14 September

Progress Reports WPs 1–7

Progress reports – WP 1

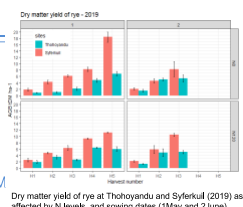- Investigating livestock – feed system in Limpopo
  - ➤ Survey (90 farms across 3 different AEZ)
  - ➤ Cattle tail switch hair
  - ➤ Cattle dung
  - ➤ Soil and forage samples
  - Missing context specific feedgaps (2021)

  - • Intensive laboratory analyses (isotopic analyses, NIRS, etc.)
  - • Survey data analysis and paper writing

- Integrating multi-functional cover crops into crop – livestock system
  - ➤ 2 seasons of field trials at Göttingen (completed)
  - ➤ 1 season trial in Limpopo → Missing second season (2021)

- Building forage crops growth models using APSIM
  - ➤ Data collection in progress (2021)

Dry matter yield of rye - 2019

Dry matter yield of rye at Thohoyandu and Syferkuil (2019) as affected by N levels and sowing dates (1May and 2June)

15.10.20   SALLnet: 2nd Annual Meeting September 2020   1

Progress reports – WP 2: Rangelands & Agroforestry

Status quo and general achievements

General Challenges:
- Travel restrictions
- Field work interruption – resuming field work under difficult conditions (everything dry)
- Postponed events (R workshop; Ecologocial field methods workshop)
- Postponement of REFA campaign
- Planning insecurity
  - Further COVID 19- restrictions in 2021?
  - Project extension?

Successes:
- Field work with minor adaptations completed
- 2 thesis completed (Bachelor / Master)
- 1 paper submitted
- Compilation of DroughtAct data
- New master student recruited

Field work Haenertsburg

Field work Syferkuil

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WP 3 Biological pest control and pollination in macadamia orchards
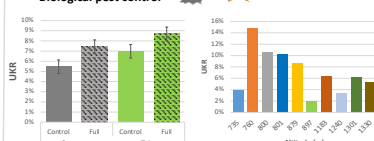**Effects of landscape composition and altitudinal gradients (pollinator/predator trials)**

Preliminary results:

Pollination

Biological pest control
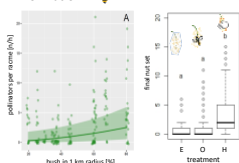
- Ratio of bush in landscape enhances pollinator abundance.
- Hand pollination (H) results on average in a 6 times higher final nut set compared to open pollination (O) and pollination exclusion (E).

- Insect damage (UKR) decreases with altitude
- Related to temperature? Natural habitat? Tree age?
- Higher unsound kernel where predators were excluded (Full 8% cf. Control 6%)
- Higher damages at the orchard edge (8%) compared to the center (6%)

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1. **WP 4: Status quo and general achievements** 2. Important concrete findings, and/or achievements 3. Collaboration: Offers and expectations 4.General challenges

❖ **Small-scale farmer survey**

- Survey between April 2019 - July 2019 referring to previous summer cropping season (Nov 2018 – Mar 2019)

- Data of 212 small-scale farming households among 5 villages:

  - ✓ **Mafarana**: 28 farmers
  - ✓ **Gabaza**: 25 farmers
  - ✓ **Makhushane**: 53 farmers
  - ✓ **Selwana**: 50 farmers
  - ✓ **Ndengeza**: 56 farmers

As a basis for the identification and discussion of collaborative activities and project issues the work packages of SALLnet were asked to **report** on the tasks carried out within the last year since the 1st SALLnet Annual in September 2019.

For reporting, work packages were asked to present:
- the status quo and general achievements,
- important concrete findings, and/or achievements,
- including information on their offers and expectations regarding existing and potential further collaboration within SALLnet, and
- general challenges, e.g. related to covid-19 restrictions.

Work package presentations showed what surveys, experimentations, and other project tasks could be carried out over the last year ahead.

To access the single progress reports please click on the slides of the WPs. The reports can as well be accessed here and on our Google drive.

Despite covid-19 restrictions, reports showed that within SALLnet the integration of results has already started to a large extent. **However, the question of how innovation can be integrated at different levels, regarding different disciplinary approaches and different assessed regions, is yet to be solved.** To do so, our approach was to discuss our options and define potential joint activities, discuss their feasibility, prioritise them and further develop them into more concrete tasks. In a first step, the following **potential joint activities** were identified:
1. Rapid ecosystem function assessment (REFA), potentially socio-economic input to be added,
2. Economic aspects in macadamia,
3. Economic assessment on household level: sustainability and climate smart agriculture,
4. Integrated livestock: linkages between two different land use types by animals (aDGVM, APSIM and potentially economical perspectives).

Apart from that, **two other important issues** have been raised:
1. Stakeholder information needs and the facilitation of research results,
2. Data gaps and how to deal with them.

In a next step, concrete **potential joint publication projects** have been discussed, such as:
1. The SALLnet Perspectives paper, of which a first draft has been submitted. If accepted, the paper would be used to present modelling opportunities, preliminary results of SALLnet and an outlook.
2. Efficiency analysis paper (Jan-Henning Feil, Reimund Rötter, Kingsley Ayisi): small-scale farmers, production and efficiency, irrigation and access to water, use of technology.
3. Integrated modelling (William Nelson, Jan-Henning Feil): Crop modelling and agent-based modelling results.
4. Cluster analysis (Jan-Henning Feil): potential future linkages to others.

WP5 Arable & macadamia systems

1. Smallholder water management adaptations to climate variability and drought events in Limpopo (Carlotta May MSc thesis)

2. RSA field experiments as extension of prior work:

   mz-lablab: Rapholo et al. 2019
   rotations: Hoffmann et al. 2020

3. Detailed collection of macadamia system to develop the first macadamia system model

   2x years; 2x farms; 2x orchards; 2x variaties; 15x trees

SALLnet annual meeting, September 2020

Progress reports – WP 6, Climate change, land use and nitrogen dynamics in rangelands

Model development

• Implementation of new litter decomposition and SOM turnover schemes based on CENTURY/ORCHIDEE-CN

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WP 7: Status quo and general achievements

Soil database development

- Ground-truthing data analysed
        +
- Other soils from various sources
   - Soil data from other WPs required

Climate analysis / assessment

- Analysis & quality check of baseline data – available for SALLnet partners
- Assessments of scenario projections sources

5. Feed gaps (Sala Lamega, Jan-Henning Feil): specific small-holder needs, can be further developed with economists Modelling (Sala Lamega, Simon Scheiter): APSIM/LIVSIM and aDGVM.

6. Macadamia model (Thomas Bringhenti, Peter Taylor, Catrin Westphal): to be further developed with additional data on pest control and pollination into a policy paper for the macadamia industry on integrated pest control – not to be realised for near future management options, but to be integrated in overall model to develop more applied perspectives for macadamia farmers.

The potential papers discussed at the meeting, have been added to SALLnet's planned papers list, to be accessed on our Google drive.

In our discussion, the opportunities to further develop these potential projects has been assessed. Some ideas were deemed unachievable, but will be kept in mind for future discussions. The following four topics/ issues have been considered **highly relevant for our current work**:

1. REFA
2. Integrated livestock: aDGVM and APSIM
3. Stakeholder information needs and the facilitation of research results: Policy briefs
4. Data gaps

These topics/ issues have therefore been discussed in four **breakout groups** to enable a more specific exchange regarding the approaches, experiences, and opportunities for collaboration across the entire project to develop concrete objectives and networks, and define next steps.

Results of the discussions are to be found here and on our Google drive.

The following plenary discussion was used to exchange results of the breakout group discussions and to provide the participants of the meeting with general information regarding the **SPACES II program**, as there are:

1. the planned SPACES II book project, and
2. the SPACES II Midterm Meeting on the 21st of October.

2nd Annual Meeting: Stakeholder day, 15 September

Frank Makhomisane

Derick Thobejane

FREDERICK SHOKANE
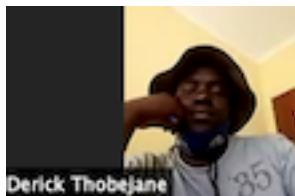
The second part of our meeting was dedicated to exchange with our key **stakeholders**. Due to travel and technical restrictions during the Corona pandemic, we haven't had the opportunity to meet with a bigger number of stakeholders. We nevertheless managed – due to the great support, mainly of Kingsley Ayisi (University of Limpopo) and Peter Taylor (University of Venda) – to invite stakeholders from many disciplines important for SALLnet: farmers (smallholders, emerging, commercial), scientific institutions, NGOs, and policy makers. Special thanks go to Sanari Moriri (University of Limpopo) for her support in enabling the participation of farmers from the villages our research mainly focusses on to take part in our online meeting and to enrich the discussion!

3

Our Stakeholder Meeting started with a presentation by SALLnet on the main objectives of our project and of the Stakeholder Meeting, followed by more specific input from our researchers on the following **four topics, that have been identified to be of potentially particular interest for our stakeholders**:

1. Irrigation
2. Nutrient, pest and disease management
3. Livestock management
4. Agricultural extension

The abstracts of these presentations can be accessed here and on our Google drive.

In addition, we have asked our key **stakeholders** for **input** from their perspective regarding:

1. Experiences, challenges, and needs in farming,
2. The relevance of conservation for inclusive rural economic development,
3. Policy imperatives related to conservation agriculture, and
4. Challenges for water, food, and energy security.

Based on the informed input of our stakeholders, we discussed the above-mentioned topics in four breakout groups. This developed more concrete concepts of how to tailor potential recommendations based on SALLnet's findings for sustainable management options for the ecosystems in the Limpopo region. These spanned more concrete recommendations for farmers to policy recommendations on a local or even national level.

In a plenary session, the results of the breakout groups were presented. In the meantime, these results were put into writing, which will be utilized to apply our research results to the specifics needs of our stakeholders.

The results of the discussions are to be found here and on our Google drive.

Further Material of the 2nd Annual Meeting

The following documents can be accessed here:

SALLnet Meeting, 14 September
- Meeting program
- Participants list
- Progress reports: presentations of all WPs
- Results of discussions in breakout groups on 14 September: Project activities and issues

Stakeholder day, 15 September
- Stakeholder day: program
- Stakeholder day: presentations by SALLnet (abstracts)
- Results of discussions in breakout groups on 15 September: Stakeholder day

These materials and further information have been as well added to the SALLnet Google drive.

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Publications of SALLnet members

Large uncertainties in future biome changes in Africa call for flexible climate adaptation strategies

Martens C, Hickler T, Davis-Reddy C, Engelbrecht F, Higgins SI, von Maltitz GP, Midgley GF, Pfeiffer M and Scheiter S (2020)

In a joint effort of South African and German scientists and a collaboration between SPACES projects EMSAfrica and SALLnet, we found large uncertainties in projections of future biomes in Africa. Climate change and elevated CO_2 are expected to drive vegetation changes in Africa. We used an ensemble of dynamic vegetation model simulations with the adaptive Dynamic Global Vegetation Model (aDGVM) to assess impacts of these drivers on carbon stocks and biomes until 2099. Downscaled high-resolution climate data from six general circulation models (GCMs) for two mitigation scenarios (representative concentration pathways, RCPs 4.5 and 8.5) from the Council for Scientific and Industrial Research in South Africa (CSIR) were used for these simulations. We assessed the direct effects of climate change and elevated CO_2 on vegetation change and its plant-physiological drivers.

Climate change and elevated CO_2 led to an 18 to 61% increase in carbon stocks, which was primarily driven by CO_2 fertilization (Fig. 1). Associated biome changes are likely across Africa, especially woody encroachment with changes from savanna to forest (Fig. 2). Disabling CO_2 fertilization resulted in a -22 to +11% change in carbons stocks. Direct effects from elevated CO_2 were associated with substantial increases in water use efficiency, primarily driven by photosynthesis enhancement. At the ecosystem level, interactions between fire and woody plant demography further promoted woody encroachment.

We conclude that substantial future biome changes due to climate and CO_2 changes are likely across Africa. The large uncertainties in future projections imply that adaptation strategies need to be flexible and that focused research on CO_2 effects is necessary. For more details, please have a look at our publication in Global Change Biology (doi: 10.1111/gcb.15390).
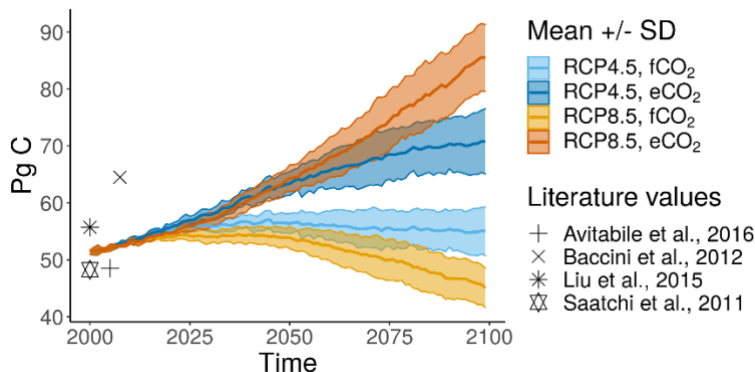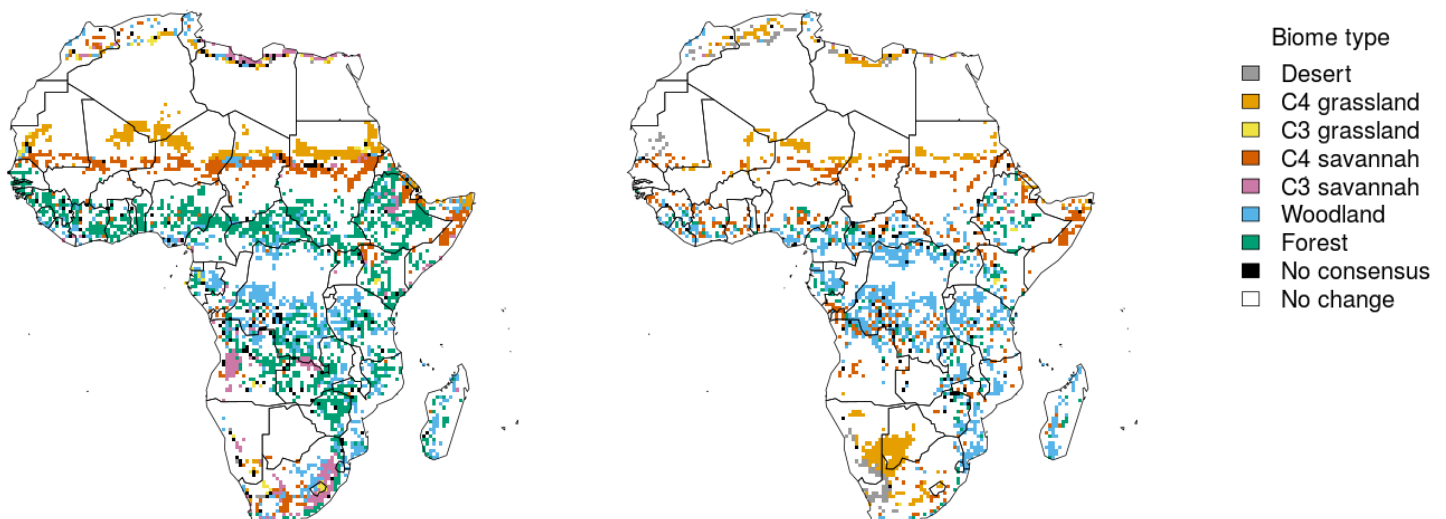

Fig. 1 (left): Carbon in aboveground biomass in Africa from 2000 to 2099.

Fig. 2 (below): Biome changes under RCP8.5 from 2000–2019 to 2080–2099 under climate change with elevated CO2 (left) and CO2 fixed at 400ppm (right).

Disentangling Drought and Grazing Effects on Soil Carbon Stocks and CO₂ Fluxes in a Semi-Arid African Savanna

Munjonji L, Ayisi K K, Mudongo E I, Mafeo T P, Behn K, Mokoka M V and Linstädter A. (2020) Frontiers in Environmental Science. doi: 10.3389/fenvs.2020.590665

University of Bonn, Germany found that drought can reduce CO_2 fluxes and increase carbon storage in the soil. The study was conducted within the "DroughtAct" experiment, which combines grazing and centennial-scale drought treatments.

Fig. 1: Measuring CO_2-Fluxes from the soil. Photo: L. Munjonji

Our study sought to disentangle joint effects of long-term drought and grazing on soil carbon stocks and CO_2 fluxes, focusing on a semi-arid African savanna grassland. Information on joint grazing and drought effects are limited, despite the wide distribution of dryland grasslands and their importance for ecosystem service provision. We installed 32 CO_2 chambers in the DroughtAct experiment (Fig. 1) which measured CO_2 fluxes over one growth period.

We found CO_2 fluxes to strongly respond to the 5-year experimental drought (Fig. 2). Extreme drought reduced CO_2 emission rates by 32% compared to ambient conditions. CO_2 fluxes averaged 5.7 mg m^{-2}min^{-1} under drought compared to 8.3 mg m^{-2}min^{-1} under ambient conditions. CO_2 fluxes were however not influenced by grazing. At the end of the growth period, grazed plots under ambient rainfall had released 16.3 tons of CO_2 ha^{-1} which was 58% higher than observed on grazed plots subjected to severe drought. Soil carbon stocks were higher under drought conditions due to slower decomposition rates (Fig. 3). Our study revealed that long-term extreme drought may be favorable in terms of preserving the existing soil carbon stocks through reduced CO_2 release. This finding is critical for understanding future soil carbon dynamics in dryland grasslands in the face of climate change.

Fig. 3: Effect of drought and grazing on C stocks. (A) The impact of the main effects (drought (D+) and grazing (G+)) on soil carbon stocks in comparison to ambient rainfall (D-) and no grazing (G-); and (B) combined effect of drought and grazing on soil carbon stocks. Different lowercase letters indicate significant differences among treatments (P < 0.05).
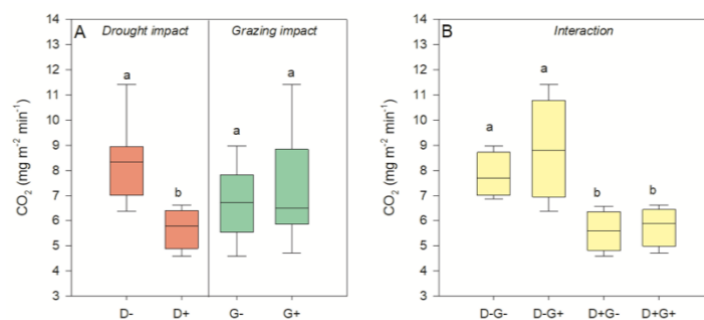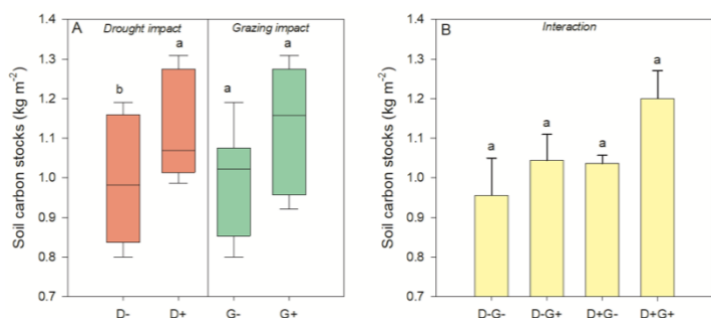

Fig. 2: Effect of drought and grazing on CO2 fluxes over one growth period. (A) Impact of drought (D+) and grazing (G+) in comparison to ambient rainfall (D-) and no grazing (G-); and (B) combined effects of drought and grazing on CO_2 fluxes. Different lowercase letters indicate significant differences among treatments (P < 0.05).

Upcoming Events

AGU Fall Meeting, San Francisco: Shaping the Future of Science

1–17 December 2020
AGU Fall Meeting will be mostly virtual and will remain the global convening meeting for the earth and space sciences community.
Fall Meeting sessions will include:

- COVID-19, from lessons learned in earth and space sciences to ideas for what to do to advance research when one can't be in the field or in the lab.
- Actions the earth and space sciences should take to remove discrimination and eliminate racism to improve diversity and inclusion.
- How to better communicate your science to policymakers, reporters, voters and other key audiences.

Further information please find here.

Calls

Biennial Africa Climate Smart Agriculture Stakeholders Conference

Deadline (extended): 15 November 2020

1–2 December 2020
Biennial Africa Climate Smart Agriculture Stakeholders Conference
The central objective of the conference is to foster continental and national Climate Smart Agriculture readiness to advert the negative effects of climate change and ensure the sustainability of agriculture, food and nutrition security, taking a food systems approach.

Further information please find here.

Global Forum for Food and Agriculture: How to Feed the World in Times of Pandemic and Climate Change?

Deadline: 22 November 2020

18–22 January 2021
The **13th Global Forum for Food and Agriculture (GFFA)**, the international conference on key issues regarding the future of the global agri-food industry, hosted by the German Federal Ministry of Food and Agriculture (BMEL), will be held on 18 – 22 January 2021, and for the first time in a virtual format.

For the *Think Aloud*! GFFA Science Slam which will also take place once again this year. The organisers welcome applications from creative and innovative scientists from around the globe.

Further information please find here.

Landscape 2021: Diversity for Sustainable and Resilient Agriculture

Deadline (extended): 15 November 2020

20–22 September 2021
Landscape 2021 will bring together scientists from across disciplines with key actors to explore whether and how diversity and diversification can contribute to a more sustainable and resilient agriculture.

We call for sessions, masterclasses, and presentations of products about social science and natural science analysis on diversification in:

- Cropping and grassland systems
- Farming systems
- Landscape management systems
- Public and private governance systems
- Food systems
- Cross scale systems

Further information please find here.

Information on SALLnet are as well to be found on our Website and on our Google Drive. Access will be granted to everyone using the links implemented into this document. The Google Drive can as well be accessed via the link Project Documentation on our website for those of you who are registered. To register please send your google address to SALLnet's coordinator.

To keep these formats updated and useful for you, please provide us with further project information (at any time) and insert changes regarding your projected field stays into our Calendar – thank you very much!

We also recommend to visit the SPACES II website, where all capacity building courses of SALLnet and the entire SPACES II programme are announced (with access to the application tool).

SALLnet – South African Limpopo Landscapes Network

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