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What drives the intra-annual variation of an invertebrate assemblage in a grassland habitat?

Falko Buschke & Marthie Kemp
Centre for Environmental Management, University of the Free State.
buschkeft@ufs.ac.za

Ecosystems are complex, multi-faceted systems where consumers interact with the abiotic environment, producers and other consumers. Arthropod assemblages have been suggested as indicators for grassland ecological integrity, but little research has been done on what the drivers are of assemblage formation. This study, carried out at the Free State National Botanical Gardens, aimed to determine how arthropod communities related to physical factors and vegetation composition. Similarity matrices of arthropod assemblages, vegetation communities and physical distances between samples were analyzed using Spearman correlations in partial Mantel tests. Results indicated that invertebrate communities showed highly variable relationships with physical and vegetation factors. For the greater part of the year, arthropod assemblages appeared to be structured by physical factors. Assemblages were however significantly correlated ($p < 0.05$) to vegetation during periods of particularly high and low primary production as well as during periods of accelerated vegetative growth. It was concluded that multiple factors influence invertebrate assemblages at different times of the year and, if arthropod communities are to be used in bioassessment, attention must be drawn towards this fact.

Key words: *Arthropods, bioassessment, insect-plant interactions, Mantel test, intra-annual variation.*

Mechal - Developing adaptive management strategies by small-scale farmers in semi-arid South Africa and Ethiopia under changing climatic and policy conditions

Keywords: climate change adaptation, livelihood strategies, Ethiopia, South Africa, participatory action research

Archer, E.1, Bekele, T.2, Kassa, H.3, Kassa, K.4, Koelle, B.5, Lötter, D.1, Oettlé, N.6,
Schmiedel, U.*7, Tadross, M.8, Ziervogel, G.9

Mechal is an Amharic word that describes resilience to adverse conditions. The MECHAL project aims to identify and evaluate existing strategies to cope with droughts and to develop, implement and evaluate new, innovative farming and other land use practices adapted to climate change conditions in semi-arid areas of South Africa and Ethiopia through an action research approach. This process is intended to enhance the resilience and problem solving capacity of the land users.

The two research sites of MECHAL, Hantam in the West of South Africa and Arsi Negelle district in the central Rift Valley of Ethiopia, are situated in the only global biodiversity hotspots in semi-arid areas. Both areas are traditional farming areas, where small-scale farming plays a major role in supporting livelihoods. Both areas already experience changes in weather conditions and are predicted to be strongly impacted by climate change.

In order to increase resilience of farmers in South Africa and Ethiopia, effective adaptation techniques are being identified, developed and shared amongst small-scale farming communities. During this process the applied learning methodology is tested and analysed to be applied in other areas of community based adaptation processes.

As part of the participatory process, Climate Change Preparedness workshops and Local Level Monitoring of climate and local water resources have been conducted regularly by local stakeholders and project team members in South Africa, and will be initiated in Ethiopia in due course. These learning processes aim at increasing resilience to climate variability and change as well as to changing policy and social conditions.

As part of the learning process, the effect of climate variability and change on livelihood strategies of the small scale farmers will be explored in various studies in South Africa (focusing on Rooibos tea and livestock) and Ethiopia (focusing on agro-forestry and livestock).

The indifference of youth towards farming in the communal areas of Namaqualand

MBV Swarts, MI Samuels, CF Cupido
ARC– API: Rangeland & Nutrition Unit, BCB Dept., UWC, P/ Bag X17, Bellville 7535, South Africa

Livestock keeping on the commons of Namaqualand has generally been viewed as an activity for the elderly. Opposing views exist as in to why there is a lack of interest in farming from the youth on the communal areas. Due to this dichotomy, we investigated whether this indifference grew from ignorance on the side of the youth or whether the elders neglected to transfer their farming knowledge. By using semi-structured questionnaires, we interviewed youth aged between 17 and 35 from the Leliefontein communal area in Namaqualand to determine why they are not actively involved in livestock rearing.

It appears that formal education created a generational gap in terms of the transfer of local farming knowledge. We observed that youth find the knowledge they acquired in school more trustworthy than that of their parents and grandparents. This is because traditional farming knowledge has for many years been regarded as backward and unproductive. Secondly, differences exists between the use of innovative farming methods which the youth wants to apply and traditional ways of farming that constantly adapts to the changing environmental conditions. Thirdly, the notion of farming as a '*sukkel bestaan'* (struggle) as locals call it, also seems to be a vital underlying factor for this growing indifference and dislike for farming amongst youth. The youth generally sees farming as an outdated and downright dull practice and a pastime that adequately fits the older community members.

Options that could address these problems include the role of researchers as mediators since they are more objective in terms of which farming methods to use. Researchers could also demystify their studies and make it easily accessible to the local community. The Agricultural Research Council has taken this initiative through developing a newsletter in the local language as an attempt to transfer scientific knowledge to farmers. The newsletter also stimulated conversation amongst the youth and elderly generations.
Communication channels need to be restored because the future success of farming in Namaqualand depends on the transfer of farming knowledge and active involvement of youth in decision-making processes.

A PILOT PROJECT ON SUSTAINABLE LAND REFORM

MR LA DE JAGER (LULLU) University of the Free State

The purpose of the pilot project is to determine three role players from the private sector, two commercial banks and one commodity live stock organisation, view points, participation, experiences and recommendations regarding Land Reform. The data was gathered by means of requesting the role players to complete a questionnaire by answering ten questions regarding the purpose of the study.

The survey was based on the qualitative research methods and data analysis. Codes, as meaningful analytical units, were identified, and organised into categories/themes, followed by interpreting, findings and conclusions.

The main findings and recommendations of the pilot study, based on 78 codes and 19 categories are :

Categories emphasized by the role players :

- Support Land Reform and participation in projects
- Maintain food security
- Establish focus groups between organisations with the same supporting services

Categories contributing towards successful projects :

- Farm bought as a running concern
- Commercial farmer as a mentor or partner
- Projects managed for beneficiaries by a management company

Categories contributing to unsuccessful projects :

- Absence of quality support
- Focus mainly on Land Reform and not transformation of ownership
- Large number of beneficiaries on one farm
- Beneficiaries lack management and farming skills

Recommendations to be addressed immediately:

- Projects with negative influence on food security must be stopped
- Improve coordination between Government Departments and their services
- Selection of candidates with a potential profile
- Active training and mentorship

+ Some of these findings correspond with literature and other research reports

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What is the value of small grant projects in the arid zone? Lessons learned in Namaqualand.

Clement Cupido, Igshaan Samuels and Melvin Swarts
ARC – Animal Production Institute: Rangeland & Nutrition Unit, University of the W/ Cape, P/Bag X17, Bellville 7535

For research to continue within the arid environment it is imperative that researchers establish good relationships with the local communities they work with. In interviews with residents staying in the Leliefontein communal area it became apparent that there is a perception that research do not always benefit the community directly. This often leads to a

fairly negative view of the community towards research and this in turn could hamper future research initiatives within such communities. The Agricultural Research Council (ARC) recognised this skew outlook from the community and seized the opportunity to registered two small grant projects (Tweerivier Ramcamp and Leliefontein Wetland Rehabilitation projects) which offered both socio-economic and environmental benefits. These projects were run in collaboration with the land users, local farmer's union and the Methodist Church.

Short-term goals of the projects included the creation of 35 part-time jobs using local labour only. Benefits derived from the Ramcamp project include a controlled breeding season for small stock which resulted in a more even dispersal of grazing pressure. In the past ewes has given throughout the year and livestock keepers were forced to keep the flocks on low-lying terrains to accommodate the pregnant ewes. This resulted in overgrazing of the lowlands. The Leliefontein Wetland Rehabilitation project contributed to eradication of *Populus* trees and rehabilitation of the historically significant wetland and spring. The benefits derived from ecological services in these projects far outweighed the financial input from funders. Through these initiatives stronger relationships have been built between the research organisation and the local community which make ongoing and future research cooperation with the community significantly easier.

RESEEDING TOPSOIL-DEPRIVED ALLUVIAL DIAMOND MINES IN THE NAMA KAROO BIOME OF SOUTH AFRICA

Betsie Milne, NMMU, Port Elizabeth

INTRODUCTION

Manhattan Corporation has been conducting alluvial diamond mining operations in the Nama Karoo Biome (Mucina and Rutherford 2006) for the past six years. Initially, they did not store seed-bearing topsoil as required by the Mineral and Petroleum Resource Development Act (2002) and their rehabilitation efforts were limited to backfilling. This created large, bare surfaces; a platform for uncompromised weed infestation. In 2008 Manhattan endeavoured the reestablishment of native vegetation and retained backfilled sites to trial reseeding. This study aimed to test reseeding success on different topsoil-deprived surfaces, and to compare the quality of the different surface material for plant growth.

MATERIALS AND METHODS

Study Area

The study was conducted in the Northern Cape, near Douglas on farms Klipfontein and Kameeldrift. The 3ha study area consisted of two topsoil-deprived sites covered with different surface materials obtained from adjacent excavations. One site was covered with sand (sandy surface) and the other with pebbles (rocky surface). Each site was fitted with a rain gauge to measure precipitation.

Reseeding

Native, perennial seeds from grasses (*Cenchrus ciliaris, Fingerhuthia Africana*), a herb (*Lessertia pauciflora* Harv.), and shrubs (*Eriocephalus ericoides* (L.f.) Druce, *E. Spinescens* Burch) were mixed and broadcasted by hand at a rate of 10kg per hectare, during the beginning of the growing season (November 2008).

Sampling

Once-off sampling was done at the end of the growing season (May 2009), following stratified random sampling. Twenty 1m2 quadrates were used to record:

- *total density (number of individuals);*
- *densities per growth form;*
- *densities for species included in the seed mixture sown vs. species not sown;*
- *densities of native emerging vs. weed emergence.*

Analyses was done using STATISTICA

Soil analyses

Five soil samples to a depth of 20cm were taken to determine the soil nutrient and soil physical properties for each study surface. Analyses were performed by the Agricultural Research Council in Pretoria.

RESULTS

Rainfall data

By the end of the rainfall season, the sandy surface received much more rain (282.1mm) than the rock-strewn surface (123.2mm), despite the small distance between the two sites.

Soil quality

The sandy surface showed to have a higher nutrient content than the rock-strewn surface. Soil resistivity measured higher for the rock-strewn surface, but the pH levels were comparable between the two surfaces. Both tested zero titratable acidity and in terms of soil texture the two surfaces were classified as sandy loam (USDA 1987).

Reseeding success

Although more individuals were counted on the sandy surface (13.6ind/m^2 vs. 11.2ind/m^2), reseeding success between the two surfaces were similar ($X^2 = 0.23$; $P = 0.6824$).

No shrubs emerged and grasses were successful on both surfaces. Herb and weed densities were low, but herbs were more successful on the sandy surface ($X^2 = 5.74$; $P = 0.0166$).

Sown species dominated total density on both surfaces. In terms of growth form, weeds were excluded to obtain a balanced comparison within related growth forms. 97% of grasses and only 28% of the herbs were sown, with no difference between the surfaces.

Weeds showed poor emergence at both surfaces, but the weed emergence was higher on the rock-strewn surface, than on the sandy surface ($X^2 = 21.04$; $P < 0.0001$).

CONCLUSION

1) It is possible to re-establish topsoil-deprived alluvial diamond mined surfaces in the Nama Karoo via reseeding.
2) Surface material in the form of sand or tailings from local excavations have acceptable nutrient, pH, and texture combinations to facilitate native species growth.
3) Native species are adapted to local environmental conditions and compete successfully with weeds.
4) It is more viable to initially sow seeds of native grasses and herbs rather than shrubs.
5) Correlate surface characteristics with plant species preferences when sowing seeds.