Grassroots

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HOW TO
write an eye-catching abstract

Proper record of birds in Africa important for Europe

2017: second hottest year on record

Advancing Rangeland Ecology and Pasture Management in Southern Africa

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FROM THE EDITOR

It gives me great pleasure to welcome you to the first issue of Grassroots for 2018.

Inside you will find two reader's letters, several international and local news articles resembling the multi-disciplinary quality of the society, two feature articles and a tribute to one of our late members, Dr Moto Lesoli.

As the GSSA we welcome divergent opinions and views on matters as this stimulates discussion and engaging with topics. Grassroots is a semi-scientific publication that publishes articles with some data as is the case under the features section. In the news section however there are various articles from trusted sources covering a wide range of interests and opinions. Part of the mission statement of Grassroots is to "provide a forum for debate and exchange of ideas". Reader's letters creates a way to contribute to the debate and views on specific topics, and is welcomed by Grassroots.

More in detail in this issue, we take a look at urban wildlife habitats, the biodiversity damaging effect of fire control, Amazon trees as a major methane source, ornamental plant invasion, how climate change risks the world's microbes, the second hottest year, mapping tree cover, the TreeApp, precision farming, the value of pee, global soil organic carbon map as a tool, the use of small fires on grazing management, fynbos-monitoring, why proper bird records is important, the transition of SA to a low carbon economy, how elephants can be stopped to trample trees, the new natural science collections facility, the new Editor-in-Chief of the AJRFS, the possibility of pasture-based dairy farms to be both environmentally friendly and economically productive, and lastly a refresher course on how to write a proper research abstract.

Lastly, this issue includes an announcement of the 53rd annual congress of the Grassland Society of Southern Africa (Congress 53) to be held in Pretoria from the 22nd to the 27th of July 2018. A special thanks goes out to our sponsors of Congress 53: Dow AgroSciences, Western Cape Government, ARC and UNISA.

I would like to invite you to submit your news snippets, opinions, dates of important events and feature articles to Grassroots – we would love to hear from you all. It will also be good to keep track of our members and hear of anyone who has lately moved jobs. We would also enjoy hearing from anyone who has recently received a post graduate achievement. Let's make Grassroots a hub of knowledge and excellence.

Please feel free to forward any recommendations with regards to layout and content of Grassroots to me.

Thank you to those who contributed to this issue – keep those articles coming.

Enjoy this one!

6 things to look forward to in this issue:

- Why proper bird records are important
- Urban wildlife habitats
- The biodiversity damaging effect of fire control
- How climate change risks the world's microbes
- Mapping tree cover with the TreeApp
- How elephants can be stopped to trample trees

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Conservation vs Profit

Barry York

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The Editor: Grassroots,

I make reference to the article in the latest Grassroots publication entitled Conservation vs Profit by Adam Hart.

One would expect that such an article, published by our association would contain well researched scientific facts and that comments based on unproven opinions would be excluded.

It is important to understand that African wildlife cultures are very different from those of the Western World. Western economies are driven by creating profits or capitalism, yet their wildlife ethos is based on a socialist model or philosophy. Many so called western conservationists or animal rightists have the philosophy that it is a terrible crime to create wealth or make a profit from wildlife or their products.

Poverty remains the greatest threat to conservation in Africa yet we witness the wasteful destruction of the stockpiles of ivory and Rhino horn, worth millions of dollars, because of the so called conservation ideologies imposed on Africa by the Animal Rights Activists from wealthy Western nations.

The economy of many African countries is generally socialistic, yet successful wildlife management or conservation models outside of protected areas are capitalistic in nature. We need to clearly understand that the management objectives of a self-sustaining game ranch, must be profit motivated in order to be economically sustainable and the huge conservation benefit is the most important by product of this commercial activity. Game ranching objectives in the private sector are therefore very different from the management objectives of a state funded game park or protected area. When the tax payer fits the bill, the economic viability of these areas is of little or no importance to those responsible for their management.

Those who claimed that - "Using resources on colour variant animals will divert from the conservation of other wildlife and can be detrimental", are requested to provide the proof that justifies this statement.

In many cases revenues generated through the sale of high value animals, including colour variants, were reinvested by game ranchers in converting additional marginal agricultural land into wildlife management areas. Hard earned revenue was also used to conserve and protect other endangered species such as our embattled Rhino. For a Prof of Science Communication to label such people as being "greedy" wildlife ranchers in a publication of Grassroots is in my humble opinion totally unacceptable.

Has the bubble burst and is another rapidly inflating?

Despite the naysayers accusations and the large fluctuations in the price of many game species over the last decade, efficient game ranching operations including those with naturally occurring, functionality efficient and adapted colour variants remain economically viable for the time being.

Our naysayers forget to mention other factors that play a most important negative role in the current South African farming economy and associated game prices. These include unprecedented levels of farm murders, land claims and threatens of exploitation of land without competition, to mention but a few.

Are international hunters avoiding South Africa because of fair chase or ethical issues or because they fear for their safety due to airport hijacks and rural insecurity?

The demand for the hunting of colour variants has increased in the last year because of an increase in numbers available for hunting at more affordable prices i.e. the principles of supply and demand apply.

"Greedy" game ranchers are accused by naysayers of rapidly inflating another bubble by selectively breeding buffalo, sable and roan for greater horn size. The fact is that to date no African animal has been selectively bred to have larger horns than those originally found in the wild is of no consequence. The conservation of buffalo, roan and sable on game ranches, is not something new and has been taking place since this industry started.

Naysayers are opposed to both inbreeding and selective breeding of wildlife yet the most effective way to prevent inbreeding on game ranches is to selectively breed unrelated animals.

Responsible wildlife managers fully understand the possible negative implications of single trait selection in any breeding program as well as the undesirable consequences associated with continuous, selective grazing.

The most important question is where do we stand as members of the Grassland Society of South Africa?

- Do we join the naysayers who shout the odds from the sidelines without offering constructive advice solutions or assistance?
- Do we offer to put our shoulder to the wheel and carry out the applied research and provide meaningful extension services to our game ranchers?
- Do we wish to work towards forming partnerships with role players and enable the wildlife industry of our country to optimize wildlife production, as a sustainable land use practice?

"The conservation of Wildlife in Africa is enhanced when the sustainable use of this renewable natural resource has greater socio-economic value to Africa's people than other land use options."

Do we share this view as it means that wildlife will need to pay more than its rent?

I look forward to your reply.

Kind Regards,

Barry York

Correction to a statement in the paper by Teague and Barnes (2017) published in the AJRFS

Mick Gammon

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The Editor: Grassroots,

Having an undying love for the veld and having devoted much of my life to veld management research and extension, I do not want to be branded as someone whose work has promoted continuous grazing. Please could you place in the next edition of Grassroots my correction to the the following statement in the paper by Teague and Barnes (2017) in the African Journal of Range and Forage Science 34: 77 - 86 :

"Most, but not all, grazing studies in the scientific literature have concluded that rotational grazing is no better than light continuous (season-long) grazing (Gammon and Roberts 1978: Gammon 1984 ..."

While this has been the conclusion from some studies, it is not a correct statement of our conclusions. The studies of patterns of defoliation during continuous and rotational grazing (Gammon and Roberts 1978) were in three parts: 1. Selectivity of grazing. 2. Severity of Defoliation. 3. Frequency of Defoliation. In a paddock chosen to offer three distinctly different veld types, with further marked variation between species within veld types, similar patterns of selection between and within veld types occurred in the two methods of management. Truly non-selective grazing has never been recorded in this highly heterogeneous veld under any form of management. By the end of the growing season the heights of defoliation were 1 to 3 cm lower under continuous grazing for most of the major species. Under continuous grazing frequencies of defoliation were greater, with 5.7 % to 11.1 % of the tillers of the most palatable species receiving more than 3 defoliations during the growing season; none were recorded as receiving more than 3 defoliations under rotational grazing. However, under continuous grazing more than 75% of the tillers of each of the major species received less than 3 defoliations during the growing season; of these, 21% to 40% were ungrazed during the growing season.

Considering the indications from relevant clipping trials, it was concluded that, under continuous grazing by cattle at moderate stocking rates, slow deterioration of the veld would occur, due to frequent defoliation of a small proportion of the most palatable species; that, due to the lenient defoliation of the vast majority of the sward under continuous grazing, only moderate increases in herbage production could be expected through manipulation of the pattern of defoliation by other methods of management.

In interpreting the results of these studies it should be noted that the form of rotational grazing applied was a far cry from the management currently applied in Holistic Planned Grazing or Adaptive Multi-paddock Grazing. The treatment applied was a simulation of Short Duration Grazing (SDG) with 6 paddocks and grazing periods ranging from 6 days initially to 12 days later in the season. The stocking rate was 10% higher than was normally recommended for that veld in good condition. It is interesting to note that the claims made at that time for this level of SDG were very similar to the current claims for far more intensive management applied under HRM.

The second study referred to in the above statement (Gammon 1984) did not in fact involve a comparison with continuous grazing. Rather, it reported on comparisons of veld condition on ranches in Zimbabwe that had applied intensive SDG with 14 to 42 paddocks per herd for up to 12 years, with that on neighbouring ranches applying less intensive management, varying from SDG with 6 paddocks to rotational resting. Included in the sample was what was referred to as the "Advanced Project", in which adaptive SDG was applied in a 32 - paddock, cartwheel layout on Liebigs Ranch. Briefly, it was found that the areas under intensive SDG were not markedly or consistently in better condition than adjacent less intensively managed areas.

After discussion of the results, in particular the case of the Advanced Project, and after considering stocking rate and rainfall effects, the results of experimental comparisons of grazing systems, factors affecting herbage production and animal performance, the effects of numbers of paddocks on grazing variables, and paddock size and layout, comprehensive conclusions were made. The initial statements of these conclusions were, "Some form of rotational grazing and resting of veld is essential if it is to be maintained in good condition or reclaimed. SDG, which starts at the point of prevention of over grazing, is probably the most effective, practical and flexible method for most situations."

References:

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Kind regards,

Mick Gammon

Habitat on the edges: Making room for wildlife in an urbanized world

Efforts to protect biodiversity are now focusing less on preserving pristine areas and more on finding room for wildlife on the margins of human development. As urban areas keep expanding, it is increasingly the only way to allow species to survive.

Richard Conniff

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One morning not long ago, in the southern Indian state of Karnataka, I travelled with a Wildlife Conservation Society biologist on a switchback route up and over the high ridge of the Western Ghats. Our itinerary loosely followed the corridor connecting Bhadra Tiger Reserve with Kudremakh National Park 30 miles to the south.

In places, we passed beautiful shade coffee plantations, with an understory of coffee plants, and pepper vines — a second cash crop — twining up the trunks of the shade trees. Coffee plantations managed in this fashion, connected to surviving patches of natural forest, "provide continuous camouflage for the predators," — especially tigers moving through by night, my guide explained, and wildlife conflict was minimal. Elsewhere, though, the corridor narrowed to a thread winding past sprawling villages, and conservationists played a double game, part handholding to help people live with large predators on their doorsteps, part legal combat to keep economic interests from nibbling into the wildlife corridor from both sides. It was a microcosm of how wildlife hangs on these days, not just in India, but almost everywhere in the world.

For conservationists, protecting biodiversity has in recent years become much less about securing new protected areas in pristine habitat and more about making room for wildlife on the margins of our own urbanized existence. Conservation now often means modifying human landscapes to do double-duty as wildlife habitat — or, more accurately, to continue functioning for wildlife even as humans colonize them for their homes, highways, and farms. There is simply no place else for animals to live.

The ambition to create new protected areas still persists, of course. National parks, wildlife refuges, and other protected areas remain essential, especially for species that do not adapt well to human-dominated landscapes. The 168 signatory nations to the Convention on Biological Diversity (CBD) have acknowledged as much, at least on paper, committing to extend protected area coverage to 17 percent of their land area by 2020.

Research has demonstrated substantial improvements in biodiversity from wildlife corridors as little as 25 yards in width.

But getting there has proved difficult. Coverage by national parks and other terrestrial protected areas has remained stuck for the past few years at about 15 percent worldwide, well short of CBD commitments, much less E.O. Wilson's grander vision of "half-Earth" set aside for nature.

Meanwhile, though, work to improve buffer zones around parks, and to establish corridors on the land between existing protected areas, has flourished. For instance:

- Just since 2000, the area protected by land trusts in the United States has more than doubled, from 23 million to 56 million acres, according to the Land Trust Alliance. Easements are one increasingly common tool for conservation on private lands, though recent research indicates that those easements tend to impose fewer restrictions on landowners than in the past.

Figure 1: Habitat on the edges
Credit: Luisa Rivera / Yale E360

Figure 2: The 250-acre Gardens by the Bay park in Singapore. Nearly half of Singapore's land is comprised of green space and nature preserves. Credit: Martin/Flickr

- Corridor protection on the grand scale has achieved remarkable results, notably with the 2,000-mile long Yellowstone-to-Yukon Conservation Initiative. It aims to connect protected areas and to ensure safe passage for elk, grizzly bears, and other wildlife across 500,000 square miles of largely shared habitat, both public and privately owned. At the same time, research by Nick Haddad, a conservation biologist at the University of Michigan's W.K. Kellogg Biological Station, has demonstrated substantial improvements in biodiversity from corridors as little as 25 yards in width, well within the range, he says, of "what's reasonable in urban landscapes." Indeed, a new study from northern Botswana has found that elephants traveling from Chobe National Park to the nearby Chobe River will use corridors as small as 10 feet wide to traverse newly urbanized areas.
- Urban areas now increasingly recognize that it's cheaper to protect clean water by buying up natural habitat both within their own borders and at the source, instead of installing expensive technology to purify it after the fact. It's not just about New York City purchasing huge chunks of the Catskills. North Carolina's Clean Water Management Trust Fund, for instance, has also protected 500,000 acres of watershed and riverside habitat over the past 20 years — with enormous incidental benefits for wildlife.
- Cities have begun to recognize the value of protecting wildlife within their own borders. Singapore, for instance, has increased its natural cover to almost half its land area over the past 30 years, even as its human population has doubled. Its Central Catchment Nature Reserve has become one of the last refuges of the straw-headed bulbul, a bird once common across Southeast Asia. The government also recently announced plans to create new nature parks as habitat for the critically endangered banded leaf monkey.
- Even in the absence of new parks and other habitat, city residents have rallied to their wildlife, sometimes in extraordinary fashion. In Mumbai, development-oriented politicians continue to encourage the destruction of natural habitat, particularly in the Aarey Milk Colony neighborhood abutting the city's Sanjay Gandhi National Park. But local conservationists, together with the park itself, have launched a pioneering campaign to help densely populated neighborhoods around the park cope with more than 30 free-ranging leopards in their midst. Likewise, Los Angeles has turned its mountain lions into urban folk heroes. (The Facebook bio of the lion known as P22 begins: "Hi! I'm LA's loneliest bachelor. I like to hang out under the Hollywood sign to try and pick up cougars. Likes: Deer, catnip, Los Feliz weekends. Dislikes: Traffic, coyotes, P-45.")
- While gas and electric transmission lines commonly divide and destroy landscapes, some utility companies have found maintenance savings (and good press) by managing these corridors as habitat, especially for pollinators and migratory birds. California's Pacific Power & Gas, with 6,400 miles of gas transmission lines, is the latest U.S. utility to sign up with the Right of Way Stewardship Council.
- Highway departments have learned that they can save money, reduce their carbon footprint, please tourists, and also help wildlife by converting roadsides and medians from grass to wildflowers. The Federal Highway Administration recently published best management practices for using roadside margins as pollinator habitat — with Florida incidentally saving $1,000 per road mile in mowing costs and Oregon reducing pesticide use by more than 25 percent.
- While restoration of abandoned rail lines as habitat and hiking trails is old news, British companies have recently begun restoring habitat along active rail lines. Network Rail, which controls most of the rail lines in the United Kingdom, works with conservation groups on species from the great crested newt to the natterjack toad.

The idea of making human landscapes more wildlife-friendly dates back at least to the anti-lawn movement of the 1970s.

The idea of making human-dominated landscapes more wildlife-friendly dates back at least to the 1970s, when the anti-lawn movement proselytized for turning backyards into habitat. But finding ways — large and small — for wildlife to live among us has come to seem dramatically more urgent in recent years. That may be partly because in this century Homo sapiens has become a predominately urban species for the first time in history, with huge projected growth in cities and megacities. It may also be due to a series of recent studies on the implications of that growth. These studies read, at times, as if the researchers are looking up from their data and describing the end of the natural world.

Even scientists were stunned in October by the report of a mass insect die-off in Germany. That study, published in the journal PLOS One, found that over a 27-year period, from 1989 to 2016, the population of flying insects at nature reserves across Germany had collapsed, down by 76 percent overall, and 82 percent in the peak mid-summer flying season. Most of the likely causes — including habitat fragmentation, deforestation, monoculture farming, and overuse of pesticides — were factors

outside the borders of these ostensibly protected areas. "We appear to be making vast tracts of land inhospitable to most forms of life," one co-author grimly commented, "and are currently on course for ecological Armageddon."

That came on the heels of a July report in the Proceedings of the National Academy of Sciences describing a "biological annihilation" in which "as much as 50% of the number of animal individuals that once shared Earth with us are already gone," with likely "cascading catastrophic effects on ecosystems," and on economic and social services "vital to sustaining civilization." In particular, global vertebrate populations — from elephants to amphibians — declined by 58 percent from 1970 to 2012, a 2016 report noted, with losses likely to reach 67 percent by 2020. That's two-thirds of all vertebrate animals on Earth vanished in the lifetime of a person not yet 50.

In the face of "annihilation" and "Armageddon," emphasis on tending the margins of our lives can seem, yes, marginal. "If the focus is on degraded landscapes – roadside edges, powerline rights of way – you can find examples where these habitats are important to particular species," says Josh Tewksbury, a conservation biologist at the University of Colorado, Boulder. "But it would be hard to find any evidence that it's going to make a whit of difference to the big problem. It's not going to solve 95 percent of the problem."

Then, as a second thought, he added, "It could be the 95 percent solution for people and biodiversity," in the sense that routinely seeing birds in a city park, or a fox running across a field, can have "big implications for how people think about the value of nature." And changes in human attitudes about nature can have dramatic effects on the ability of wildlife to survive in human-dominated landscapes.

For instance, persistence of old cultural attitudes is the major reason wolf recovery has struggled in the U.S., despite an abundance of available land. Meanwhile, Europe, one of the most industrialized landscapes on earth, has welcomed the return of wolves even to the fringes of its largest cities — along with brown bears, lynx, bison, and other species. The surprisingly rapid recovery of such species in Europe has led to a call, as a recent commentary in the journal Conservation Letters put it, for rewilding to become "a primary component" of long-term biodiversity conservation on degraded landscapes elsewhere — even perhaps everywhere.

One danger is these landscapes may become places where excess individuals from undisturbed habitat can survive but not increase.

But caution about the potential of our cities and suburbs as wildlife habitat is probably still a good idea. One danger is that these landscapes may become "ecological sinks" — that is, places where excess individuals from undisturbed habitat can survive, but not ultimately increase. Having straw-headed bulbuls in central Singapore does not, for instance, ensure survival of the species. Success with some more visible species may also blind us to broader but less obvious declines in other species. European rewilding, for instance, has not been rewilding for its insect population.

Finally, we know almost nothing about what ecologist Meredith Holgerson at Portland State University calls "these cryptic changes happening" as humans occupy and alter a landscape. For her doctoral research at Yale University, she looked at the effects of suburbanization on wood frogs in 18 ponds in the prosperous Connecticut suburb of Madison. The area around the ponds had developed largely with two-acre zoning, allowing for survival of "pretty good red maple swamps and vernal ponds," says David Skelly, a professor of ecology at the Yale School of Forestry & Environmental Studies who oversaw the research. But chemical analysis of the ponds demonstrated that, along with other changes, the wood frog larvae were getting as much as 70 percent of their nutrients from materials leaching out of septic systems. "It suggests," says Holgerson, "that tadpoles and other pond organisms are made up of human waste."

The consequences of that remain unknown. But it also suggests that we may change the entire nutrient flow of an ecosystem, cause eutrophication, or introduce hormone-disrupting drugs or other chemicals in our waste — and still imagine that we live in a relatively intact habitat.

Figure 3: A female mountain lion in the Verdugos Mountains, north of Los Angeles. Also known as cougars, these animals are an increasingly common sight in the mountains surrounding Southern California's cities. Credit: National Park Service

Fire control harms biodiversity in Brazilian savannah

Rodrigo de Oliveira Andrade

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SÃO PAULO - Policies that prevent fires caused by people in El Cerrado (the Brazilian savannah) lead to biodiversity losses because they promote the expansion of forests with dense vegetation.

This is the main conclusion of a study that examined impacts over the last 30 years in parts of El Cerrado that belong to São Paulo state.

The researchers used satellite images to determine changes in vegetation, and in the amount of carbon dioxide absorbed in different areas of a small city in El Cerrado the commune Aguas de Santa Barbara.

They confirmed that a policy banning human-caused fires between 1986 and 2015 encouraged the growth of denser forest.

This led to an increase, by 1.2 tons, of the carbon stored in both vegetation and soil in those areas since 1986.

But at the same time, they found a reduction in the diversity of plants and ants in the same period, by 27 per cent and 35 per cent respectively. According to the researchers, these findings apply to other animals too, so impacts can also be expected for birds, reptiles and amphibians.

"Suppression allowed forest to encroach upon savanna ecosystems which might cause massive loss of species that live in this sort of vegetation," - William Hoffmann

Figure 1: Panoramic view of El Cerrado. Credit: Wikimedia

The El Cerrado is an area with open vegetation, shrubs and grasses. The chemical processes that influence biodiversity by stimulating the sprouting and blossoming of plants, fruiting and seed dispersal, are regulated partly by fires.

Giselda Durigan, forestry engineer at the Forestry Institute of São Paulo, and lead-author of the study, published in the journal Science Advances, says ceasefire policies might be beneficial for Amazonia and the Atlantic Forest but not for El Cerrado. This is an area that needs fire in order to maintain its animal and vegetable species diversity, she explains.

"The rise of forest with dense vegetation, with tall trees that are close to one another, has decreased the light incidence in that region", Durigan tells SciDev.Net. "When a fire is eliminated, the chemical processes needed to maintain the [natural] environment are affected."

Biologist William Hoffmann, from North Carolina State University in the United States, and a co-author of the study, says that while ceasefire is beneficial for carbon dioxide mitigation, "[the] El Cerrado has a range of specific characteristics that are the result of vegetation adapting to the fire".

According to Hoffmann, excessive fire suppression might be devastating to the species that depend on natural savanna habitats, both in Brazil and in other regions of the world such as parts of Africa.

"Suppression allowed forest to encroach upon savanna ecosystems, which might cause massive loss of species that live in this sort of vegetation," he points out.

Lucíola Lannes, also a biologist, at the engineering faculty of São Paulo State University in Brazil, says: "the work shows that carbon dioxide mitigation policies that favour fire suppressions cannot be a priority conservation policy in El Cerrado".

Amazon trees are major source of methane emissions

Rodrigo de Oliveira Andrade

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SÃO PAULO - Trees growing in floodplains surrounding the Amazon river emit up to 20 million tonnes of methane gas (CH_4) to the atmosphere every year, a study in Nature has estimated.

Methane is one of the three most potent greenhouse gases and traps up to 34 times more heat compared with carbon dioxide.

The amount calculated in the study is similar to emissions from the Arctic tundra, or emissions from all oceans combined, or the total volume of methane emitted from wild animals and termites globally, the authors point out.

Still, the amount of methane emitted from Amazon trees is just half that emitted by humans, according to the authors — whether in the form of emissions from landfills, the meat industry, or burning fossil fuels.

"These trees act as chimneys, funnelling the methane produced in the submerged soil into the atmosphere," - Luciana Vanni Gatti

The researchers argue that although they result from a natural process, these emissions may also be responding to environmental change, such as the building of dams across the Amazon basin. A separate study has reported that 140 hydroelectric dams are in operation or under construction along the Amazon basin, and another 288 are planned for the coming years.

"We do not know the consequences for emissions of such [construction] activity", stresses Vincent Gauci, from the Open University and the study's main author. "However, any changes to the dynamic hydrology of these systems could alter the function of these trees in unpredictable ways."

Geographer Evlyn Moraes Novo, from Inpe's Remote Sensing Division, says the findings are surprising and give a more complete picture of the sources of greenhouse gas emissions in the Amazon region.

"This could be used in global models designed to predict how environmental change can have a knock-on effect on the tropical wetland methane source," says Evlyn, who was not involved in the study.

The findings are based on measurements of methane emissions taken from 2,300 trees spread across a number of locations surrounding the rivers Negro, Solimões, Amazonas and Tapajós — where the water level can flood trees by up to 10 metres.

The research was carried out in 2013 and 2014 by scientists from the Open University in the UK, in collaboration with atmospheric scientists from the Nuclear and Energy Research Institute (Ipen) in Brazil, and other institutions including the universities of Leeds in the UK, Linköping in Sweden and British Columbia in Canada.

The researchers used gas chambers placed around tree trunks to estimate fluctuations in emissions at a small scale. They also measured methane with an aircraft flying across the entire Amazon basin in order to also calculate emissions at a large scale.

By analysing the measurements collectively, they found that trees growing in wetland areas of the Amazon subject to seasonal flooding emit 21.2 million tonnes of methane gas to the atmosphere every year.

"These trees act as chimneys, funnelling the methane produced in the submerged soil into the atmosphere," chemist Luciana Vanni Gatti, from the National Institute for Space Research's Laboratory of Greenhouse Gases (Inpe) and one of the study's authors, tells SciDev.Net. "They are the source of the largest diffusive emissions ever recorded in wetlands."

Biologist Luana Basso, from Paulista University in Brazil, who carried out the research whilst a doctoral student at Ipen, adds that "it is important to understand where this gas comes from in both natural ecosystems and from human activity".

Figure 1: Amazon trees are a major source of methane emissions. Credit: Servicio Nacional Forestal y de Fauna Silvestres (SERFOR), Perú

Figure 2: Amazon shore Credit: Servicio Nacional Forestal y de Fauna Silvestre (SERFOR), Perú

Taming ornamental plant invasion in Kenya

Verenardo Meeme

Reprinted From: http://bit.ly/2ntEcgZ

Scientists and local people explain the dangers of *Opuntia stricta*, an invasive cactus weed covering large tracts of land in Kenya's semi-arid Laikipia County, and efforts in place to tame its spread and adverse impacts.

O. stricta, a native plant of South America, is causing problems for people, domestic animals as well as wildlife. It was introduced in Kenya as an ornamental plant but has since invaded community lands according to Arne Witt, regional coordinator for invasive species at the Center for Agriculture and Biosciences International (CABI).

In Laikipia, about 253 kilometres to the north of Nairobi, Kenya's capital city, it is dominating thousands of hectares of land given its fast propagating nature. As a result it is reducing the area of agricultural farmlands, wildlife areas and ranches. It is also causing socioeconomic and health challenges.

But scientists are now using a bio-control method in the area to destroy the weed. They have introduced a sap-sucking bug called *Dactylopius opuntiae*, commonly known as cochineal. It was imported from South Africa where it is being used to control the cactus weed in Kruger National Park.

Bio-control is restoring the ecosystem's natural balance and curbing the weed's spread, Witt explains. The cochineal specifically feeds on the cactus and has gone through laboratory tests to ensure it has no non-target impacts, especially on other plants.

Since the introduction of cochineal in the Laikipia areas of Il Polei, Naibunga and Dol Dol, infected plants have virtually stopped producing fruit, inhibiting further spread of this noxious weed. This is more so where communities have embraced the use of cochineal, according to Witt.

O. stricta cannot be suppressed through chemical and mechanical control because of the costs associated with those methods. The spread of the cactus in Laikipia, Witt explains, is fuelled by the fact that it adapts well to semi-arid regions.

He says bio-control is a long-term, sustainable and effective way of controlling widespread invasive species in Africa. "Embracing bio-control in Africa, not only for controlling invasive plants but also for controlling crop pests is crucial as pests become resistant to chemicals over time," says Witt. "Over 200 weeds species [are] resistant to herbicides, 500 weed species are resistant to chemicals."

A survey has shown that *O. stricta* spread is getting worse, but Witt is optimistic that in four to five years cochineal will get established.

Invasive species is a growing concern in Kenya — 50 per cent of such plants are introduced intentionally into the country for ornamental or agro-forestry purposes.

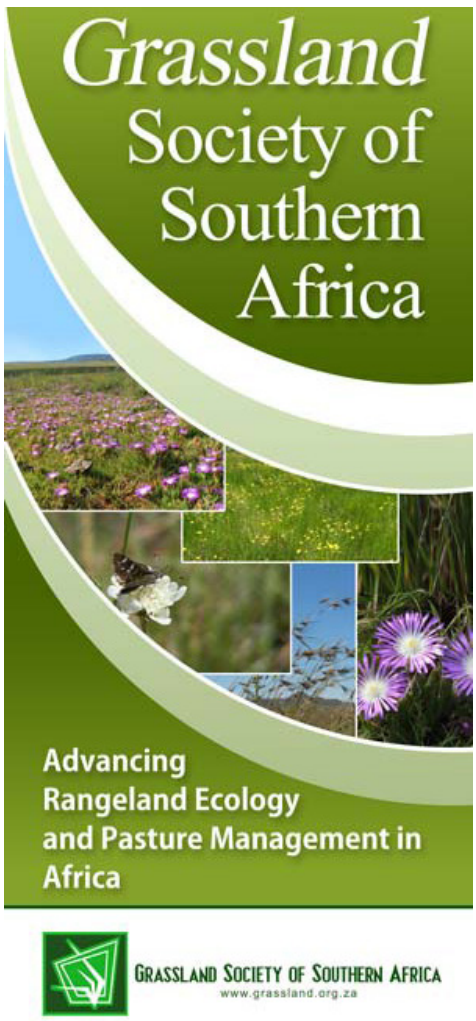
"Invasive species [are] foreign species brought from somewhere else as a result of human activities, and once established in a new environment, their proliferation starts to have a negative impact on diversity, crop production and animal health," Witt says.

He adds, "We need a strict surveillance in place such that any new invasive [species] can be detected very early and eradicated."

Kimani Kuria, manager of the community development programme at Ol Jogi Game Reserve, says science is playing a big role in biological control. "When harvested, the plants stay in the green house for two months laced with cochineal", he says, adding that using the green house improves the control and speed of the process.

The impact of *O. stricta* extends to wildlife and livestock. When abandoned baby elephants are rescued, Kuria explains, their tongues are found to be septic as a result of damage from the plant, and they cannot feed well. He says this is also seen in livestock in neighbouring communities, as the majority depend on livestock production. "If we do not manage *Opuntia stricta*, we will lose millions of dollars in range land production and livestock production in Kenya."

Kuria explains that the cactus has a waxy layer on the leaves, which means that a high concentration of chemical or other methods are required to control it, which would pose a threat to non-target organisms.



Is Climate Change putting world's microbiomes at risk?

Researchers are only beginning to understand the complexities of the microbes in the earth's soil and the role they play in fostering healthy ecosystems. Now, climate change is threatening to disrupt these microbes and the key functions they provide.

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In 1994, scientists at the Pacific Northwest National Laboratory moved soil from moist, high-altitude sites to warmer and drier places lower in altitude, and vice versa. In 2011, they returned to the sites and looked again at the soil microbes and found that they had done little to adapt functionally to their new home. That's a bad sign, experts say, for a world convulsed by a changing climate.

"These microbes have somehow lost the capacity to adapt to the new conditions," said Vanessa Bailey, one of the authors of the study, published this month in *PLOS One*. That not what scientists anticipated, and it "calls into question the resilience of the overall environment to climate change," she said. "Soil is the major buffer for environmental changes, and the microbial community is the basis for that resilience."

As snow and ice melt, it's fairly straightforward to grasp what climate change means for the future of, say, polar bears in the Arctic or penguins in Antarctica. But it's far more difficult to understand what is happening to the planetary microbiome in the earth's crust and water, a quadrillion quadrillion microorganisms, according to *Scientific American*. Yet it is far more important, for microbes run the world. They are key players that perpetuate life on the planet, provide numerous ecosystem services, and serve as a major bulwark against environmental changes.

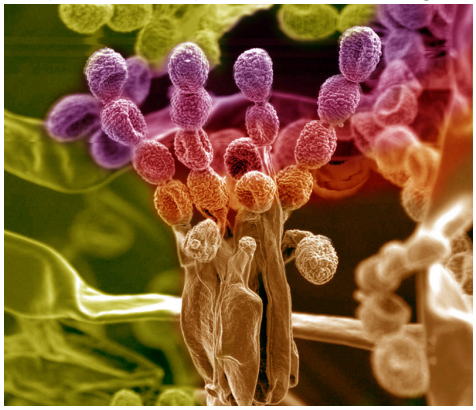

Figure 1: The spores of an opportunistic soil fungus, *Penicillium* sp. Credit: PNNL

Researchers say that as the planet warms, essential diversity and function in the microbial world could be lost.

But they can also cause serious problems — as the world's permafrost melts, microbes are turning once-frozen vegetation into greenhouse gases at a clip that is alarming scientists.

As vital as they are, we are only beginning to understand microbes and the role they play in the world's ecosystems. The problem is that these fungi, archaea, and bacteria are so small that in a gram of soil (about a teaspoon), there are a billion or so, with many thousands of species. Perhaps 10 percent of the species are known. The Lilliputian communities that these microorganisms create are enormously complex, and their functions difficult to tease out. But in the last decade, new tools have been developed that have begun to change the research game.

"Soil was a black box," said Janet Jansson, chief scientist for Biology Earth and Biological Sciences at the Pacific Northwest National Laboratory and president of the International Society for Microbial Ecology. "I have been working in microbial ecology for decades, and it has been difficult, if not impossible, to study them. Now we have these new molecular processes, and suddenly the whole field is exploding."

There is a Manhattan Project-like urgency to sussing out these secrets. A paper in the journal Science last year called for a Unified Microbiome Initiative, and experts have held a series of meetings about it at the White House. The Earth Microbiome Project is a massive global effort to collect samples of microbial communities from thousands of ecosystems around the world. Meanwhile, the Global Soil Biodiversity Initiative got underway in 2011 — one-third of the world's biodiversity lives beneath our feet — and it's focused on preserving the services that healthy soil ecosystems provide, such as a place for plants to grow, the breakdown of waste, and the natural filtration of water. The TerraGenome Project is sequencing the metagenome of soil microbes.

And Jansson's project, Microbiomes In Transitions, is studying how "perturbations" — disruptions such as climate change and pollution — affect both the microbiomes around us and inside of us. "It's extraordinarily evident that bacteria, fungi, and viruses play a massive roll in the development of health and disease in humans, and in environmental settings and ecological systems," said Jack Gilbert, a microbial biologist at Argonne National Laboratory and a founding member of the Unified Microbiome Initiative.

The new tools came about because of keen interest in the human microbiome that new research shows is linked to everything from mood disorders to immune system dysfunction. Microbes play similarly essential and wide-ranging roles in the external world. They are a healthy foundation for the food web — plants and the critters that eat them are all de-

Figure 2: Microbiologists at the Pacific Northwest National Laboratory are studying how soil microbes react to climate change. Credit: PNNL

pendent on soil microbes.

Interest in microbiomes in the natural world is also exploding because many researchers realize that as the planet warms, essential diversity and function in the microbial world could be lost. Some areas may not be able to grow the same crops they are growing now — in the United States, for instance, no corn in Iowa or wheat in Kansas, because the microbes that currently fix nitrogen for the plants' roots in the soil will no longer be able to do so. And, as we learn more about how microbes function, there may be ways to put them to work in the service of adaptation — enhancing plant growth, for example, in a warming climate.

Most urgent, though, is the fact that the earth has locked up a great deal of carbon and should it come unlocked as $C0_2$ it could dramatically speed up climate change. "The big question is whether soil will be a sink or source of greenhouse gases in the future," said Jansson.

One of the major areas of study is a feedback loop — the impact of climate change on microbes, and the role of microbes in climate change. Soil microbes are key players in how much greenhouse gas permafrost releases into the atmosphere, and it's probably the most critical area of study. The frozen vegetation, rich in microorganisms, is thawing as the Arctic warms rapidly and microbes consume the newly available plant matter and release both $C0_2$ and methane, potent greenhouse gases.

There is concern that some key microbes could become extinct before we know what they do.

This could cause more warming and thawing, a positive feedback loop. Understanding these dynamics is "really important because about 20 percent of the terrestrial surface of the earth is permafrost," said Jansson. "As much $C0_2$ is stored in permafrost as is stored in plants and the atmosphere. What happens when that carbon becomes accessible to newly activated microorganisms that are there? They can speed up climate warming, and it's of concern."

It's not just permafrost. All soil contains large stores of CO_2, and scientists are trying to understand how climate change will impact those stores, and how they could be released by land management practices. Much of this information will help create more accurate models of global climate change. And it will also provide insight into ways to alter land management practices to minimize the amount of CO_2 released from soil. Tillage and desertification, for example, unlock greenhouse gases in the soil and allow them into the atmosphere. "There are certain soils that just dragging a plow through it displaces huge, huge quantities of carbon," said Bailey. No-till farming, which leaves residue from past crops on the soil and minimizes plowing, is far more beneficial because it gives the microbes food and shelter.

There are other functions that could be lost or diminished as climate conditions change. Microbes that have adapted to moist conditions in the old-growth forests of the Pacific Northwest, for example, may not be able to carry out their activities as the soil warms and dries. Consider the zone around tree roots, where a critically important relationship between microorganisms and trees exists. A densely packed community of microbes about the width of a finger live there, and in exchange for exudates — sugars — from the tree, they clean the water that the tree takes in, a critical filter system in the planet's hydrological cycle. It's such a robust phenomenon that some engineers use trees, especially willows and poplars, to clean up toxic waste, something called phytoremediation. This ecosystem service could be diminished if these microbes cannot adapt to maintain this function as soil temperatures climb or if the microbes disappear. Fortunately, there is a lot of redundancy in these communities, so in some cases the function of microbes impacted by climate can be replaced by others.

The jury is out on how warming will impact the phyllosphere — the microbes that live on leaves that help trees to fix nitrogen and function as an immune system, allowing trees to ward off disease. "We are pretty ignorant about how those trees are going to respond and whether or not you make plants more susceptible to pathogens," when temperatures warm, said Mark Bradford, an expert in the role of microbes in forests and grasslands at the Yale School of Forestry and Environmental Studies.

Whether microbes can go extinct is not settled science. When it comes to microbes, "everything is everywhere" has been the adage among researchers who thought that all types lived everywhere, though abundance varied. Yet as more is learned about these tiniest of critters, some scientists believe that likely isn't true, and there is concern that some key microbes could be rendered extinct before we know what they do. In 2003, a study published in the journal *Ecosystems* estimated that the biodiversity of some 5 percent of U.S. soil was "in danger of substantial loss or complete extinction."

Microbiomes carry out similar kinds of functions in oceans, where researchers forecast similar kinds of problems. There's a bacterium called *Trichodesmium*, for example, that grows in nutri-

ent-poor parts of the ocean and creates nitrogen gas that fertilizes everything, from plankton to whales. For a study published last year in the journal Nature Communications, these bacteria were placed in warmer conditions that simulate forecasts for a future climate, and they went into reproductive overdrive and began gobbling up iron and phosphorus, nutrients which are in limited supply and needed by other organisms. It's a scenario that could cause those other microorganisms to disappear, or, if the *Trichodesmium* caused its own extinction, it would leave a gaping hole in the food web.

Microbes may also be able to be tapped for beneficial uses. Research shows microbes can be applied to seeds to activate natural plant defenses against pests to reduce pesticide use or make crops more resilient in the face of drought.

Certain kinds of vermicompost — fertilizer made from worm castings — have been shown to greatly enhance beneficial microbes in the soil, reducing disease in plants and boosting their natural defenses against insects.

And in Japan, fishermen learned about research that showed that decaying trees released humic acid into the ocean, a chemical that which allowed microorganisms called phytoplankton to fix iron, a fertilizer, and exponentially increase their growth. They formed a group called Forests are the Lovers of the Sea to plant trees around the country to bring fish and stocks back by stimulating the growth of the plankton, the bottom of the food web.

Knowledge of these tiniest of natural systems and their role in the world is key going into the future. "We need to understand clearly how microbes are going to behave in a changing climate," said Bailey. "By understanding what's going to happen, we can make better plans."

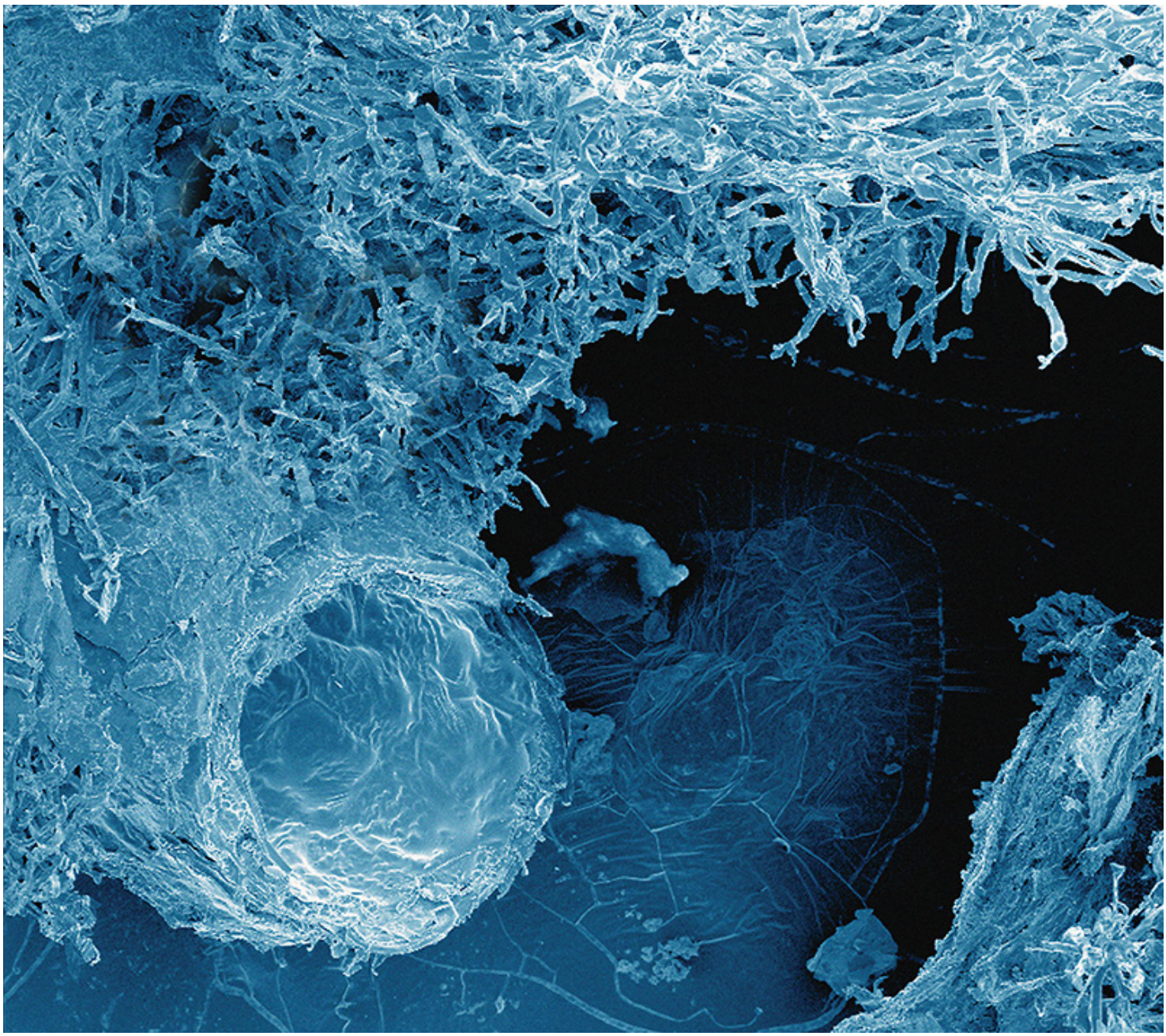

Figure 3: A close-up image of a soil fungus surrounding a pine tree root. Credit: PNNL

It's official: 2017 was the second hottest year on record

E360 DIGEST

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Last year was the second hottest year on record worldwide, behind 2016, according to a European Union climate monitoring program. Global temperatures averaged 14.7 degrees Celsius (58.46 °F) — 1.2 degrees C (2.2 °F) above pre-industrial times.

The announcement comes from the Copernicus Climate Change Service (C3S), a research project by the European Union to provide past and current climate data to help inform EU climate policies.

It is the first major weather or climate agency to report 2017's final average temperatures, but the measurements back up a projection by the World Meteorological Organization (WMO) made in November that 2017 would be the second- or third-hottest year on record, according to Reuters.

C3S reported that last year was just 0.1 degrees C cooler than 2016, and 0.5 degrees C warmer than the 1981-2010 period.

While 2016's temperatures were boosted by an intense El Niño event in the Pacific Ocean, C3S said that 2017 saw very little influence from that event. Rather, "2017 was close to the warmest year on record despite cooling La Niña conditions both early and late in the year," the report said.

UPDATE, January 18, 2018:

NASA scientists confirmed 2017 as the second warmest year since 1880, when global measurements first became possible and records began, while the National Oceanic and Atmospheric Administration (NOAA) concluded it was the third hottest year by a small margin.

The minor difference is due to the different methods used by the two agencies to analyze global temperatures, although the agencies' records remain in strong agreement over the long term.

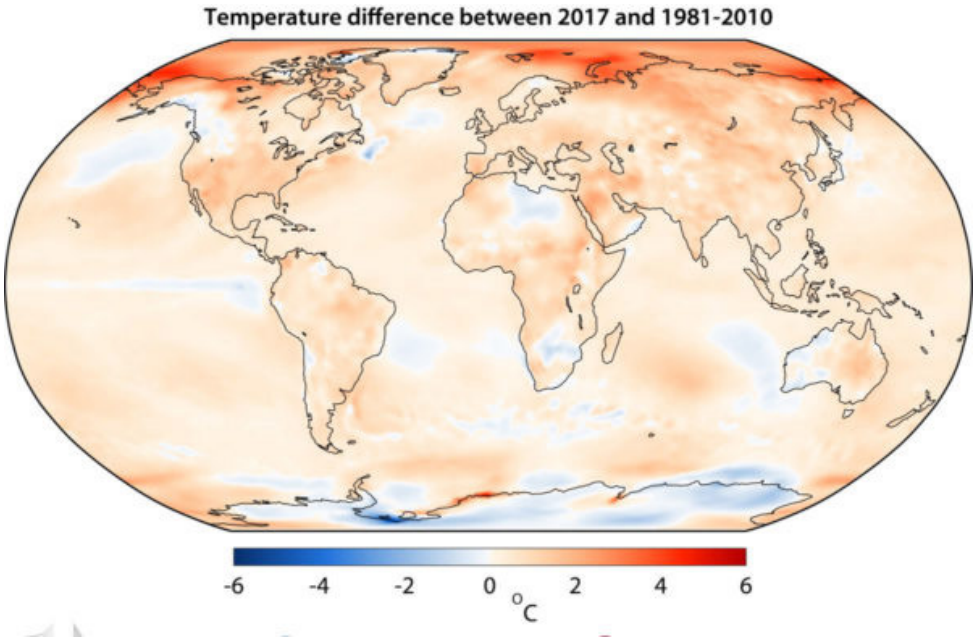

Figure 1: Air temperature at a height of two meters for 2017, shown relative to its 1981–2010 average. Credit: C3S, ECMWF

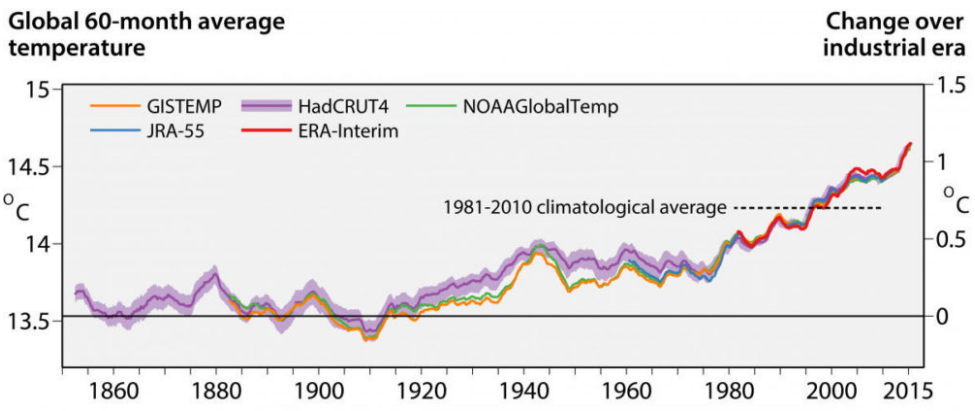

Figure 2: Running 60-month averages of global air temperature at a height of two meters (left-hand axis), and estimated change from the beginning of the industrial era (right-hand axis), according to different scientific datasets. Credit: C3S

Technique developed in Kenya offers a refined way to map tree cover

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Scientists at the World Agroforestry Centre in Nairobi, Kenya, recently pioneered a new approach which uses satellite images and maps to show patterns linked to land use and cover change on a yearly basis. Though the technique was developed in Kenya, it can be used regionally and potentially across the world.

"Land use and cover change" are terms used by scientists to define changes to the earth's surface. This can be due to natural causes or because of the way in which land is put to use by people. Land use refers to what's being done on it, for example mechanised farming, while land cover refers to what is physically on the land, for example what crops are being grown.

What's important about the new approach is that the maps consist of an array of both physical and human geographic data to explain changes. It can also be used in combination with large-scale climate models, for example to understand how changes in vegetation in East Africa might be affecting climate in other regions of Africa.

In Kenya's case, the system mapped changes in agriculture and natural vegetation with information from over a 30-year period. Using a series of aerial photographic surveys – which could be used to distinguish specific crops or natural vegetation – and freely-available spatial data such as rainfall, and population density, interpreters were able to classify Kenya's land use and cover change. They were then able to construct maps of this change on a yearly basis without extensive and costly field visits typically used when mapping change.

Understanding land use and cover change is important because they both affect how land responds to the envi-

Figure 1: Each year satellite images and maps show patterns linked to land use/cover change. Credit: Flickr/NASA

ronment. Many of the changes are human-induced – for example the way that people use the land can lead to habitat loss, increase the stress of life that the land supports, affect greenhouse gas emissions and storage, modify runoff and ground water storage, or alter the climate.

Deforestation, perhaps the most well-known type of land use and cover change, comes about primarily from agriculture and logging. It has an impact on the world's climate because trees store huge amounts of carbon that would otherwise be in the air trapping heat. The absence of trees therefore contributes to global warming.

Deforestation also affects people locally, particularly in the global south. Forests help regulate rainfall and water storage, and help maintain a high level of biodiversity.

Much of the global north has seen an increase in tree cover in recent years. But much of the global south continues to show declines due to population growth, weak institutions and other social and ecological factors.

Mapping deforestation

To understand the drivers as well as the effects of deforestation, geographers use various tools that map the extent and density of tree cover. These include aerial photos, satellite images and other spatial data through time.

The World Agroforestry Centre's approach takes this a number of steps further. It also uses demographic data, such as population density, which is often bypassed by scientists when mapping change.

The new approach suggests that physical drivers, like rainfall, may not be as important as previously thought.

Finally, the new technique provides a way forward for scientists interested in understanding what drives land use and cover change. It allows them to look at how this process interacts with processes like climate change over large areas and long periods of time.

From a scientific perspective, this helps us better to understand the environment and how humans may be modifying it. This in turn will help those designing land management strategies.

Kenyan case

Our research in Kenya shows that the most important predictor of land use and cover change was population density. Kenya is part of the East African Horn region. Like many other countries in Africa, its population is growing rapidly and is largely devoted to rain-fed subsistence agriculture and pastoralism.

Population growth occurred more rapidly in fertile areas, so the conversion of natural vegetation to agriculture was much higher. In less fertile areas, population growth was much slower, so the conversion was less.

Kenyan farmers and pastoralists are largely unable to acquire new land and are instead forced to intensify their practices on subdivided land.

We were able to detect that as the number of people per square kilometre increased, the amount of natural vegetation declined, because it was being replaced by farm or grazing land.

Climate predictors, such as rainfall and air temperature, were also correlated with the conversion of natural vegetation to agriculture, but less so compared to population density.

As seen in the Kenya case, the growing demand for food in Africa must be met with effective land tenure reform. By mapping changes in our environment continuously over long time periods, farmers and policymakers can understand underlying mechanisms and explore opportunities for reform.

TheTreeApp makes its debut

Simnikiwe Mzekandaba

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Just in time for Arbor Week celebrations, TheTreeApp is making its debut to help outdoor enthusiasts identify and learn about 1 114 trees, which include all indigenous trees and the larger well-known invasive species.

TheTreeApp aims to provide a deeper understanding of the diversity of woody species and the huge variations in the different parts of SA, says app founder and co-creator Val Thomas.

The tree identification app was developed by a team of South Africans, including Thomas, dedicated to conservation, wildlife and sustainable biodiversity.

She hopes the app will help people to start noticing and enjoying trees by name, whenever they are outdoors and wherever they go.

"Our experience is that trees are harder to learn than, say, birds or mammals. But they are really deeply loved by large numbers of people, with outdoor interest across the board, who could have a lot of pleasure if they knew more," she explains.

"Traditional botany is a serious and significant science, but it is not accessible to the average person. TheTreeApp has attempted to bridge this gap and provide a usable resource that allows users to discover the magnificence of our trees using relatively simple concepts and simple language. We do want TheTreeApp to be used by all South Africans, and we have gone to the enormous expense of including all the species names we could unearth, for all 11 languages in South Africa, as well as the botanical names."

The app functions much like Google, but for trees, allowing audiences the opportunity to easily investigate, search, identify and learn about trees based on their own descriptions and observations made using the digital tool.

The search function on the app works by a process of elimination. Users can choose from hundreds of categories that are sorted into a logical structure. The user can go into any of the categories and select the attributes of the tree, says Thomas.

Figure 1: Inside TheTreeApp

"The main categories are leaves, thorns, flowers, fruit, woody features, growth form, latex and status. Under these main categories there are sub-categories, so the user will drill down through the structure until a selectable option is provided. The main categories filter the number of trees once you enter it, eg, when you select 'simple leaves', it will filter the number of trees to only display trees with simple leaves, but will then allow the user to select further filtering options under simple leaves."

In addition, the creators have added a GPS location search capability that works with a mapping function to select the specific trees in a user's location.

The app is available for devices that run on both iOS and Android at a cost of R400.

"This app involved a huge effort by many people and was very expensive to develop, as it is a specialist app. We created it for wildlife and conservation particularly in South Africa. It needs to be sold, partly to recoup some of the costs, but also as ongoing maintenance and new features are expensive. Funds are also needed to support other specialist apps we are working on," she states.

Although it doesn't work like Shazam for now, Thomas says the team is working on that and it will be available in a future version.

"Currently, it only supports physical selection by the user and not artificial intelligence like Shazam," she concludes.

Figure 2: Val Thomas, founder and co-creator of TheTreeApp

Precision farming creates a buzz as growers try new technology

Sarah Wild

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A drone flies over the orchard. The small robot, loaded with sensors and cameras, moves in a grid pattern high above the trees.

It picks up things the human eye cannot see: the nutrient content of trees, the health of the soil, how much water there is in parts of the orchard.

With this information, farmers can tell which areas of their farms need watering, which need fertiliser — and they can estimate yields.

Precision farming could be the future in SA, farmers and technology specialists say.

Agriculture in the last quarter helped pull the country out of a technical recession and contributed 0.7 percentage points to the 2.5% GDP growth in the second quarter.

But until the first quarter of 2017, agriculture's GDP contribution had been declining since the end of 2014.

Declining farming profitability and water scarcity — drought, declining rainfall or over-demand for water — has left SA with less than two-thirds of the number of farms it had in the early 1990s, the World Wildlife Fund says in its report Agriculture: Facts and Trends in SA.

Climate change is expected to make water increasingly scarce in coming decades, pushing farmers to better manage their water, fertiliser and crop resources.

"There is quite a bit of precision farming in SA and it is developing rapidly," says Raymond Auerbach, professor of soil science and plant production at Nelson Mandela University in Port Elizabeth.

"The pros are that it allows very accurate application of fertiliser and chemicals — avoiding over-application — and can also help with water management," Auerbach says.

The cons are that the infrastructure for technology-aided farming can be expensive.

However, as it is a vast emerging field, no one is sure how widely precision farming has penetrated in SA. Some call it "precision agriculture", some "satellite farming", others "site-specific crop management" or "digital agriculture".

Precision agriculture uses new technology — sensors, satellites, drones and GPS — to gather more data about a farm or crop, and the data is used to make more informed decisions that are tailored to a specific farm, part of a farm and crops.

"Grain and oilseed producers in SA are leaders in the uptake of precision farming in the world," says Corné Louw, a senior economist at GrainSA.

Although it is expensive to initially acquire the right equipment, every producer must make decisions in terms of his own financial abilities.

"The problem is that it is very difficult to quantify," Louw says.

This is because precision farming can range from using GPS tracking to steering equipment, or collecting nutrient information with sensors from specific plants so that farmers know how much fertiliser their crops require.

Jozua du Plessis, Grain SA's grain producer of the year for 2016, is a firm advocate of precision farming. "To remain competitive with grain producers in the rest of the world, it is essential," he says.

"Although it is expensive to initially acquire the right equipment, every producer must make decisions in terms of his own financial abilities." His farm in Delmas uses precision farming to keep the soil nutrients stable across its hectares to improve productivity — and thus yields and profits — and to keep better records. "We have to measure to know," he says.

While Du Plessis imported systems to precision farm, several local companies are now offering services.

Aerobotics, a Cape Town-based start-up, is one.

"It doesn't make sense to blanket-apply treatment — whether it's fertiliser or irrigation — across your crops," says its co-founder and chief technology officer, Benji Meltzer.

"Precision agriculture says 'let's get more precise and use that data to become more prescriptive'," Meltzer says

"It can also track performance, pick up on a problem before you see it with the naked eye. These [commercial] farms are massive.

"It is also possible to track how crops are doing, in terms of health, to get a better understanding of potential yields at the end of the season," he says.

Initially, Aerobotics was a drone company that used computer software, but "now we use any form of aerial data, drones are just one form".

Imaging services for agriculture is a competitive space, he says. The com-

pany provides services to about 100 farmers.

Demand is picking up again after a decline: precision farming in SA fell prey to the hype that often follows the emergence of a new technology, Meltzer says.

American consultancy Garner describes technology development as having five stages: the "technology trigger", characterised by a sharp spike in visibility; the technology reaching a "peak of inflated exceptions", the greatest visibility it will obtain, before plummeting into the "trough of disillusionment"; and following an arduous climb up the "slope of enlightenment", a technology reaches a "plateau of productivity".

There has been a boom in sensor-based and remote-sensing technology — agriculture is just one of the applications — and a sharp rise in the number of companies offering sensor-based solutions.

However, having the technology and the data it generates do not necessarily mean that it will suit a farmer's needs. This resulted in farmers being overwhelmed with the technology's applications and creating disillusionment, Meltzer says.

"The feeling became quite negative because people had been oversold … but that is changing," he says.

"There was a lack of education about what this technology is and isn't capable of. When drone technology initially came on the scene, everyone knew it had potential, but no one knew exactly what."

A major aspect of new technology is the algorithms that make the data useful.

One way to do this is with artificial intelligence that allows a computer to perform tasks that were usually only within the ambit of human skill, such as sensing, optimised decision-making and learning.

A current Aerobotics project uses artificial intelligence processes to identify and map trees in an orchard.

"There's an object recognition or classification [algorithm] that will identify each tree and give you a count across a range of metrics, such as tree height, canopy depth, health of the trees," Meltzer says.

Each tree has unique GPS co-ordinates, and "each time you fly a drone over the orchard, you can pick up outliers and anomalies", he says.

The team at Aerobotics — 13 people, 11 of whom are engineers — is also undertaking research to predict individual tree fruit yields.

"There's been an explosion on the tech side," Meltzer says.

"The applications have started becoming apparent, and industry is waking up to it."

Figure 1: Eye in the sky: In precision agriculture, farmers make use of drones, sensors, satellites and the Global Positioning System (GPS) to gather data about their crops, allowing them to make more informed decisions and better manage resources. Credit: ISTOCK

Who knew pee was valuable?

Dave Chambers

Reprinted From: http://www.bizcommunity.com/Article/196/493/171017.html

Liquid gold has been discovered at the University of Cape Town. It comes in the form of urine, which engineering students have transformed into fertiliser and bricks. Now UCT says urine from its urinals has the potential to produce six tonnes of fertiliser a year - twice the amount it uses on its sports fields.

Civil engineering lecturer Dyllon Randall said: "Chemically speaking, urine is liquid gold. It makes up less than 1% of domestic wastewater but contains 80% of the nitrogen, 56% of the phosphorus and 63% of the potassium of this wastewater.

"We literally pee away these valuable nutrients every day."

After spending two years in Switzerland working on a "reinvent-the-toilet" challenge funded by the Bill and Melinda Gates Foundation, Randall challenged four civil engineering doctoral students to continue his work.

Craig Flanagan built a urinal containing calcium hydroxide, which reacted with urine to produce calcium phosphate. Phosphate is a key ingredient in fertiliser, but natural deposits of phosphate are expected to run out within the next 50 years.

Suzanne Lambert took Flanagan's leftover urine and put it into sand that had been colonised with an enzyme that produces calcium carbonate. Randall said this cemented the sand into any shape, such as a brick. It was the first time this had been done with urine. By-products of the bio-brick process are nitrogen and potassium, also used in fertilisers.

Bilaal Kowdur harvested 110 litres of urine from 10 makeshift urinals installed at a UCT residence and used it to make nearly 2 kg of fertiliser.

Tinashe Chipako researched the feasibility of installing waterless urinals on upper campus and found that UCT uses the equivalent of about seven Olympic-size swimming pools of water annually just to flush urinals.

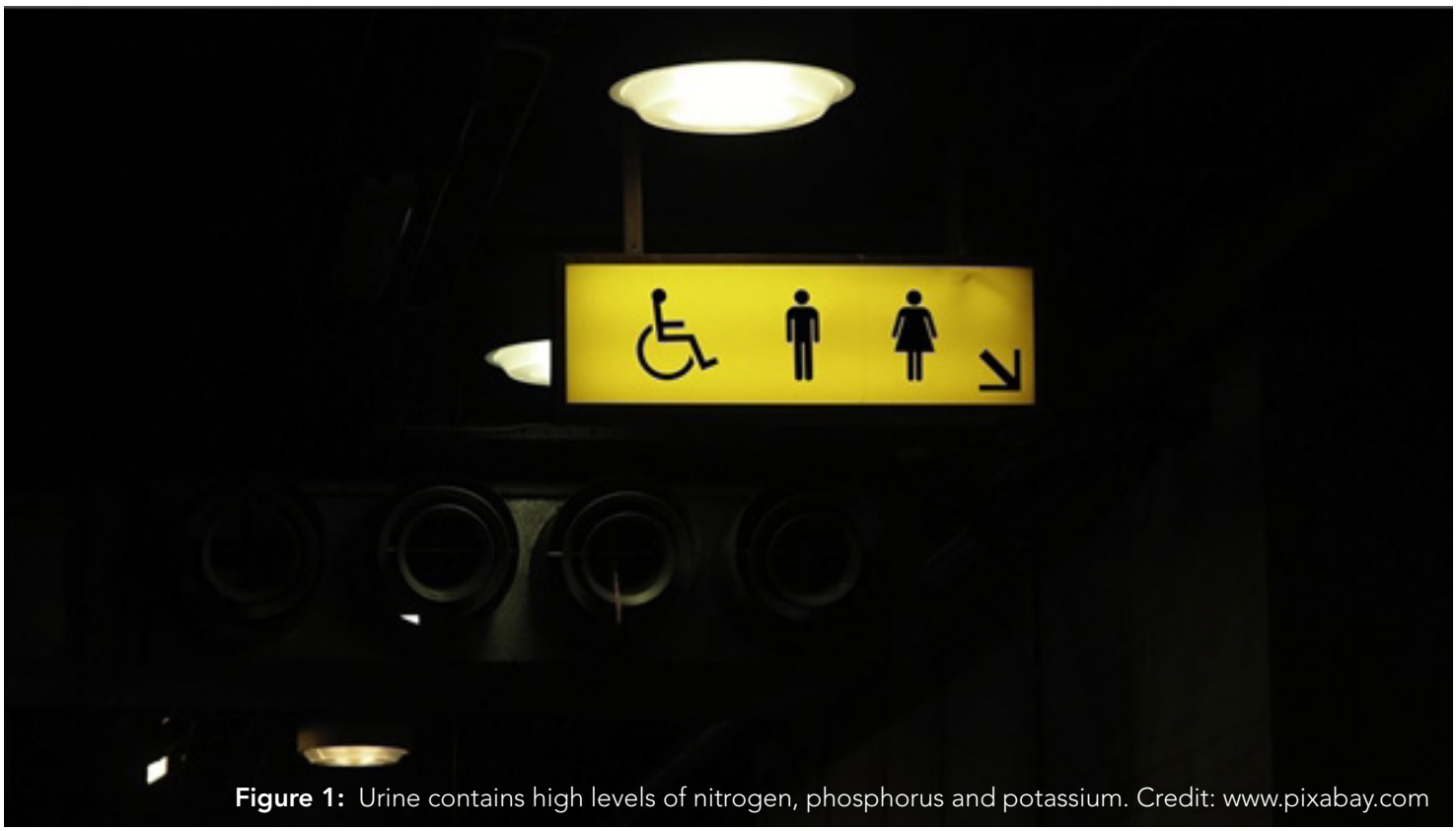

Figure 1: Urine contains high levels of nitrogen, phosphorus and potassium. Credit: www.pixabay.com

Global Soil Organic Carbon Map a powerful tool for sustainable agriculture, climate change mitigation

Reported by Thin Lei Win | Editing by Ros Russell

Reprinted From: http://www.bizcommunity.com/Article/1/643/170960.html

With carbon as its main component, soil organic matter is crucial to soil health and fertility, water infiltration and retention and food production. Conserving and restoring soils, as a major carbon storage system, is critical for both sustainable agriculture and mitigating climate change. FAO, marking World Soil Day, launched a comprehensive global map showing the amount of carbon stocks in the soil.

The world's soils act as the largest terrestrial carbon sink, reducing greenhouse gases in the atmosphere. Intensifying this role could significantly offset the rapid rise of carbon dioxide in the atmosphere. In a historic decision on agriculture, the recent climate change conference in Bonn (COP23) recognised the need for improved soil carbon, soil health and soil fertility.

The Global Soil Organic Carbon Map, illustrating the amount of soil organic carbon stock in the first 30 cm of soil, reveals natural areas with high carbon storage that require its conservation, as well as those regions where there is the possibility for further sequestration. This information can prove a powerful tool to guide decision-making on practices that aim to preserve and increase the current soil carbon stocks, helping win the fight against climate change.

"Soil is the foundation of agriculture, it is where food begins," said FAO Deputy Director-General Maria Helena Semedo. "Maintaining the soil's important functions and ecosystem services to support food production and increase resilience to a changing climate calls for sustainable soil management practices."

Managing soils to protect carbon-rich soils and restore those degraded

The map shows that globally, the first 30 cm of soil contains around 680 billion tonnes of carbon - almost double the amount present in our atmosphere. This is a significant amount compared with

Figure 1: Managing soils to protect and restore carbon-rich soils. Credit: StockSnap via www.pixabay.com

the carbon stored in the whole vegetation (560 billion tonnes).

More than 60% of the 680 billion tonnes of carbon is found in ten countries (Russia, Canada, USA, China, Brazil, Indonesia, Australia, Argentine, Kazakhstan and the Democratic Republic of Congo). This means that actions should be implemented towards protecting these natural carbon-rich soils to avoid emissions to the atmosphere.

The degradation of one-third of the world's soils has already prompted an enormous release of carbon into the atmosphere. Restoring these soils can remove up to 63 billion tonnes of carbon, significantly reducing the effects of climate change.

Increasing carbon content in soils to raise yields

Soils with high organic carbon content are likely to be more productive, better able to purify water and provide plants with optimal moisture conditions. The water stored in soil serves as the source for 90% of the world's agricultural production and represents about 65% of fresh water.

Increasing soil organic carbon by improved management can help maintain productivity in drier conditions. Therefore, actions should be taken to foster further sequestration where the conditions are suitable for that purpose. Innovative good practices such as the use of deep rooting species should be promoted.

"Maintaining - but especially increasing - soil carbon stocks should become an obligation as this will allow us to unlock the soil's full potential to support mitigation and adaptation actions in a changing climate," Semedo said.

Participatory process

This first-ever soil organic carbon map developed through an inclusive and country-driven process was supported by FAO's Intergovernmental Technical Panel on Soils. Ultimately, more than 100 member countries shared their national carbon maps which FAO put together into a global map - it is a concrete contribution towards Sustainable Development Goal 15 - Life on Earth. The next step is for countries to move into monitoring soil organic carbon levels using their national soil information systems to make evidence-based decisions on how to manage their soils and monitor the impact of those actions.

Facts and figures about soil

- Through sustainable soil management, we could produce up to 58% more food. Soil preservation is essential for Zero Hunger world. 95% of food is produced on our soils.
- Worldwide, nearly 80% of the average calories consumed per person comes from crops directly grown in the soil.
- It can take up to 1,000 years to form 1 cm of soil.
- Soils can sequester around 20,000 megatonnes of carbon in 25 years, more than 10% of the greenhouse gas emissions
- Soils filter sediment, pesticides, plant nutrients, salts, bacteria, viruses, heavy metals, organic chemicals from freshwater resources.
- There are more living individual organisms in a tablespoon of soil than there are people on earth.
- The majority of the known antibiotics originated from soil bacteria, including penicillin.

Creative management of grazing through the use of small fires

Wits University

Reprinted From: https://m.phys.org/news/2017-11-creative-grazing-small.html

A recent paper by scientists from Wits University in South Africa shows how creative fire management can increase habitat for wildebeest and other grazing animals in national parks.

The work, published in the Journal of Applied Ecology, shows that small, repeated fires can have a concentrating effect on animals, and create "grazing-lawn ecosystems" where food quality is higher and herbivores can see predators from further away.

The research was initiated through a collaboration between the University of the Witwatersrand and the South African National Parks (SANParks). SANParks managers within Kruger National Park (South Africa's largest protected area) have been managing fire since as early as 1957, with fires applied to achieve particular objectives.

However, recent self-analysis raised concerns that the fire-policy in the Kruger Park was resulting in a switch to fire-adapted grasses that excluded grazing animals who need higher quality graze such as wildebeest. Managers were specifically worried that large fires resulted in grazers spreading out into the large burn scars after a fire and reduced grazing pressure in the local area.

Navashni Govender from SANParks joined up with Prof. Sally Archibald from Wits University and Prof. Catherine Parr from the University of Liverpool. Together with a team of graduate students and technicians, and with the support of Working on Fire, Govender, Archibald and Parr set up a large-scale experiment near Satara Restcamp in the Kruger Park in 2013.

Over the following three years fires of varying sizes were lit annually in the early- and late-dry season of each year and the type and number of grazers visiting burns was monitored by looking for the presence of dung on burn sites. The response of grass to the grazing herds was also measured with plots that were never burnt used to compare any changes.

"After 5 years the results are conclusive," says Archibald. "Our PhD student, Jason Donaldson, has shown that all grazers increase their use of small burns (<25 hectares) after a fire, and

Figure 1: Creative management of grazing through the use small fires can draw back herbivores to grazing areas that are avoided by animals. Credit: Wits University

that the number of animals on these smaller burns is large enough to keep grass short and palatable for longer periods."
Wildebeest remained on these small burns and actively selected them over areas where burns were absent, and grass was taller. The continued high number of wildebeest on small burn patches ultimately kept grass very short.

The collaborators are now investigating whether smaller animals, like grasshoppers, benefit from the management intervention, and have found three families that were unique to short-grazed patches, increasing biodiversity overall.

"The research adds to a growing understanding of the interactions between fire, grazers and grass structure and function in savannas and highlights the importance of understanding feedbacks between fire management policies and wild herbivores," says Donaldson. "The collaborators have been testing this management tool in other ecosystems in Africa, and are also, with collaborators from the University of Pretoria, exploring what this means for rangeland systems, where, cattle, not wildebeest are the dominant grazers."

Fire management may seem like a contradictory idea to some, who view it as a destructive force of nature, but humans have been making use of effect of fire on vegetation structure and animal movement since before the rise of modern man.

"In his book Sapiens, Yuval Noah Harari states: 'Some human species may have made occasional use of fire as early as 800 000 years ago … A carefully managed fire could turn impassable barren thickets into prime grasslands teeming with game'," says Donaldson.

Modern day land managers still rely heavily on fire to manage grasslands in Africa with commercial farmers and migratory pastoralists both burning savannas to provide fresh growth for livestock and to keep areas clear of thick brush.

"The research presented here adds a new layer to this story, as fire size has seldom been considered in these management decisions," says Archibald.

The Kruger National Park is exploring the possibility of using this new insight to manage the southern Basalt plains, which are notoriously low in animals despite their high soil fertility.

Archibald teamed up with visual artist Hannelie Coetzee to interpret this work through burning an artwork titled Locust and Grasshopper (2017) in a Highveld savannah landscape. Coetzee created the images of a locust and grasshopper facing each other, and used the savannah landscape as her canvas to plot them in, with 5D Surveys. With the assistance of fire management organization Working on Fire, they performed their work in a live-burn demonstration at the Nirox Sculpture Park in the Cradle of Humankind.

Through her art, Coetzee asks the question of how human behaviour impacts on our environment.

"Science and art are often conflicting schools of thought, but they can work in parallel, providing a meeting of the head and heart," says Coetzee.

"The representation of the locust and grasshopper expands on the ideas of diversity, but also emphasizes the idea that something so small can play such a large role in our environment. It is only when we look at the intricate detail of these elements that we can communicate these complex issues to the public in a visual way."

Figure 2: Controlled fire experiment. Credit: Wits University

Figure 3: Controlled fire experiment. Credit: Wits University

Fynbos-monitoring tool beats a trail for fire-prone areas

Sarah Wild

Web Address: http://wildonscience.com/
Reprinted From: http://bit.ly/2oLQnHH

A South African-led team has won a UN conservation award for its near-real time monitoring of the Cape's unique fynbos.

The Cape Floristic Region is the smallest of the globe's six floral biomes, with very high biodiversity.

According to the UN Educational, Scientific and Cultural Organisation, a fifth of Africa's flora are contained in this landscape, which takes up less than 1% of the continent's land area. But this region, parts of which form a UN Educational, Scientific and Cultural Organisation world heritage site, is under threat from drought, increased fires and invasive species.

"By detecting potential threats to the ecosystem in near-real time, our tool can inform the responses of conservation authorities, citizen scientists and policy makers while simultaneously collecting data for long-term ecological research," says Jasper Slingsby, a biodiversity scientist at the South African Environmental Observation Network who headed the project.

The tool — called Emma (ecosystem monitoring for management application) — uses satellite images to produce near-real time reports on the state of and changes in vegetation. The pilot won the UN's Data for Climate Action Challenge's climate mitigation category.

"Big data and analytics is a game changer for policy making," says Robert Orr, a special adviser to the UN secretary-general on climate change.

"There is just one problem: much of the data is privately owned and we have to find ways to share it."

While these tools exist for forests, such as the Global Forest Watch, which monitors forest health and deforestation in real time, most other ecosystems, such as savannas, do not have the same monitoring tools. This is the first time that the fynbos can be monitored in near-real time using large satellite-derived data sets.

Emma is a collaboration between Slingsby; Glenn Moncrieff, a data scientist at local company Ixio Analytics; and University of Buffalo bio-ecologist Adam Wilson in the US.

The ability to access long-term data, in near-real time, on an area's biodiversity as well as environment is "critical for ecosystem management and stewardship", Slingsby says.

A major difficulty in modelling the fynbos region, which is frequently affected by fires, is that it is difficult to tell what is natural variation compared with an aberrant problem.

"Wildfire is an important part of the ecosystem, so there is a natural cycle of vegetation loss and recovery," says Wilson.

"To monitor this ecosystem, you need to be able to identify changes that fall outside of these natural variations, and

Figure 1: Watched: The survival of fynbos has been facilitated by near-real time monitoring using data from satallites. Credit: Nicky de Jager

Figure 2: Threatened: Fynbos, such as these proteas picked near Gansbaai, in the Western Cape, is under threat from drought, increased fires and invasive species. Credit: Esa Alexander

our system does this quite well."

Slingsby explains on his blog what the tool, which is still in pilot phase, seeks to do: "Detecting abnormal change in these ecosystems is highly challenging. The state of vegetation varies dramatically due to natural disturbances, long-term trends or cyclical functions, such as those relating to fire, post-fire recovery or seasonality," he writes.

phone app, so that a citizen scientist, field ranger or landowner can map their landscape, take notes and mark specific locations.

But while the fynbos region is unique because of its high biodiversity, it is not the only region in the world whose vegetation is affected by periodic wildfires.

"Systems like Emma have been very useful for monitoring forest ecosystems,

"Systems like Emma have been very useful for monitoring forest ecosystems, but we don't have any way of doing this in non-forest ecosystems such as shrublands and natural grasslands, as far as I am aware" - Glenn Moncrieff, Ixio Analytics

"We don't want to compare the observed vegetation signal [how green it is] against the long-term average at that site; we want to compare it to the expected signal at that site for the age of the vegetation since the last fire and that time of year," Slingsby writes.

The pilot therefore uses data from Nasa's Terra and Aqua satellites and compares that with models of what the landscape should look like, making allowances for the season and the time since the last fire — among other things.

The team is also developing a smart-

but we don't have any way of doing this in non-forest ecosystems such as shrublands and natural grasslands, as far as I am aware," Ixio Analytics's Moncrieff says.

"The tool we've created could have a lot of utility for other fire-prone ecosystems, such as the Mediterranean Basin, California or southwestern Australia."

Why a proper record of birds in Africa is so important – for Europe

Les Underhill

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Reprinted From: http://bit.ly/2j8np21

Most of Europe's birds head south each year around September to escape the northern winter. Some species only migrate as far south as southern Europe. But most cross the Mediterranean Sea to Africa. And many species cross the Sahara Desert to destinations in West Africa such as Nigeria and in East Africa, such as Kenya. Some travel as far south as South Africa.

These European birds are diligently monitored. Every April, during the breeding season in the early part of the northern summer, teams of citizen scientists in most European countries gather vast amounts of data on the distribution and densities of breeding – for almost every bird species. Thousands of citizen scientists are involved. They diligently generate the data in their leisure time.

Europe is also completing its second atlas of breeding birds. This provides a map, for each species, of the places where it has actually been recorded breeding. With this information resources can be dedicated to protecting the areas where birds breed, and to improving their breeding habitat.

But all this effort is worth little unless it is matched by carefully planned initiatives in the non-breeding season, in Africa. The problem is that there's not much accurate or up-to-date knowledge about distributions and migration routes in non-breeding areas.

Development – cities, agriculture, mining and industry – is changing the face of Africa. The impact of climate change is predicted to hit Africa harder than any other continent. These factors will certainly affect the bird species that migrate to and from Europe to breed; for many species, more than half the year is spent in Africa.

If Europe is going to reap the benefits of conservation measures at home, the greatest need for research in ornithology that's relevant to conservation is an understanding of where "their" birds migrate to when they head off to Africa.

That's where the African Bird Atlas comes in.

Tracking sometimes subtle shifts

Southern Africa has had atlas projects for birds, frogs, reptiles and butterflies. Only the bird atlas was truly comprehensive: almost every corner of Botswana, Lesotho, Namibia, South Africa, Swaziland and Zimbabwe was visited by citizen scientists who collected and compiled all the data.

The first bird atlas was developed in the late 1980s. The participants generated seven million records of bird distribution – a project described as the biggest biodiversity project conducted on the African continent.

Biodiversity tourism – including bird tourism – has huge potential for sustainable employment in Africa.

A second bird atlas was initiated in 2007 to cover South Africa, Lesotho and Swaziland. This project is ongoing. In August 2017, its database reached 10 million records. It has sister projects, using the same protocol, running in Kenya and Nigeria. Europe focuses on the breeding season, but work on the African bird atlas continues throughout the year. This allows us to gather precious data on the timing of the arrival and departure of migrant birds.

Other countries in Africa such as Ethiopia and Zambia have had bird atlas projects. These were mostly undertaken by expatriate birdwatchers from Europe and North America. While most of the distribution maps produced by these projects are well out of date, they remain incredibly valuable because they help show how distributions have changed.

The two bird atlas projects in southern Africa are a quarter century apart. Many species have shown massive changes in distribution. The Glossy Ibis has expanded westwards. The Maccoa Duck has decreased to the point where it ought to be listed as a threatened species.

The timing of migration is also changing. This is especially true for long-distance migrants. Comparisons between the two bird atlas projects have revealed subtle shifts in the timing of migration to and from South Africa of the iconic bird of the European spring, the Barn Swallow – famous for the saying "one swallow does not make a summer".

A vital project

So who can get involved in gathering information for the bird atlas, and why should they?

Anyone with a good ability to identify birds in their home can be a citizen scientist for the project. People who think they fit the criteria are encouraged to register as an observer on the project's website.

The guidelines for participation are all there, including a description of the protocol which needs to be followed. In a nutshell, this involves spending a minimum of two hours in a grid cell, about 9 km square, making a bird list which is as comprehensive as possible. We are currently looking for citizen scientists from across the continent.

All of this work is enormously important for Africa itself. For example, in planning species conservation and setting priorities for action, the first questions asked are: "Where does the species occur?" and "Is this range changing?" Only proper fieldwork through a project like the bird atlas can assure that the answers are not guesswork.

Also, biodiversity tourism – including bird tourism – has huge potential for sustainable employment in Africa. But bird tourism is best planned if there is access to comprehensive distribution maps, especially in the field guides.

And the African Bird Atlas will also be of tremendous use to Europe. A 2014 review showed that Europe's long distance migrants to Africa are in decline. The weak link in the annual cycle is not clear. The same review points out that we "understand little about distributions patterns" in Africa, and recommends that this is a priority for further research.

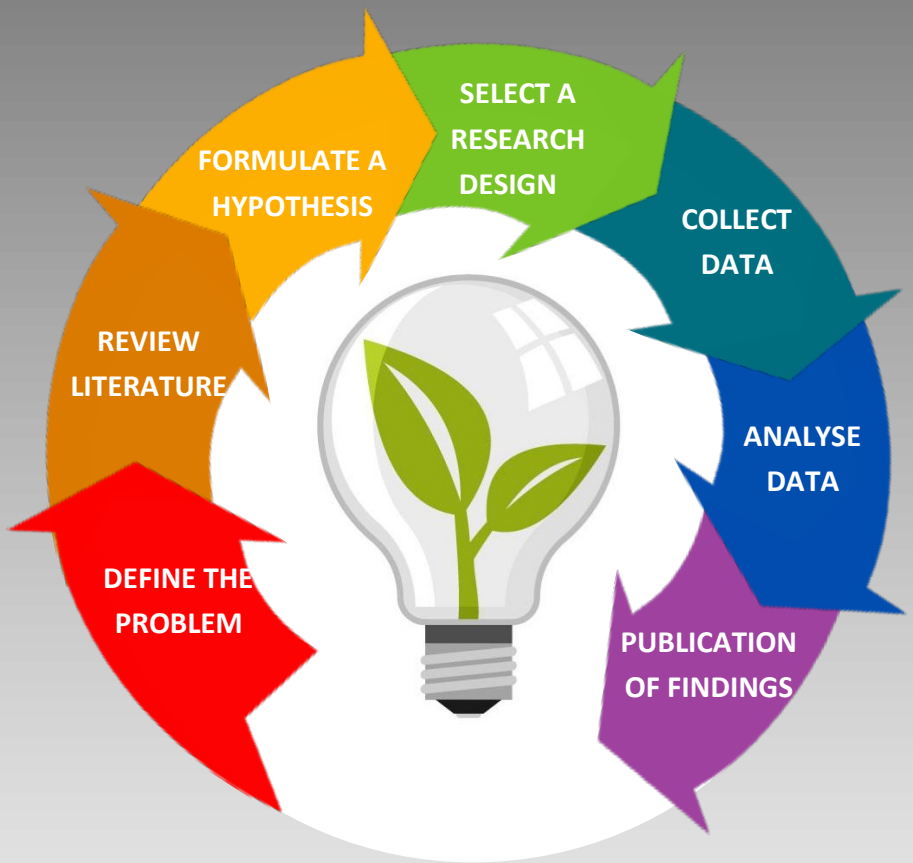
Figure 1: Carefully tracking the migration habits of birds like the Barn Swallow can help to conserve these species. Credit: Shutterstock

Research Skills Workshop

Presented by the Grassland Society of Southern Africa

22 to 23 July 2018

Roodeplaat, Pretoria, Gauteng Province, South Africa



WHO SHOULD ATTEND?

The workshop will be of value to anyone involved directly or indirectly in biological, ecological, and agricultural research, including scientists, researchers, managers, technicians, teachers, mentors, and students.

To register, complete the registration form available on the website, www.grassland.org.za, or contact Erica Joubert on info@grassland.org.za, +27 (0)63 361 2647 (only between 8am and 1pm).

Day 1: Sunday 22 July 2018	09:00 to 17:00
Where we end up– choosing a career path	Julius Tjelele
Networking, management and collaboration in research institutions	Ntuthuko Mkhize/ Clement Cupido
The research question	Wayne Twine
Data management– making it easier for you	Victoria Goodall
Overcoming the publishing obstacle	Wayne Twine
Sourcing research articles, referencing and avoiding plagiarism	To be confirmed
How to plan and construct a thesis	Abel Ramoelo
Practical: Organising and manipulating data in Excel	Justin Du Toit
Ten tips for designing the perfect scientific poster	Adrian Shrader
Day 2: Monday 23 July 2018	**08:30 to 17:00**
Writing for popular publications	Amelia Genis
Practical: The research question (continued)	Wayne Twine
Practical: Designing a scientific poster	Adrian Shrader
Practical: Smartphones and android apps for fieldwork	Clement Cupido
Practical: Photography in the field	Justin Du Toit
How to get subsidised to attend conferences	Freyni Du Toit
Working with communities	Igshaan Samuels

Registration Fees

	Early bird payments (received before 14 May 2018) LESS 40%	Normal payments (received before 29 June 2018) LESS 25%	Full Fee (payments received after 29 June 2018)
Full time students/ interns	R1680.00	R2100.00	R2800.00
GSSA Members	R1920.00	R2400.00	R3200.00
Non-Members	R2304.00	R2880.00	R3840.00

Transitioning SA to a low carbon economy that responds to climate change

In a series of articles, the NSTF is unpacking the National Development Plan (NDP). The focus is on understanding it from a science, engineering, technology (SET) perspective. The NDP is seen as a blueprint/guiding document for South Africa. The NDP aims to eliminate poverty and reduce inequality by 2030.

NSTF

E-mail Address: enquiries@nstf.org.za

Reprinted From: http://www.nstf.org.za/wp-content/uploads/2018/02/The-NDP-part7.pdf

Chapter 5 – Transition to a low carbon economy

This chapter starts with South Africa's commitment to "reduce its emissions below a baseline of 34 percent by 2020 and 42 percent by 2025". The NDP sees 2030 as a time when "South Africa has reduced its dependency on carbon, natural resources and energy". We need to recognise that humans' wellbeing relies on the wellbeing of the planet. However, this must be balanced with increasing employment and reducing inequality.

The NDP Commission undertook extensive stakeholder consultations to inform this chapter – because of a need for consensus on challenges and trade-offs. Some consensus had been reached while other points require ongoing discussion.

The "primary approach to adapting to climate change is to strengthen the nation's resilience".

Resilience includes socioeconomic objectives such as decreasing poverty and inequality, increasing education levels, improving health care, creating employment, promoting skills development, and having a strong economy with high energy, water, food and natural resource security and strong innovation.

Government adaptation policies include:

- Significant investment in new adaptive technologies and techniques in water, biodiversity, fisheries, forestry, and agriculture sectors
- Early warning systems for adverse weather, pest and disease occurrence
- Disaster relief preparedness
- Investment in natural ecosystems

The NDP sees South Africa's carbon emissions as peaking around 2025 and then stabilising. This must be done without hindering the socioeconomic objectives. The regulatory environment will support stabilisation through, for example:

- Expanded renewable energy programme
- Advanced liquid and bio-fuels sector
- Promotion of green building and construction practices
- R&D resources being allocated to low-carbon technologies (not only for mitigation but for global opportunities)

Transition is challenging because historically policies have focused on minerals and energy. South Africa has "abundant coal, minimal hydroelectricity and little production of natural gas". We also have some of the world's richest mineral deposits – with mining and processing needing substantial energy. Beyond this, there is also a shortage of skills and capacity. There is a "fundamental structural challenge in moving towards a lower carbon economy". The main "challenge is de-linking economic activity from environmental degradation and carbon-intensive energy, while remaining competitive" and keeping to the socioeconomic objectives.

The NDP notes that "more detailed analysis is needed to determine the optimal mix of mitigation actions". The poor and vulnerable must be protected from transitional costs, while considering the economic implications overall. Financing is seen to come from realigning existing budgets, domestic sources (eg carbon pricing), and international aid.

Planning needs to follow rigorous and transparent processes with meaningful stakeholder engagement and evidence-based decision making. While the responsibility for the transition is collective with full participation of all stakeholders, the state should facilitate and guide the process acting "in the interests of the nation". The government must build capacity, improve governance, and restructure institutions. Institutional coordination is essential, in particular, aligning and coordinating government departments and their policies.

Transition and planning is local, regional and global. South Africa must commit to a domestically established mitigation target – taking into account the country's specific needs and development process. Cooperative regional development planning is also necessary as is global solidarity and international assistance. Monitoring and reporting should be done against national, regional and international goals.

A carbon budget approach is proposed. "A carbon budget sets the amount of carbon that can be emitted in a given amount of time." This would entail regular monitoring and reviewing of carbon budget targets, with flexibility in certain energy- and carbon-intensive sectors. The suggestion is to "apportion carbon space to the sectors and initiatives that add the greatest value".

The "international best practice has established that adequately pricing GHG [greenhouse gas] emissions is one of the most effective ways to encourage polluters to change their behaviour." The NDP supports a carbon tax approach. However, specific planning needs to be addressed around the uncompetitive and monopolistic electricity generation sector to see real effects. Further focus should be on sectors where the price may be insufficient to change behaviour.

"The transition to a low-carbon, resilient economy and society requires careful phasing of strategic planning, evidence gathering, and investment."

In South Africa, bees stop elephants from trampling trees

The humble bee is helping to keep elephants from destroying trees and wiping out crops in their quest for food.

Associated Press

Reprinted From: http://bit.ly/2I2eVVy

The humble bee is helping to keep elephants from destroying trees and wiping out crops in their quest for food.

A project launched near South Africa's Kruger National Park in 2015 has found success. Hanging beehives containing African honeybees from the branches of marula trees are highly effective at protecting these trees from elephant impact, a new study has confirmed.

Research, conducted by South African based Elephants Alive and the University of the Witwatersrand in Johannesburg, in partnership with the Elephants and Bees Project of Save the Elephants in Kenya, has discovered that African elephants appear to avoid impacting marula trees containing beehives with African honeybees.

According to Save the Elephants, conservation managers in fenced-off protected areas are concerned about the impact that expanding African elephant numbers have on the survival rate of large tree species.

"Wire-netting has proven to be successful at increasing trees' survival rates by preventing elephants from ring-barking these trees. However, wire-netted trees are still vulnerable to other types of elephant impact. This requires researchers to investigate new methods which may be effective at completely deterring elephants from particular large trees," says the organisation.

"A new study shows that hanging a combination of both active and dummy (inactive) beehives from the branches of marula trees creates a formidable mitigation method for protecting this keystone species from elephant impact," it adds.

An elephant's skin is thick but sensitive. The animals will try to avoid a bee sting whenever possible, experts say.

"They're terrified of it coming up the trunk and then they could potentially suffocate," says Jess Wilmot, field researcher with the organisation Elephants Alive.

Project founder Michelle Henley says beehives have proven to be "significantly effective" at protecting indigenous trees from being trampled.

"This innovative study demonstrates that there are peaceful means with which we can foster the important ecological linkages between elephants, trees and bees. The bees not only protect the large trees from severe impact but as pollinators they also ensure valuable seed banks for the surrounding landscapes," says Henley.

Beekeeper Mark Collins says "It's amazing how a creature so small can actually scare away an elephant."

Now the project is upgrading the beehives and using them to explore commercial honey production.

Figure 1 - 3: Hanging beehives containing African honeybees from the branches of Marula trees are highly effective at protecting these trees from elephants. Photos: Supplied/ Mike Kendrick

Natural Science Collections Facility to protect South Africa's mega biodiversity

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The launch of the Natural Science Collections Facility (NSCF) will see over 30 million preserved plant, animal and fossil specimens from more than 40 museums, science councils and universities in the country organised under a single coordinating hub.

These natural science collections, built up over 200 years, present economic and scientific opportunities and are used by researchers all over the world.

Examples of these materials and associated data include assessments of South Africa's endangered plants, specimens of reptiles and insects, and maps showing priority biodiversity areas to guide development and priority areas for conservation.

The collections are essential as a reference for accurately identifying materials for bioprospecting and agriculture. In addition, they can be used to track pathways for the spread of diseases and pests, and to analyse movements of animal species, which is especially relevant for sustaining biodiversity-based industries such as fishing.

Data associated with the specimens are used for modelling climate change impacts on economically important species' distributions, timing ecologically important events such as pollination, and spatial planning that informs decision-making for sustainable development.

An assessment of South Africa's natural science collections showed that while there were pockets of excellence, the collections were under-resourced and not used to their full potential, with many of them being at risk of loss.

The NSCF will see the collections housed in a virtual facility with the central coordinating hub based at the South African National Biodiversity Institute (SANBI).

The Department of Science and Technology (DST) will spend more than R50 million over the next three years to establish the virtual facility.

Speaking at the launch of the facility in the Drakensberg on 17 October 2017, the DST Chief Director for Basic Sciences and Infrastructure, Dr Daniel Adams, said the NSCF was one of the 13 research infrastructure facilities identified as part of the South Africa Research Infrastructure Roadmap.

"Access to adequate and relevant research infrastructure is essential for promoting quality outcomes and research, so as to develop a competitive and sustainable National System of Innovation," said Dr Adams.

He added that adequate levels of funding for such infrastructure formed a key component of any national research system.

According to the project leader, Prof. Michelle Hamer, Director of Zoological Systematics at SANBI, the different institutions, and even collections within single institutions, operate largely in isolation.

"Establishing the NSCF would address these problems with a number of collections at different institutions that work towards a common set of goals and targets and produce coordinated outputs," said Prof. Hamer.

The NSCF will secure the collections through the development of national standards and policies for curation and interventions, improve access to collections by providing a single entry point to the specimens and services associated with them, and digitise images of specimen collection databases.

The facility will also coordinate strategic research based on the collections that address priority questions and develop relevant capacity to care for, document, expand and research the collections.

NISC welcomes a new Editor-in-Chief

NISC

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"I am excited about the future of the journal and am committed to helping continue the ever-improving trajectory it has established over the past few years under the Editorship of Dr James Bennett," said Dr Pieter Swanepoel, the incoming Editor-in-Chief for African Journal of Range and Forage Science.

Dr Pieter Swanepoel has been a member of the Grasslands Society of Southern Africa (GSSA) since 2009 and has been an Associate Editor since 2013. "The role of editor is a significant responsibility, and I thank the GSSA committee for the trust they have placed in my ability to lead the African Journal of Range and Forage Science."

Dr Pieter Swanepoel is currently employed by Stellenbosch University, where he lectures Agronomy (including pasture agronomy) and does research mainly on soil quality of pasture and crop rotation systems. "Going forward the journal is in a good position and this is due in no small part to the efforts of the editorial team," said outgoing Editor-in-Chief, Dr James Bennett.

In addition, the journal welcomes two newly appointed Associate Editors: Dr Debbie Jewitt from Ezemvelo KZN Wildlife and Dr Lindeque du Toit from the University of Pretoria. In welcoming Dr Pieter Swanepoel as Editor-in-Chief of the African Journal of Range and Forage Science, his papers listed below have been made available to access at no cost until the end of February 2018.

- A critical view on the soil fertility status of minimum-till kikuyu–ryegrass pastures in South Africa
- Soil quality effects on regeneration of annual Medicago pastures in the Swartland of South Africa
- Managing cultivated pastures for improving soil quality in South Africa: challenges and opportunities

With an Impact Factor of 0.961 (2016), the African Journal of Range & Forage Science is the leading rangeland and pastoral journal in Africa. The journal is dedicated to publishing quality original material that advances rangeland ecology and pasture management in Africa. Read more about the journal here: http://grassland.org.za/publications/ajrfs

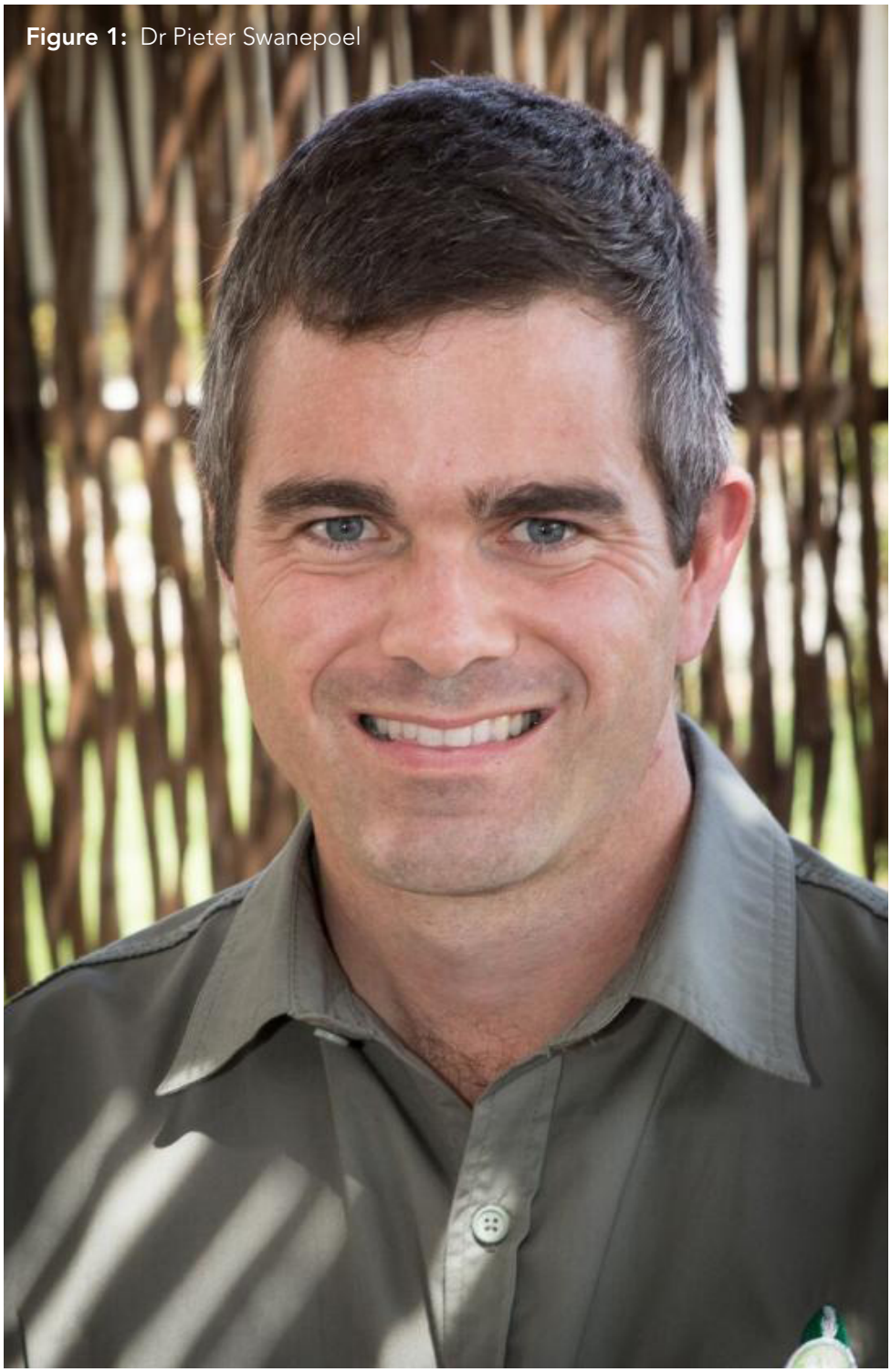

Figure 1: Dr Pieter Swanepoel

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Is it possible to be both environmentally friendly and economically productive on pasture-based dairy farms?

Craig Galloway

Original feature article submitted to Grassroots

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This is a very important question which environmental practitioners and advocates for environmentally friendly farming need to answer. If the answer is no, then it becomes increasingly difficult to advocate for environmentally friendly practices. If the answer is yes, then we need to figure out how. This question was addressed in a recent paper by Galloway et al. (2018), "Are private and social goals aligned in pasture-based dairy production?" Seeing as though I was the lead author on this paper, I spent a lot of time thinking about, researching and trying to find some answers to this question. I do not think that the answer is straightforward, mainly because there are so many environmental impacts resulting from farming practices that it is almost impossible to consider all of them in one study. I believe this research started exploring this question though, and provided some interesting insight. The main takeaway is that yes, pasture-based dairy farmers can include both environmental and economic goals in how they manage their farms without them contradicting each other.

I would like to use a few of the results from this study to discuss some aspects of farm management which I believe are of utmost importance when wanting to achieve environmental and economic goals concurrently on pasture-based dairy farms. Without getting into the technical details (you can read the paper for that), the study examined the dynamic between total factor productivity, greenhouse gas (GHG) emissions and nutrient use efficiency (NUE) on 43 pasture-based dairy farms in the Eastern Cape. Although only 43 farms were included, some farms provided more than one year's worth of data, and each year was included as an observation, resulting in 80 total observations. All of this data was obtained from Trace & Save, which is an independent agricultural sustainability company, from farms which participate in the Woodlands Dairy Sustainability Project.

Figure 1: Typical pasture-based dairy farm.

Total factor productivity (measured using the data envelopment analysis) is a measure of farm economic efficiency. It benchmarks farms against each other, providing a relative efficiency level for each farm. GHG emissions are associated with climate change, a significant environmental impact of dairy farming, and were measured using a carbon footprint. Nutrient use efficiency, which assesses how efficiently nitrogen (N) and phosphorous (P) are utilised on farms, was measured using a nutrient budget. The more inefficiently nutrients are used the more excess N and P from farms potentially ends up in freshwater sources and in the atmosphere, causing pollution of these natural resources. GHG emissions and NUE are therefore measures of environmental impact. It is important to note that they do not comprehensively assess the environmental impacts resulting from dairy farming practices, but they are both whole-farm measures which have been used extensively to assess environmental impacts. Along with these measures, we used farm system descriptors (the terminology partial productivity measures was used in the paper) to provide further insight into the results.

The table below contains data obtained from Table 2 of Galloway et al. (2018). We divided the farms into three equal groups based on their economic productivities. This gave us upper, middle and lower efficiency groups. The GHG emissions (kilograms of carbon dioxide equivalents per kilogram of energy corrected milk) and NUE efficiency (nutrient removed per year divided by nutrients imported per year, expressed as a percentage) results were averaged for each of these groups, providing insight into any differences in environmental impact between farms with different economic productivities. The farm system descriptors, namely stocking rate (cows in milk per hectare), milk production per cow (kilograms of energy corrected milk per cow in milk), milk production per hectare (kilograms of energy corrected milk per hectare), purchased concentrates fed (megajoules from concentrates per kilogram of energy corrected milk produced), purchased roughage fed (megajoules from supplementary roughage per kilogram of energy corrected milk produced) and fertiliser application rates (kilograms of N and P per hectare), were also averaged for each group. These descriptors provided insight into the average farm system adopted for each efficiency group.

Table 1: An adaptation of the table showing selected farm system descriptors and environmental impact measures, grouped by economic efficiency (Galloway et al. 2018)

Farm system descriptors and environmental impact measures	Efficiency group		
	Upper (n=27)	Middle (n=26)	Lower (n=27)
	Mean ± std deviation		
Nutrient use efficiency	34% ± 13%	26% ± 10%	22% ± 9%
GHG emissions	1.43 ± 0.20	1.42 ± 0.21	1.61 ± 0.30
Stocking rate	2.55 ± 1.32	2.47 ± 0.96	1.66 ± 0.65
Milk production per cow	6,777 ± 913	6,816 ± 884	6,444 ± 987
Milk production per hectare	17,189 ± 8,265	16,428 ± 5,620	10,847 ± 4,834
Purchased concentrates fed	4.03 ± 1.00	4.82 ± 0.68	5.42 ± 0.98
Purchased roughage fed	1.49 ± 1.42	1.22 ± 1.20	2.10 ± 2.16
Nitrogen fertiliser	209 ± 137	274 ± 163	250 ± 139
Phosphorous fertiliser	23 ± 26	34 ± 37	19 ± 28

The Upper tercile was 84—100% efficient, the Middle tercile was 73—84% efficient and the Lower tercile 3 was 25—73% efficient.

The first thing that stands out for me in these results is that the nutrient use efficiencies are highest in the upper efficiency group, and lowest in the lower efficiency group. Secondly, the GHG emissions are lowest in the upper and middle efficiency groups, and highest in the lower efficiency group. This is the evidence of the earlier statement saying that economic and environmental goals can be achieved simultaneously on these farms. The farms in the upper efficiency group had the lowest overall environmental impact. This leads to that second question, how did these farms achieve this?

In order to answer this, we need to look at the farm system descriptors. There are a few things which stand out to me from this data. The farms in the upper efficiency group had the highest stocking rate and milk production per hectare. This indicates that it is important to optimally utilise the available land for milk production. Further to this, the farms in the upper efficiency group had the lowest concentrates fed and lowest N fertiliser applied, and lower P fertiliser applied than the middle group. This is interesting as it means the upper group did not achieve the higher stocking rate and milk production per hectare through feeding more concentrates and using more fertiliser. They were the most efficient at converting concentrates into milk, and in using N fertiliser. The purchased roughage fed was higher in the upper efficiency group than in the middle group, indicating that roughage can be used effectively to support the higher stocking rate. There were no large differences in milk production per cow between the upper and middle efficiency groups. The takeaway is that in order to achieve higher economic efficiency, and reduce environmental impact, farmers need to optimise milk production on the available area while not using excessive concentrates and fertiliser.

Figure 2: Highly fertile soil of a pasture-based dairy farm

Figure 3: A child drinking a glass of milk

There are two prominent practices which I believe contribute to this: 1) soil health management and 2) grazing management. Soil health management on pasture-based dairy farms is about improving the biological, chemical and physical aspects of the soil so as to support optimal pasture growth through natural soil processes. The only way to achieve high stocking rates, without relying on excessive amounts of purchased feeds, is to grow sufficient and good quality pasture. Farmers often attempt to achieve this through the application of fertiliser, especially N fertiliser. The data from the Galloway et al. (2018) study shows that the upper efficiency group of farms are obviously not relying on this mechanism. I believe one of the mechanisms they are relying on is healthy soil. This is not evidenced in the data collected for this specific study, but has been observed from interacting with these farmers over the past five years, discussing soil health management with them based on the soil health tests carried out by Trace & Save. The second prominent practice is good grazing management. Most pasture-based dairy farmers these days implement some form of rotational grazing management. We have come to the point where it is not good enough to just do rotational grazing, farmers need to ensure that they are fully utilising the pasture which is grown on the farm and converting it into milk. I believe this is the other prominent mechanism being used by the farmers in the upper efficiency group to achieve higher stocking rates and milk production per hectare without relying on excessive purchased feeds.

This short article only covers a small aspect of what is explored in the Galloway et al. (2018) paper, but the essence of the message is that pasture-based dairy farmers do not need to sacrifice their economic productivity in order to reduce their environmental impact. A lower environmental impact was actually associated with a higher efficiency on the farms included in the study. This is the good news for pasture-based dairy farms. The challenging aspect of it is that this is only achieved through hard work, and the implementation of good, sustainable management practices over a prolonged period of time.

Reference

Galloway C, Conradie B, Prozesky H, Esler K. 2018. Are private and social goals aligned in pasture-based dairy production? *Journal of Cleaner Production* 175:402-408.

Writing an eye-catching and evocative abstract for a research article: A comprehensive and practical approach

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Reprinted from: www.ephysician.ir/2012/520-524.pdf

Abstract

It is an important and difficult job to write an eye catching abstract. A large percentage of the manuscripts that are submitted to academic journals are rejected because their abstracts are poorly written. This paper provides a new and step by step approach for writing a good structured abstract.

Why is the abstract important?

Writing an abstract properly is one of the most highly-specialized forms of academic writing. The abstract, which is a very vital part of a journal article, comes first in the article, but it is the last part to be written (1). The abstract is read more frequently than any other part of the article, and it must cover all the major points of the article (2). Since prospective readers decide whether or not to read the entire article by reading the abstract (1), the abstract functions as an advertisement for your work. Unfortunately, many researchers think that writing an abstract is an easy and trivial task, so they do not expend the time, energy, or effort required to produce a good abstract. As a result, abstracts frequently are full of errors (Table 1) and do not match the original text of the article (3). After reading an abstract, the reader should know the following:

- Why the study was conducted.
- What the findings of the study were.
- How the findings can be applied.

The present paper provides a detailed discussion of the features of a good abstract. Some practical guidelines for writing a very sophisticated abstract are provided. This paper is focused on the elements of structured abstracts for research articles, because such abstracts are preferred by most journals, and they have been demonstrated to be of higher quality than alternative approaches (1).

A practical approach

A structured abstract for an original research article is an abstract with different, labeled parts to facilitate the reader's comprehension. This helps the readers who wish to identify and investigate further only journal articles that are focused on a specific issue and that are valid from a methodological perspective (3, 4). This method of organizing an abstract also instructs writers in summarizing the content of their research accurately (Table 2) and facilitates the peer-review process (4, 5). Writing an effective structured abstract is difficult, but it is not an impossible task. Such an abstract must be well designed, well organized, and concise (Table 3); however, the format required for a structured abstract is not the same in all journals. Their lengths and structures vary by discipline and by the publisher's requirements. Most journals mention the specific criteria they require for abstracts in the "Instructions for Authors" section. A widely-accepted format for structured abstracts in a research article includes the following sections: Introduction, Methods, Results, and Conclusions (3).

Table 1: Common mistakes in writing an abstract

Using an inappropriate writing style
Addressing irrelevant information that is not mentioned in the original text
Including unnecessary words or phrases
Using the first line of the Introduction as the first sentence of the abstract
Compiling the abstract by selecting some sentences from the main text
Including references in the abstract
Writing long sentences (recommended maximum = 25 words)
Writing incomplete sentences
Using inappropriate tense of verbs (and improper subject-verb agreement)
Using exaggerated, overblown and grandiose words
Using non-required synonyms and repetitive words
Using "Tables" in the abstract
Using "Figures" in the abstract
Using non-essential jargons
Plagiarism
Grammatical mistakes
Mixing "results" and "inferences (Discussion/Conclusion)"

Writing the Introduction

This section is actually a brief summary of the Introduction of the article. It may consist of three short sentences, with the first sentence specifically mentioning the core content, the second its context i.e. the background and the third addressing the objectives of the research.

Writing the first and second sentences

The first sentence should provide the background of the study, address the research focus, and point out the importance of the problem or the gap in the knowledge (Table 2). Usually, a good background sentence states the problem that the study addressed, provides the context for the study, and indicates the importance of the study, each of which provides information that the reader needs to know. Make sure you address the most important aspect of the research and express the restrictions of previous studies, if possible; but BE CONCISE and encapsulate all of these components in two short sentences.

Writing the third sentence

Here, you should quickly address the main research question or hypothesis in the form of a research objective (Table 4). You may present the overall objective of the study or address one specific, key objective. After you have formulated your research objective, be sure to write it in the appropriate form based on the type of study (e.g., qualitative vs. quantitative) and the variables that were investigated. In expressing research objectives, it is essential to use infinitives, i.e., the combination of "to" and a verb, such as "to develop", "to determine", and "to assess" (Table 4).

Writing Methods

In this section, you should state the methods that were used to answer the research questions. Three to four sentences should express the research design; the study population; the subject selection process; and the instruments, measurement tools, and statistical techniques that were used. In other words, you should precisely summarize the process and the fundamental procedures you used to answer your questions. A practical approach for writing this section is to begin with an explanation of the study design and its structure (Table 2). After that, you should discuss the study population, sampling methods, and the setting (e.g., hospital, clinic, university, or company) and explain the selection procedure (e.g., the selection criteria, the number of subjects selected, and the demographic characteristics of the subjects). If you are writing about an experimental study, you should explain the characteristics of any interventions that were necessary. At the end of this part, you should mention the statistical analyses that were used in the study. It is a prudent practice to mention how was acceptable validity and reliability ensured.

Table 2: Questions that should be answered before writing each part of the abstract

Sections	Approach	
Introduction	1st & 2nd sentences (The What and Why?)	Ask yourself: What is the core content of your manuscript/thesis (about WHAT?) Why were the problem and the results important? What problems did you aim to solve? What was the main gap(s) in knowledge that your research was intended to fill?
	3rd sentence (The What For?)	Ask yourself: What was the general objective of the study? What was the key, specific objective of the study? Was there a major hypothesis?
Methods	Ask yourself (The "How"): What was the study design? What was the population and who were the subjects of the study? What were the key variables? What were the entry criteria that subjects had to meet? What measurement tool(s) did you use? What steps did you follow and how? What kind of statistical analyses did you use? What steps did you use to ensure acceptable reliability & validity?	
Results	Ask yourself (The "So What"): What were the major results of the research? Were the results significant? How were they significant? Did you find any meaningful changes? If so, what were the magnitudes of the effects? Any consideration of effect size? If so, is it statistical significance or clinical significance?	
Conclusions	Ask yourself (The "Then What") : What do your findings actually mean? What are the implications of your findings? Can the findings be generalized to other situations? Are the results specific and limited to a particular case or situation? Did the research findings fill the gap(s) of knowledge identified earlier in the Introduction section? How comparable are your findings relative to those of other studies? Did the results point towards developing a new hypothesis?	

Table 3: Main rules for developing a good abstract - a recommended "to-do" list

Structure and grammar	**Follow an appropriate writing style.**
	Use the appropriate tense for verbs.
	Use active voice rather than passive voice whenever possible.
	Use complete sentences.
	Use correct punctuation and spaces.
	Use figures and numbers appropriately.
	Use past tense to report "Method" & "Results"
Content	**Highlight the main points of the article.**
	Include all of the notable findings and points of the article.
	Create a distinct image of the content of the article.
	Reflect the purpose and content of the main text.
	Include precise information.
	Only report your findings; do not evaluate, review, or comment on them.
	Be concise, accurate, and clear.
	Never present new information; just summarize the content of the article.
	Include key terms.

Writing Results

In this section, you must describe you major findings, and you can use a word count that is similar to that used in the Methods section. You should clearly define the primary outcome of your research and the key information provided in the article. Confidence intervals, P-values, odds ratios, relative risks, and effect sizes are among the most common kinds of information that authors usually present in this section. You should resist the temptation to include peripheral or irrelevant information that is not included in the main text (Table 1).

Writing Conclusions

In this section, you have the opportunity to inspire your colleagues in one or two great sentences in which you state your main conclusions and recommendations. Only new, important, and major findings and their implications should be included; but, be careful to ensure that all of your conclusions are supported fully by the findings of the research; it is essential that you avoid exaggerating your findings or making rash over-generalizations about their significance. PLEASE, don't flash neon lights that say "I am a beginner" in the Conclusions section by using grandiose, exaggerated, and overblown descriptions of the importance of your findings! A good approach in writing the Conclusions section is to outline the key findings (but not directly pasting phrases or sentences from the "Results") from the research and present a rational statement about their potential for beneficial applications (Table 2).

Table 2: Questions that should be answered before writing each part of the abstract

Bad?	Good?	Reason?
This paper discusses three issues. The first issue is X. The second and thirds issues are Y and Z.	**This paper discusses X, Y and Z.**	**Use as few words as possible.**
The main hypothesis of this study was: "There is a positive relationship between X and Y."	**The purpose of this study was to determine the relationship between X and Y.**	**Write the "hypothesis" in "objective" form.**
The purpose of this study was to investigate the relationship between X and Y.	**The purpose of this study was to determine the relationship between X and Y.**	**Use the appropriate verbs to describe the objectives of the quantitative and qualitative research.**
According to Author et al. (2009), there is a significant relation between X and Y.	**There is a significant relationship between X and Y.**	**Do not use a reference in the abstract.**
There is an extreme relationship between X and Y.	**There is a significant relationship between X and Y.**	**Use words that are statistically meaningful, and avoid using words that have general meanings, such as extreme, extremely, very, outstanding, and huge.**

There was a huge difference between the mean ages of the two groups.	**There was a significant difference between the mean ages of the two groups (P < 0.05).**	**1. Use P-values, confidence intervals, and Odds ratios whenever possible. 2. Use statistically-meaningful words and avoid using words that have general meanings, such as extreme, extremely, very, outstanding, and huge.**
It was examined by the study…	**The study examined …**	**Avoid using the passive voice whenever possible.**
I examined…	**1. The study examined X, Y, and Z. 2. We examined X, Y, and Z. 3. In the study, X, Y, and Z were examined.**	**Avoid using the first person whenever possible (Use the alternative form No.1). If you really need to do so then using "We" is much better than "I" (the alternative form No.2). Even using the passive voice (the alternative form No.3) is much better than using "I".**

Ask the expert

Writing a good succinct abstract is difficult, because your goal is to convey as much content as possible in the fewest words possible. Therefore, using scientific writing services (6) and asking an expert to review the abstract (or the entire manuscript) before submission are often good ideas. It is recommended that you add this article to the reference section of your manuscripts and place the appropriate citation in the text if you use the approach recommended in this article. For example, you can cite this article using the following sentence at the end of the Methodology section of your article: "The report of the study was prepared based on the journal format and other guidelines provided in this reference (Jalalian, 2012)".

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Obituary

Dr Moto Lesoli

Dr Lesoli was born in Hlotse, Lesotho. He attended Mount Royal High School and completed his higher education at Lesotho Agricultural College and at the University of Fort Hare where he obtained his PhD in Rangeland Ecology in 2011. He was the head of Total Quality Assurance and Student Services at Fort Cox College of Agriculture and Forestry for a number of years after obtaining his PhD. At the time of his passing he was the CEO Designate at Amadlelo Agri based in Alice. Throughout his career he contributed his work through poster and platform presentations at several GSSA Annual congresses. He was a member of the GSSA Council. He died after a short illness on the 9th of November 2017, and his contribution to the GSSA and rangeland science in general will be sorely missed. Moto is survived by his wife and two children.

Figure 1: Dr Moto Lesoli

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Proposal and abstract submission opens:	**4 SEPT 2017**
Workshop and special sessions proposals due:	**30 OCT 2017**
Registration opens:	**1 NOV 2017**
Abstracts (platforms and standard posters) due:	**30 MAR 2018**
Student sponsorship applications due:	**30 MAR 2018**
Preliminary programme available:	**23 APR 2018**
Abstracts (research proposal posters) due:	**7 MAY 2018**
Early bird payments due:	**14 MAY 2018**
Cancellation and registration closes:	**29 JUN 2018**
Normal payments due:	**9 JULY 2018**

REGISTRATION: Sunday, 09:00 - 10:30; Monday, 14:00 - 17:00; Tuesday - Friday, 07:30 - 09:00
RESEARCH SKILLS WORKSHOP: Sunday, 10:00 - 18:00; Monday, 08:00 - 17:00
ANNUAL CONGRESS opens Monday, 18:00, then Tuesday - Thursday, 08:00 - 17:00
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