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PROVINCE OF KWAZULU-NATAL

AGRICULTURAL LIVESTOCK RESEARCH SERVICES

LIVESTOCK RESEARCH SYMPOSIUM

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**MARCH
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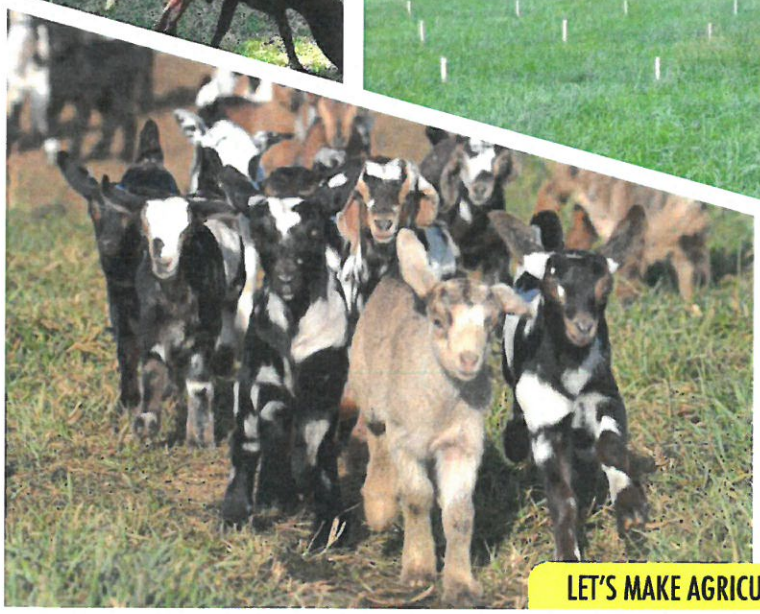


LET'S MAKE AGRICULTURE OUR CULTURE

CONTENTS

PROGRAMME

Climate Smart Livestock

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"The biggest destroyer of the world's environment", *"Cow 'emissions' more damaging to the planet than CO_2 from cars"* and *"Eat less meat to avoid dangerous global warming"* - these are just a few statements made about animals (especially ruminants) when talking about climate change and global warming. However, climate change and livestock have a reciprocal influence on each other - as one author puts it: *"Climate change represents a feedback-loop in which livestock production both contributes to the problem and suffers from the consequences."* Why is livestock, especially ruminants, being singled out as *destroyers* or *killers* of the environment:

- Livestock occupies 30% of the world's land surface and 70% of all agricultural land (primarily in the cultivation of feed crops such as cereals and soybean used to feed cattle, particularly in the developed world).
- Livestock feed accounts for over 35% of overall cereal use with cattle consuming over 1 billion tons of grain each year.
- Livestock accounts for more than 9% of global water use (mainly irrigation for feed crops).
- Globally, the total water footprint of animal production constitutes 29% of the water footprint of total agricultural production. When the total water footprint per animal category is considered, it was found that beef cattle have the largest contribution (33%) to the global water footprint of farm animal production, followed by dairy cattle (19%).
- Livestock is responsible for 18% of overall greenhouse emissions, expressed in CO_2 equivalents.
- Livestock is responsible for ±9% of the total anthropogenic CO_2 emissions.
- Livestock is responsible for the production of large quantities of anthropogenic methane (CH_4) - 37% of Ch_4 emissions are from livestock.
- Manure from livestock and manure management contributes considerably to nitrous oxide (N_2O) emissions - ±65% of emissions.
- Poultry and pigs (monogastrics) produce 3.7kg and 24kg carbon per kilogram of edible protein respectively - ruminants produce 58 - 1000kg carbon per kilogram of edible protein.

These are just a few of the statistics given when the negative effect of livestock to the environment is discussed. However, the presence of livestock on this plant is not only bad. What then are the good or beneficial aspects of livestock?

- Up to 1.3 billion people globally are employed in different livestock product value chains globally.
- Milk and meat rank as some of the agricultural commodities with the highest gross value of production (VOP) in the developing world.
- Nearly 1 billion people living on less than 2 $US a day in South Asia and sub-Saharan Africa keep livestock.
- More than 80% of poor Africans keep livestock.
- Some 68% of households in the developing world earn income from livestock.
- Across the developing world, livestock contribute, on average, 33% of household income in mixed crop-livestock systems and 55% of pastoral incomes.
- The growth in demand for milk and meat, mainly driven by urban consumers in developing countries, has been increasing in the last few decades and is projected to double by 2050 (meat

consumption in 2050 will be ±465 million tonnes and milk consumption will be ± 1043 million tonnes in 2050).

- Livestock contribute greatly to global food security.

Livestock, whether they are called destroyers or killers of the planet, will not disappear from this planet. What then is the solution to make livestock production climate smart?

- Use indigenous locally developed and locally adaptive breeds.
- Use species capable of surviving and producing under stress conditions.
- Use species with the ability to walk and graze.
- Use breeds with strong teeth – capable of getting sufficient grass to meet their daily intake requirements for maintenance and reproduction.
- Use breeds with the ability to manage the stress of biting and sucking insects.
- Use breeds with a good grooming ability.
- Use breeds with adaptations to heat and humidity.
- Breed thus more productive animals.
- Improve diets so that animals produce more protein with less feed and lower emissions.
- Make use of better manure management (e.g. composting).
- Make use of better herd management to improve output, including better herd health management with less reliance on antibiotics.
- Better management of veld (e.g. rotational grazing) and make use of better and improved planted pastures.

The advantages of adapted climate smart livestock are the following:

- Little to no stress load - can thus use their energy more effectively for production and reproduction.
- Need less feed supplements.
- Need less potentially harmful stock remedies.
- Less harmful effect on the resource.

Aquaculture in South Africa: Food for Thought

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Aquaculture in South Africa is dominated by the production of marine organisms including mussels (1682 tons), abalone (1306 tons) and oysters (266 tons) while the freshwater sector is predominated by the production of trout (1497 tons). There have been attempts at farming species successfully farmed around the world (i.e. tilapia and catfish) for both food security and as commercial ventures however success has been scarce and variable. Reasons such as fluctuating regional temperatures, water scarcity, access to finance and consumer preferences for other protein sources are seen as the main reasons for the slow progress in these sectors.

Government's "Operation Phakisa: Unlocking the Ocean's Economy" was launched in 2014 and included Aquaculture as one of its focus areas. While DAFF has made headway into providing more opportunities through the development of Aquaculture Development Zones (ADZ's), completion of EIA's, streamlining of aquaculture permitting/legislative requirements etc, potential investors have been relatively slow to respond.

The presentation aims to explain what drives success and development in South African aquaculture, why certain species work well and others don't. From a KwaZulu-Natal perspective, the use of aquaponics and small-scale aquaculture for food security as well as ideas on possible strategies and opportunities will be discussed.

Bankrupt bush - *Seriphium plumosum*

Dr Erika van Zyl

Bankrupt bush or *Seriphium plumosum,* previously known as *Stoebe vulgaris,* is a fynbos plant indigenous to South Africa. It is a so-called pioneer plant which slowly, and somewhat unnoticed, colonized significant proportions of semi-arid grasslands in South Africa to become a serious threat to the sustainable productivity of grasslands. The Conservation of Agriculture Resources Act (CARA) lists this plant as a proclaimed encroacher. Common names for the plant are Slangbos and Bankrupt bush. The term bankrupt bush is maybe the most descriptive term since it can "bankrupt" the farm or turn it into a "green desert" if it is allowed to invade.

According to the latest national survey, an area of 150 000 ha of the central grasslands of South Africa has already been invaded by this plant. The invasion is currently expanding at an alarming rate. The provinces that are severely affected are North West, Free State, Eastern Cape, Mpumalanga, Gauteng and certain parts of KwaZulu-Natal (KZN). Currently, only the Sandy Sourveld (Bioresource group 14), situated in the central north-western parts of KZN is affected. However, no proof exists that it will not spread to other areas in the Province.

S. plumosum encroachment reduces the carrying capacity of veld to an extent approximately proportional to its abundance through the mechanism of out-competing preferential plants, i.e. grasses, for available resources such as light, nutrients, and water. The rate of canopy-forming by the shrubs contributes to a suppression of the establishment and survival of grass tufts. Collapsing of mature plants of *S. plumosum* contributes to the canopy density. The result is that large areas without grass plants develop in encroached sites.

A strong relationship exists between aboveground phytomass production (total amount of living organic plant material above ground) of grasses and plant density of *S. plumosum.* Where plant densities of more than 2000 *Seriphium* plants ha^{-1} are present, a drastic reduction in grass production potential of about 65% can be expected. At densities of 5000 plants ha^{-1}, the root distribution of *S. plumosum* spreads to such an extent that they compete strongly with the grass sward for water and plant nutrients. Where *S. plumosum* reaches densities of 10 000 plants ha^{-1}, grass production can be reduced by up to 75%. Densities of 30 000 mature *S. plumosum* plants ha^{-1} resulted in 100 % canopy cover, effectively out shading other plants. Assessments done in the Free State reported several invasions where densities with 20 000 plants ha^{-1} and more occur.

The reality and threat of bankrupt bush encroachment is that veld, a profitable fodder source when in good condition, can be turned into a degraded piece of land on which sustainable livestock production is no longer possible. It is alarming that even veld in good condition can be encroached on by *S. plumosum*, and not only veld which is in poor condition, as is sometimes wrongly assumed. The plant produces thousands of seeds, which can be easily distributed by the wind over large distances and can, therefore, encroach areas which were previously free of *Seriphium plumosum.*

There is lots of proof that after farmers have eradicated *S. plumosum*, reappearance occurs after 3 to 5 years. It is unknown whether the veld was contaminated again by seed being blown in and/or

due to seed being present in the soil and germinating under favourable conditions. In many cases, the major pattern of distribution is in the same direction as the prevailing winds in an area.

S. plumosum seeds can survive in the soil for a number of years and remain viable. It was found that three-year-old seeds still have a germination of 65%. Seeds have a post ripening period of about one year. Seeds can cling to a plant for as long as 6 months after flowering and assist in wind distribution of the seed. It also lengthens the period where wind distribution can take place. The seeds can also easily be distributed by clinging to the bodies of animals.

In the 1970's *Seriphium* invasion was widely observed in lower lying areas, commonly in abandoned croplands, where the low organic matter and other poor soil conditions provided no or little competition from adjacent vegetation, an ideal habitat for it to proliferate and create new seed sources. Abandoned cropland areas have characteristically marginal soils, poor soil fertility, and low organic matter. Sandy soils seem to be prone to encroachment. Road reserves also provide a safe haven for bankrupt bush seedlings to establish. The shrubs are seldom found in wetter areas, due to water-logged conditions and higher soil fertility. Increased atmospheric CO_2 levels, as part of climate change, benefits woody plants in general and could also contribute to the overall spike in *S. plumosum* encroachment over the last few decades.

Of utmost importance in a Bankrupt bush invasion, is that the focus of the control of woody encroachment must be to rehabilitate/preserve/ increase grass production, following eradication of the encroacher species and not only to control the invader. The earlier the *S. plumosum* plants are controlled, (low plant numbers indicating low seed quantities in the soil) the more cost effective it is. Several methods to control *S. plumosum* are available:

- Mechanical chopping is a labour intensive method that needs annual follow-up control. Chopping must be done below soil surface to remove the burl, else it will sprout again.

- Fire can reduce the canopy density, but shrubs regenerate after fire. This is caused by the dormant buds that are capable of coppicing after a fire (Trollope 1970). The volatile oils in the plant, causing a very hot fire, also do not destroy all the seeds in the soil, but in effect stimulate germination. However, young seedlings can succumb to fire (Snyman 2009). Fire may be a useful tool to remove moribund material for more effective control with herbicides.

- Chemical control remains the most cost-effective method currently available. The use of herbicides in a natural environment will always be regarded as a sensitive issue and in the case of bankrupt bush control, this is no exception.

Integrated methods are probably the most effective method. Burning and manual clearing of the shrub led to higher densities if not properly managed. Manual clearing and chemical control, however, can become economically unfeasible. All these control measures are probably temporary, with re-invasion inevitable.

Aftercare needs to be the focus on the control of seedlings. More research on bankrupt bush, the control methods and the aftercare, and veld restoration following bankrupt bush are high priority in this struggle to save our precious grasslands.

The invasive alien plant *Parthenium hysterophorus* and livestock production in KwaZulu-Natal

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The invasive alien plant *Parthenium hysterophorus* (Asteraceae: Heliantheae), an annual shrub originating from Central and South America, is widely acknowledged as one of the most severe invasive alien plants in the world. It impacts negatively on agricultural crop and animal production, conservation of biodiversity, and human and animal health. In South Africa, this plant is locally referred to as parthenium, famine weed, Demoina weed, Maria-Maria, and Umbulalazwe. It invades KwaZulu-Natal, Mpumalanga, North-West and Limpopo provinces, and has spread at a considerable rate in recent decades. It has invaded neighbouring countries, some extensively, and is becoming increasingly problematic on the African and Asian continents, causing severe economic losses.

Attributes that contribute to its aggressive invasive ability include rapid growth and flowering, allelopathic properties, prolific seed set and relatively long-lived seed banks buried in the soil. Parthenium rapidly invades disturbed land, exacerbated by agricultural cropping practices, overstocked grazing land, road construction and maintenance, and construction activities. It invades cultivated and fallow land, grazing land, roadsides, national parks, waterways and surrounds human settlements.

Contact with, or inhalation of, airborne particles (pollen or other fine plant debris) of parthenium commonly causes significant allergenic responses in both humans and animals, due to sesquiterpene lactones (secondary plant metabolites), primarily parthenin in aerial plant parts (Allan *et al.*, in press). Various external dermatitis diseases result, most commonly airborne contact dermatitis, and internal diseases such as rhinitis (hay fever), bronchitis, asthma and atopic dermatitis (Allan *et al.*, in press).

Animals that consume or come into contact with parthenium are susceptible. Parthenium is unpalatable to most animals, often avoided, but consumption is variable. Goats and sheep feed on parthenium, cattle and buffalo only occasionally consume it, and other livestock avoid the plant (Allan *et al.*, in press). Ingestion of large quantities of the plant leads to coughing and diarrhoea, severe contact dermatitis, skin lesions, common erythematous eruptions, and ulcerations around the face and alimentary tract, followed by haemorrhage and rupture of internal organs, and in some cases, death within four weeks or earlier (Allan *et al.*, in press). Allergic reactions have been observed in cattle, sheep, goats, camels, horses and black rhinos. Removal of affected animals from parthenium-invaded areas or removal of parthenium from the diet facilitates recovery.

Parthenium taints milk and meat, affecting quality, and reduces the market value of cattle. Parthenium infestations cause significant yield losses in crops, reducing feed availability for intensive livestock production systems. The costs of parthenium invasion to faming and grazing industries are significant, in addition to healthcare costs for allergy treatment (Allan *et al.*, in press).

Various management strategies are used to curb the rampant spread of parthenium, including chemical control operations using registered herbicides, biological control using host-specific natural enemies and in some countries, competitive plant species are used. Chemical control is effective but requires repeated follow-up applications until native vegetation establishes. Biological control

addresses the imbalance of the lack of natural enemies that keep parthenium in check in its native range, to reduce its competitive ability. Insects, mites and/or pathogens from the native range, that are demonstrated to affect the target weed only are utilised. Five introduced natural enemies (two rust fungi and three insect agents) are currently utilised in the management of parthenium in South Africa, with additional agents under investigation. Native grasses can outcompete parthenium in the absence of significant overgrazing. Maintenance of grass cover is essential to ensure sufficient interspecific competition for the successful management of parthenium.

Removal of grazers and browsers or lowering the stocking rate of animals successfully reduces the extent and impact of parthenium. Exclusion of livestock from parthenium-invaded areas for several weeks prior to slaughter or milking may improve produce quality. Mixed forage should be provided to animals which are more susceptible to allergic reactions e.g. cattle.

Parthenium will continue to spread in South Africa and elsewhere, impacting significantly on livestock production as well as on other aspects if active measures are not implemented. Parthenium has severely impacted on the livelihoods of people in many countries. South African landowners need to take cognisance of the real threat of parthenium to livestock production, crop production, biodiversity conservation, and health, and take preventative steps to manage its impact, by using integrated management strategies.

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Household livestock for food security

Zandile Ndlovu

Promotion of safe, sufficient and nutritious food at household, institutional and community level will result in the reduction of food insecurity, which causes starvation and malnutrition. The most vulnerable group include pregnant and lactating mothers, people who are HIV^+ as well growing children. KZN Department of Agriculture and Rural Development have developed food security programmes. Gardens are source of vegetables, fruits and grains for human maintenance and growth. Livestock plays an important role in providing a complete nutrient-dense, high quality protein and bio-available micronutrient diet. Cattle are also used as draught animals for ploughing land on which vegetables and fruits are produced. High quality proteins are found in meat as well as livestock products such as milk and eggs. Bio-available micro-nutrients available from livestock and their by-products include Vitamin A, Vitamin B6, folic acid, niacin, iron and zinc. Vitamin B6, folic acid and niacin are produced by rumen fermentation and are not found in seed source. These micro-nutrients are of great importance since their deficiencies are detrimental to growth of children, as well as to adults' health. Folic acid is one of the vital micro-nutrients; a deficiency in pregnant woman could result in the incomplete development of the spinal cord and brain of the unborn baby, such as spina bifida that affects the nervous system. This incomplete development can be prevented by eating lean meat as per South African Food-Based Guidelines, which recommends 560g lean meat per week. Furthermore, livestock produce manure, which is taken back to the soil for organic production of pastures and vegetables.

Over the years, Livestock Research Services have run a number of trials on improving livestock production in the KZN Province. The research trials resulted in the production of a number of Research Bulletins, manuals and different production guidelines. To ensure dairy products on shelves, "Dairying in KwaZulu-Natal" was written. Management principles that were relevant then are still relevant in this technological era. The caring and feeding of dry and post-parturient cows is still the same, whether it is done electronically or manually. The complete training manual for running the dairy enterprise is available on the Departmental website; furthermore, a dairy course is run annually at Cedara. Dairy cattle need pastures closer to the parlour so that they do not walk long distances. The manual called "Pastures in KwaZulu-Natal" helps to understand pasture establishment, fertilization, utilization and different production systems. There are a number of Research Bulletins on different cultivars that can be planted and a number of cultivar evaluation trials run through the five Research stations. On Cedara, tall fescue, cocksfoot, perennial ryegrass, festulolium and lucerne evaluation trials have been conducted and some new varieties are introduced annually. Such information is available from the section. Forage production systems for goats on pastures have been thoroughly researched by looking at the performance of goats grazing pastures.

"Beef Production in KwaZulu-Natal" aims at increasing beef production. These guidelines can help an upcoming beef farmer with all the preparation to start an enterprise. It can help to choose the production system suitable for the farmer, for example; the farmer can decide to sell yearlings or two year olds as well as heifers. These guidelines explain the advantages and disadvantages of the system. A manual called "Guidelines To Ensure That Your Animals Are Healthy", was produced in 2011 following in collaboration with Mdukatshani Rural Development Training (MRDT) and Institute

of Natural Resources (INRI). This book explains different diseases and conditions that affect livestock, as well as the symptoms and treatment of common diseases. This manual ensures that goats, pigs, dogs, poultry and horses are kept healthy. An example of a management calendar that includes a vaccination programme is included. However, for every region, it is advisable that the farmer consults with the local Veterinarians to know diseases prevalent in the area.
"Veld in KwaZulu-Natal" was produced to ensure that livestock grow well on veld. The manual aids farmers in planning veld management for the whole farm by dividing camps based on the understanding of veld ecotypes thereby, helping in planning a year-round fodder flow. Understanding animal factors such as stocking rate and grazing strategies will help increase veld potential and reduce overgrazing of palatable nutritious species.

Intensive work has gone into goat production in KwaZulu-Natal province. Collaboration with Agricultural Research Council – Onderstepoort resulted in the production of goat health manual. The "Goatkeepers Animal Health Care" manual was developed for resource-poor farmers to maintain herd health, detect early signs of ill-health and implement immediate treatment of common diseases. Symptoms of disease and conditions are shown in picture format to enable the farmer to understand sickness in the flock. The "Goatkeepers Animal Health Care manual was followed by a "Goat Production Handbook in association with MRDT and Heifer Project SA". This manual covers the topics such as how to keep animal healthy, nutrition of goats and creep feeding of kids, diseases and conditions causing illnesses, goat commercialization, marketing and value adding. From the "Goat Production Handbook" a training calendar was developed for training goat farmers regarding different diseases and other management principles. To ensure correct dosage of sick goats, a weigh band was developed. The weigh band estimates the weight of the goat so that the farmer can calculate the correct dosage to administer. Knowing the correct dosage ensures that animals recover quickly and further prevents resistance of certain medication developing because of underdosing.
"Household Chicken Production" produced by our Department in collaboration with MRDT and Heifer Project SA deals with types of chicken and production systems, feeds and feeding, nutrition and endo- and ectoparasites affecting poultry.

A number of Research Bulletins are available on the Departmental website. Livestock Research services has worked on different topics. These include selecting correct grass cultivars, understanding when to cut grass for making hay; how to make own hay bales using a box baler; raising orphan kids and calves; identification and tattooing of livestock. Research Bulletins are freely available in the Livestock Research Section. The section staff also participate in running various FET courses as shown in the short course book.

Status of livestock in KwaZulu-Natal province "The past, present and the future"

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The Mission statement of KwaZulu-Natal Department of Agriculture and Rural Development (KZNDARD) is "to promote, thorough partnerships, sound agricultural practices that stimulate economic growth, food security and advancement of rural communities in KwaZulu-Natal (KZN). In order for economic growth to be stimulated and rural communities be advanced and thus being able to measure the performance of the agricultural sector. Agricultural statistics such as livestock numbers play a role in food security, decision-making, planning, and measurement of employment and research.

The status of livestock in KZN has been summarized by different bodies such as Statistics South Africa (Stats SA), Department of Agriculture, Forestry and Fisheries (DAFF), KZNDARD and Non-Governmental organisation (NGO's) and all this paint a clear picture of what the status of KZN livestock is. These however in some instances differ as most data available is related to animals being reared under commercial set up, therefore not providing the correct values of rural livestock. Some NGO's like Mdukatshani have looked at rural areas such as Msinga and Nongoma to get a better sense of the livestock numbers. Farming Systems Research Section (FSRS) under KZNDARD has also been doing research throughout KZN and livestock numbers formed part of the study.

Stats SA (2016) reported a drop-in number of households involved in agriculture in South Africa from 2.9 million in 2011 to 2.3 million in 2016. The drop-in cattle numbers could possibly be attributed to the drought that was evident in most parts of the country including KZN in the year 2014/15. KZN had 23% of the country's total. A total 241 991 were involved in livestock only and 124 5863 involved in mixed farming in KZN. In terms of estimated livestock numbers in KZN updated to August 2017, there were 2 496 million cattle, 692 million sheep, 712 million goats and 147 million pigs (DAFF, 2017). These are not far off to the numbers provided by Stats SA (2016) where there were, 2 498 209 cattle, 549 943 sheep, 1 9 30175 goats, 201 826 pigs and 6 406 289 chickens. Non-ruminants animals in the past have been ignored when livestock numbers are done due to different reasons and organisations conducting the research.

Cattle numbers observed from the recent studies conducted across KZN indicate that cattle numbers vary across different districts (FSR 2017, preliminary data). Although data was collected per climatic zones when translated into districts it shows interesting outcomes thus far. A closer look at cattle number shows an average of between 10 – 19 cattle per household from 9 out of the 11 districts of KZN. Districts showing the highest number of cattle per household include Mkhanyakude, uThukela, Mzinyathi and Harry Gwala districts. Districts with fewer cattle per household were Ilembe, Msunduzi, Ugu, Zululand and uThukela. When zooming at one district in particular uMkhanyakude, from census numbers provided by State vet of the district showed an average of 18.5 head of cattle per household updated to December 2015. FSR has found similar results of 19 head of cattle in the preliminary data of 2017 which shows that the cattle numbers have either remained constant throughout the drought or have increased dramatically after the draught effect. WWF (2017) reported that overgrazing is still an issue as some of the land is overstocked beyond its long-term carrying capacity in provinces of Limpopo, Eastern /cape and KwaZulu-Natal. This was partly observed in parts of

some districts such as uThukela and Zululand where there was virtually very limited grazing land available (FSR, 2017 – personal communication)

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Potential for aquaculture in Maputaland

Dr Mbongeni Khanyile & Dr Trevor Dugmore

Introduction

The global aquaculture sector has expanded rapidly in past two decades to maintain fish supply, especially given the decline in the capture fish industry due to unsustainable practices (FAO, 2006). Despite the global decline in fish capture, fish generate a wide variety of benefits for the local communities of northern KwaZulu-Natal. Such benefits include food security, the provision of livelihoods, and contributions to wealth and wellbeing of communities. Recently a survey on indigenous knowledge of fish harvesting and utilization in Umhlabuyalingana local municipality has revealed that fish was the third most consumed protein in the area, that people consumed fish on average twice a week, that most of the fishing gear used had no destructive effect on fishery resources.

Constraints

Lack of clearly defined policy, and expertise has been the main contributing factors affecting the development of sector. The progressive drought in most part of South Africa also present new serious threat to the sector. Fishery management was historically the mandate of the nature conservation authorities, who managed the resource primarily for recreational purposes which resulted in the exclusion of indigenous inhabitants in accessing fishery resources. Nature conservation departments have no development mandate and capacity to support the development of livelihoods based on fisheries.

Opportunities

Aquaponics and sea cage culture for marine species can be explored to un-lock the potential of sustainable aquaculture in northern KwaZulu-Natal Province. Lake Sibaya and Kosi lake are under-utilised due to difficulties of local fishermen in accessing fishing licences and gears.

Recommendations

1. It is recommended that the provincial DARD develop aquaculture and fishery zoning areas.
2. The DARD to develop a component responsible for sustainable aquaculture development and fishery management.
3. The development of a sustainable aquaculture sector in rural communities requires the integration of fisheries and aquaculture.
4. Quantification of ground water in areas with potential for fish farming.

Interventions to improve the productivity of sheep in communal systems in the Nquthu District

Phumzile Msuntsha & Dr Erika van Zyl

Nquthu is situated in the sour veld of North-Western KZN, with severe winters and low quality and quantity of grazing. Sheep farming is an important practise and an estimated number of 11 000 sheep are present. Interventions to improve the productivity of sheep in communal systems, and ultimately improve the livelihood of these farmers, were undertaken by the Livestock Science Research Services Section, based at Dundee Research Station, in cooperation with the local Nqutu Extension Service staff.

The Thanda Bantu woolgrowers Association in the Haladu area in the Nqutu district was selected for the project. The first intervention was to gain baseline data by completing a survey questionnaire. Results showed that most farmers rely on a low input management system with a need for supplementary feed in winter. Yellow maize is fed at critical times. Health care is practiced at a low level. Sheep are mixed breeds, but the majority are wool-type sheep (Dohne-Merino and Merino). Nearly half of the flocks (43%) are small (ten ewes or less), but a third of farmers (27%) own flocks with 48 ewes or more. Lambing season is mainly during autumn and winter.

The second intervention was a pilot investigation to collect quantitative data through monthly monitoring of sheep from five participating farmers. Animals were individually identified with tags and weighed on a monthly basis. A comparative group for Dundee Research Station has been identified, where animals will be on the veld and the weights will be compared to the Nquthu group. Lambing % is at 42%, mainly in autumn or winter. Ewe mortality was 20%, however, the recording year was abnormally dry. It is expected that in a normal year, ewe mortality will be lower. Dung samples to monitor internal parasite loads were taken. Results from dung samples, analysed for parasite eggs expressed in eggs per gram (EPG), were shared with farmers, advising them when to treat sheep. Recorded fleece weights were ± 2 kg ewe^{-1}.

A current third intervention is to provide and facilitate recurring training sessions. Sheep shearing and wool classification training resulted in an improved wool crop in 2016/17. Other topics covered were animal identification and stock theft and future training on veld management, sheep nutrition, sheep handling facilities is planned as well as other applicable topics identified by the farmers as the programme continues.

Scientific Foundations for Livestock Production

Dr Trevor Dugmore

Sound foundations are critical to success, whether building a house or for managing your livestock. Many years of scientific research have established the basic building blocks, or foundation stones, required for sound animal husbandry practices. This paper reports on the scientifically proven foundations for a successful ruminant livestock production enterprise.

Water – the source of life

Water is the single most critical element in livestock husbandry. Animals require water for metabolic and digestive processes, producing 80 to 100 litres saliva per day, as well as for conveying nutrients around the body and in eliminating metabolic waste products via the urine and faeces. Water is also required to produce milk (water required is 1.28 kg/kg of milk) in lactating cows. In hot weather, animals use more water for evaporative cooling. Beef cattle (450 kg) will consume 40 litres per day at an environmental temperature of 5°C, and will drink about 100 litres of water at an ambient temperature of 32°C. Sheep and goats consume between 4 and 10 litres per day. Water intakes on hot days (>33°C) are typically double the average water intake at a mean temperature of 25°C. When water supply is restricted, both in quantity and access, such as walking very long distances to water daily, animals go into survival mode rather than reproduction and production.

Animal size – bigger is not better

Optimal animal size is a function of the environment, with tropical breeds being smaller than temperate breeds as smaller animals have a greater surface area (skin) relative to their body size and consequently improved heat loss. Smaller animals have lower maintenance requirements and need to eat less feed to survive. When stocked at the same biological weight per ha, smaller framed animals have a higher production per ha than large framed animals, with smaller cows eating relatively more feed per kg of body weight.

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Breed – there is no super breed

Communally run cattle are perceived to be less productive than other cattle breeds. However, research at Döhne Research station in the Eastern Cape, where 58 cattle were selected from 9 communal farmers and randomly allocated to commercial or communal management groups on the research station, showed that for the animals originating from communal farmers, but managed commercially, cow efficiency was equal to, or even greater, than the commercially run Nguni and Bonsmara herds on Döhne, with re-conception rates the similar to the Nguni and Bonsmara herds. Other factors, such as cow adaptability and size relative to its environment, feed quality and availability, disease and tick resistance, as well as walking ability override the effect of breed.

Stocking Rate – the key driver of sustainable livestock production

Stocking rate, or the amount of feed resources allocated to an animal, is the overriding factor determining animal performance on a specific area. Worldwide research has shown the relationship between stocking rate and animal performance. The higher the stocking rate, the less feed is available to an animal, with growth rates declining linearly as stocking rate increases, until animals starve to death at excessively high stocking rates. Apart from a negative effect on animal performance, stocking rates impact on fertility and the animal's immune status.

Nutrition/feeding

As indicated above, stocking rate indirectly determines the allocation of feed to an animal. Animals require feed firstly for survival (maintenance), then growth and reproduction. Apart from the gross feed allowance, the quality of the feed determines productivity, so degraded, poor quality veld will not be as productive in terms of animal production as good quality veld in pristine condition. Supplementary protein and mineral nutrition is required to offset deficiencies in the veld. In KZN protein is deficient in winter when the veld is no longer actively growing and is frosted off. Consequently, a urea (protein) lick containing energy (molasses or maize) which enables the rumen microflora to convert urea to metabolic protein is critical in winter. Phosphate (P), the chief component of the metabolic energy pathways, is the first limiting element in summer on actively growing veld, with supplementation of a P containing lick being critical in summer to ensure optimal livestock performance. In KZN, much of the grassland areas are deficient in Selenium and Iodine, and, to a lesser extent, Copper. These elements also need to be incorporated into the lick for optimal animal performance, immunity and in cases even survival, e.g. a deficiency in Iodine can result in abortions and stillbirths. The highly successful goat block developed at Cedara for the Goat Agri-business Project is an indication of the gains that can be made from small interventions. Good nutrition also impacts on the animal's immune status and resistance to diseases, as poorly fed cows do not have the energy to resist infections.

Body condition score

Body condition score is an indirect measure of the animal energy or fat reserves and is associated with both fertility and production. This is an important tool in monitoring the nutritional status of your herd. Other scientifically proven tools at our disposal are the FAMACHA and 5 point check to assist in assessing internal parasite burdens in sheep and goats. Bioactive forages are also an important tool in supressing worm loads in sheep and goats.

Breeding season

Research at the Dundee Research station, where Nguni herds are run under the same conditions and stocking rates, indicates that if cows and heifers are run with the bull continuously (open breeding season) the heifers are mated very early, many out of the active pasture growing season, are underweight, leading to poor calf performance, and ultimately smaller mature cows (15% or 60 kg difference) than those cows and heifers which are subject to a breeding season, with heifers grown out and mated at 2 years of age. The unseasonal calves from the open breeding season treatment suffer while lactating during the winter leading to increased cow and calf mortalities, a consequence of inadequate nutrition.

Conclusion

The first priority in a livestock production programme must be to ensure the basics are implemented (foundations), before the fancy stuff which is often not scientifically validated.

Progress on the non-conventional feed resources for pigs

Dr Mbongeni Khanyile & Prof. Michael Chimonyo#

Introduction

Globally, pressure on grain seed such as maize and soybean feed resources is increasing, especially in the tropics where many countries are net importers of food (Kambash *et al.*, 2014) which poses a serious threat in small-holder pig production. Utilization of local available non-conventional feed resources, such as *Vachellia* leaf meals in feeding pigs in the tropics (Halimani *et al.*, 2007; Khanyile *et al.*, 2014; Ndou *et al.*, 2015) present a possible solution for sustainable pig production and food security.

Broad objective

Research evaluated the effect of feeding graded levels of *V. tortilis* leaf meal based diets on growth performance, nutritional related serum metabolites, enzyme, carcass quality and pork quality in general.

Hypothesis tested

It was hypothesise that the inclusion of *V. tortilis* leaf meal may improve performance and meat quality.

Project Methods

Vachellia tortilis leaves was harvested at Makhathini Research Station, Jozini, KwaZulu-Natal Province, South Africa, according to the method described by Khanyile *et al.* (2014). Briefly, leaves were harvested green, air-dried under shade by spreading on polyethylene sheets at room temperature for 72h. Different age and weights pigs were assessed to an experimental diet that were formulated to iso-energetic, iso-nitrogenous and iso-lipidic. Experimental diets were formulated such that at list 27% of maize and 15 % Wheat bran was replaced. Growth performance, metabolic response, carcass and meat quality data was gathered.

Findings

It was observed that *V. tortilis* leaf meal can be included up to 129g/kg DM in finishing pig feeds and that the ability with which pigs utilize leaf meal-based diets improves with duration of exposure to such diets. The inclusion of *V. tortilis* leaf meal beyond 129g/kg resulted in reduction of feed intake, weight gain, carcass traits and increase relative size of internal organs. The inclusion of *V. tortilis* leaf meal in finishing diet had the beneficial effects in increasing *n*-3 PUFA, MUFA, nutritive value index and reducing *n*-6: *n*-3 ratio, atherogenic and thrombogenic indices in pork.

Conclusion

In conclusion, using *V. tortilis* to feed pig could be interesting in smallholder pig production with limited access to concentrate. It may be worthwhile ascertaining the economic viability of using various levels of *V. tortilis* in pig's diet.

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Animal Science - UKZN

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Sheep Scab

Phumzile Msuntsha, Erika van Zyl, Peter Oosthuizen & J.P. Reynolds

Background

Sheep scab is one of the major scourges of sheep farming in many countries throughout the world. Ever since the 17th century, this disease has been endemic to South Africa. Sheep scab is an extremely infectious disease, and by law, a positive case has to be immediately reported to the local State Veterinarian. Sheep scab causes severe skin irritation, which leads to animals scratching and biting themselves, resulting in wool loss and decreased feed intake. As a result, sheep lose weight, leaving animals with decreased immunity and prone to secondary diseases such as pneumonia and internal and external parasites.

Causes

Sheep scab is caused by *Psoroptes communis ovis*, a mite which is 0.8 mm long in the adult stage and barely visible to the naked eye (Bath and de Wet, 2000; Bates, 2007). See Figure 1.

FIGURE 1: The sheep scab mite (*Psoroptes communis ovis*)

Life cycle of sheep mites

As with all mites, development goes through various larval and nymph stages (See Figure 2). In the case of sheep scab, the whole life cycle takes place on the sheep. Adult life span lasts for about 50 days, during which the female mite lays about 50 to 100 eggs on the skin of the host. The shortest life cycle duration from eggs to eggs of the next generation is about 10 to 14 days (Janquera, 2013).

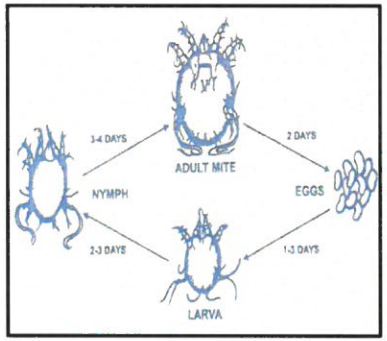

FIGURE 2: Life cycle of sheep scab

Eggs hatch and go through the various stages of development. Mites puncture the skin with their mouthparts, then feed on the exudates and secretions produced by the affected skin (See Figure 3). The serum mixes with dead tissue, dirt, secretions of the mites, wool fiber and oil, initially causing a wet wound on the skin. After a few days, the wound becomes dry and a crust is formed in the middle of the wound. The mites then move to the edge of the wound that is still wet and in this way cause the wound to expand until a very large part of the body is affected, resulting in severe irritation and inflammation.

FIGURE 3: *Psoroptes* on the skin of an animal

In severe infections, scabs may spread to cover the entire body in two to three months if left untreated (Janquera, 2013). More than half of the wool can be lost in such cases. Hairy sheep are less susceptible to sheep scab than wool sheep. Goats are not affected by sheep scab, but can be carriers (Fourie, 2016).

Season of occurrence

Visible signs of disease are common in winter when sheep have full fleeces. In winter, when temperatures and sunlight intensity decrease and wool moisture increases, parasites become more active. Parasites can be present on sheep in summer without causing scars. Goats and non-woollen sheep can, especially in summer, be carriers of the parasite, without showing any symptoms (Bath and De Wet, 2000; Fourie, 2016).

Method of transmission within the flock

Transmission within the flock is mostly by physical contact. Mites do not actively jump or crawl from one host to another one but are passively transmitted when animals come in close contact with each other. However, it is important to note that *Psoropteric* mites and their eggs can survive for two to three weeks off the host (e.g. in tags of fallen wool, on fence posts). This means that sheep can pick up mites or eggs from their environment, especially from those objects that affected sheep use for rubbing e.g. fence posts. There are no external vectors that transmit the mites (e.g. insects, worms, rats, mites, birds) as happens with other parasites (Janquera, 2013).

Symptoms

Affected sheep become itchy and constantly rub themselves against objects such as posts. Scabs or crusts surrounded by moist or wet rings will become visible on the sheep. *Psoropteric* mites especially affect areas along the back and sides, and along the tail, causing a loss of wool (Watt, 1980). See Figure 4.

FIGURE 4: Affected sheep with sheep scab

Sheep scab could lead to weight loss, wool loss, reduced milk production and general weakness that makes the affected animals more susceptible to other diseases (Janquera, 2013; Corke and Broom, 1999).
In early stages of the disease, it is difficult to detect the disease since an animal behaves and appears normal (Bates, 2007).

Diagnosis

A small piece of infected skin and wool from the sheep needs to be examined under a microscope for positive identification of sheep scab. A private or State Veterinarian or veterinary laboratory can assist with a positive identification.

Note: Sheep scab infections can easily be confused with red lice infections.

Prevention

According to Bates (2007) and Fourie (2016) the following preventative strategies can be followed:

- Quarantine incoming sheep for at least three weeks. Treat them for scab, whether they show signs of having the disease or not.

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- Buy sheep only from known sources.
- Ensure good fencing to prevent stray animals on the farm.
- Disinfect livestock trailers after transporting livestock.
- Remove all debris (wool etc.) from contaminated housing and do not re-stock for at least three weeks.
- Treat all sheep and goats annually with an approved dip, as a further precaution.
- Be alert for any signs of scab in the flock.

It is advisable to dip or inject all sheep on the farm in autumn/winter with a long-acting product. It is a good strategy to arrange with neighbours to treat within the same two to three weeks.

Important points

Sheep scab or any cases of skin conditions need to be reported to a State Veterinarian to aid in control and confirm the diagnosis.

- Treatment needs to be with a registered product and must be repeated 8-10 days later.
- Pen or kraal needs to be rested for at least three weeks. Disinfection might aid.
- Amitraz products under a 12% concentration used for ticks is not effective in sheep scab control.

Treatment

A treatment plan against sheep scab should be in place because of the high economic and welfare cost of the disease. Sheep farmers and owners should discuss the plan with the local veterinarian and communicate with neighbours to maximize the benefits of their actions.

When sheep scab outbreaks are declared, all small stock on the farm must be treated with a remedy that is registered for a specific breed under Law 36 of 1947. Infected sheep must be treated twice with an interval of eight to ten days. That will ensure that newly hatched larvae, that were still in the egg stage at the time of the first treatment are also treated.

Wool from infected animals must be destroyed rather than sending it to the buyer (i.e. BKB). If the wool is sent to the buyer, the wool will be marked as scab wool as it is heavier than normal wool. See Figure 5.

FIGURE 5: Fleece with sheep scab infection

The wool is worth less than clean wool and the farmer or supplier will be penalized financially. The more preferred option is for the farmer to get rid of the wool by destroying it.

Treatment can be done by either plunge dipping or the use of registered injectable remedies for sheep scab (Table 1). Severely infected animals must be shorn before treatment. Make sure that during the dipping process animals are submerged for at least two minutes and the head must be submerged at least twice.

Pour-on dips, sprays, jetters or showers are not recommended as they are ineffective in the control of sheep scab. Both dips and the injectable remedies include products which have a short and long action. Long-acting products kill mites on the animal and provide protection against re-infection. Short-acting products kill mites on the animal but offer no protection against re-infection.

TABLE 1 Registered remedies for the treatment of sheep scab

GROUP	TRADE NAME	CHEMICAL	APPLICATION METHOD
Organophosphors and carbamates	Cooperzon 30 Dazzel NF Zipdip	Diazinon 30% m/v Diazinon 30% m/v Triazophos 40% m/m	Dip or topical application
Pyrethrins and pyrethroids	Decatix 3 Delete X5 Langa/dip	Deltamethrin 2.5% m/v Deltamethrin 5% m/v Cypermethrin 20% m/v	Dip or topical application
Formamidines	Supatraz 25% Triatix 500 Triatix 250	Amitraz 25% m/v Amitraz 50% m/m Amitraz 25% m/v	Dip or topical application
Macrocyclic lactones*	Cevamec 1% Ecomectin 1% Cydectin 1% Dectomax	Ivemectin 10mg/ml Ivermectin 1% m/v Moxidectin 1% m/v Doramectin 1% m/v	Injectables
Combinations	Ivomec Super Closamectin Solution 3.5% LA	Ivermectin 1% m/v, Clorsulon 10% m/v Ivermectin 0.5% m/v, Closantel 12.5 m/v Ivermectin 2.25% m/v, Abermectin 1.25% m/v	Injectables

** several more ivermectins are registered, consult local veterinarian*
% m/m = amount of grams of active ingredient/100 gram of drug
% m/v = amount of grams of active ingredient/100ml of drug

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Buying and selling livestock at auctions – do's and don'ts

Derryn Nash

Livestock auctions are a part and parcel of the South African livestock industry. They serve a vital role in helping farmers from all backgrounds to buy and sell animals and to get to know others in the same industry. Auctions are especially important for the emerging farmer with a small number of animals to trade who **doesn't necessarily have the marketing power of big** commercial farmers.

Livestock auctions take place on a regular basis at designated sites. They are run by professional auctioneers, the companies in kwa-Zulu Natal operate at Lionsriver, Mooiriver, Creighton, Geluksberg, Dundee, Estcourt, Elandslaagte, Eston, Cedarville, Swartberg, Kokstad, Underberg, Bergville, Seven Oaks and many other sites on a regular basis. They also conduct on-farm auctions or dispersal sales of a specific breed eg. A dairy auction or a breeding cow or bull auction.

General livestock auctions tend to sell a mixture of animals, beef and dairy cattle, goats and sheep, pigs and chickens.

To buy an animal on auction, one must register with the auctioneers and get a number. **A valid identity document is required**. A refundable deposit of about R2 000 is also required (this varies according to the auction and auctioneer)– this is to ensure that you can pay for the animal you bid for. Animals are presented to the public and anybody registered who wants to buy it can make an offer. The highest offer usually gets to buy the animal. Often an owner puts a reserve price on his animal, if this price is not reached, they do not have to sell it. It must be noted that the auctioneers take a percentage commission for running the sale and selling the animal. Some farmers are VAT registered and some are not. This must be taken into consideration when participating in a sale. A buyer must also be aware that if there are, for example 10 animals in the ring, bids are made on one average animal but all ten must be bought. Simply put, if the bid goes to R4500 the total cost for the group will be R4500 X 10 = R45 000 plus VAT if applicable. Not understanding this point can lead to a great deal of confusion.

To sell an animal one has to also register with the auctioneer and book the animals in to the chosen sale. **All animals must by correctly branded or tattooed with the owners own brand**. The stock theft unit inspects animals and if they do not comply they will not allow them to be sold. The animals on offer must also be in a good condition. The SPCA sends inspectors to the stock sales and any animals that have been abused, injured or starved may be confiscated. Sick or weak animals should NOT be presented for sale – they will give the seller a bad reputation when they cost the buyer money to make them well again. Owners must be present to sell their livestock. **They may NOT send other people to sell on their behalf without a signed affidavit that they may do so, and a valid identity document. This rule helps to reduce the sale of stolen animals.**

It is up to the owners, buying or selling, to transport animals to and from the sales in a safe and humane way. There are a number of transport companies with trucks both big and small that can be contracted to move stock. Be very careful not to overload a vehicle to save money. An overloaded vehicle can easily lose control and crash, potentially killing or injuring people **and livestock. It is also very easy for an animal to "go down" or collapse under the other animals and be** trampled to death or not be able to breathe and then die. This is not good for all concerned and the SPCA and traffic police are on the lookout for overloaded trucks.

Vehicles and trailers have to comply with regulations to be suitable to transport animals. **Animals may not be tied down by the legs or body on the back of an unsuitable trailer or vehicle**. They may only be tied by the head (with a halter) or horns to the rails of a suitable vehicle to stop them jumping out. Bakkies and trailers must have suitable approved rails to contain the animals. A crate may not be home made from pieces of wire and wooden poles. The floor of the vehicle must be non-slip, a mesh or rubber mat must be laid on the floor to stop animals slipping and falling. These are most important points as the auctioneer will not allow animals purchased to be loaded into unsuitable vehicles. If animals are loaded onto unsuitable vehicles, the auctioneer and owner can be charged by the SPCA, South African police service and/or other animal welfare entities.

While auctions have many advantages there can also be disadvantages. The biggest advantage of an auction is that small farmers can easily buy and sell at a market related price. Large auctions attract a lot of buyers making prices more competitive. The biggest disadvantage is that animals are coming from all sorts of places and from owners one may not know. All sorts of animal diseases may come to the auction. Animals on sale may not have been vaccinated properly and are under a lot of stress being transported and sold. They may fall ill after purchase. As soon as an animal has been sold, responsibility for the animal passes to the **new owner and it's welfare is for his/her account**. When looking to purchase animals at an auction establish who the seller is and find out the history of the animals. This will make purchasing them a lot safer if one knows they have been managed well before.

Animals may also come to an auction already ill eg redwater, gallsickness or pneumonia. Look at them very carefully before buying.

Disease can easily spread from newly purchased stock to the animals back home. This must be avoided by keeping newly purchased stock away from all other animals until one can be sure they are healthy (ie keep them under quarantine for at least two weeks). Sheep can easily have scab which is a notifiable disease (ie the state vet must be informed and the area put under quarantine) and is very contagious. Animals may also come with worms and ticks that could cause a problem. Deworm and dip any purchased animal before allowing it the join the herd/flock. Goats and sheep must be vaccinated with pulpy kidney before being dewormed. It may be advisable to inject young stock with a long acting tetracycline when moving them. If moving into a known redwater area in summer, dip and medicate the animals for the disease (called blocking) to give them time to adjust to the new surroundings without becoming ill. Redwater and gallsickness are deadly diseases which can be treated if noticed in time.

When purchasing goats and sheep be very aware of their heartwater status. If the buyer lives in a heartwater area (bushveld) do **NOT** purchase animals from an area that has no heartwater. The animals will have no immunity at all and, unless treated with tetracycline regularly, will probably die of heartwater very quickly. As a general rule of thumb do not buy small stock and move it eastwards unless it is for slaughter purposes. Small stock moving from west to east generally do not survive very long in the new place.

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If buying animals for breeding or milk production it is very important to know that they are CA (contagious abortion) and TB (tuberculosis) free. Reputable sellers will be able to provide veterinary tests proving their animals are negative. Never buy untested or positive animals.

Conclusions

Livestock auctions, to a large extent, underpin the economy of livestock trading, especially amongst emerging farmers. They need to be encouraged and supported. However, the onus is on the individual to ensure that quality livestock is traded and transported in an acceptable and humane manner. The health and welfare of the animals being traded is of paramount importance to both buyer and seller. All reputable auctioneers have websites and are easily accessible.

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Figure 1 A typical sale yard

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THE USE OF FIRE IN THE KWAZULU-NATAL MISTBELT AND HIGHLAND SOURVELD

SHEILA HOUSEHAM

Grasslands are dominated by perennial plants that can withstand fire, drought, frost and inappropriate grazing in moderation. Undesirable changes to the grasses can occur (for example changes in vigour, species composition, productivity and increase in abundance of the tree component) when fire, drought, frost and grazing occur too frequently or not at all.

There are numerous management tools at a farmer's disposal, of which rest, fire and grazing are the most influential. Factors that are important for veld composition and functioning are fire, grazing, climate and soils (Short, 2010). The interactive effects of these factors can have a significant effect on animal performance, veld condition, bush thickening and encroachment.

High rainfall (mesic) grasslands are referred to as fire-climax grasslands (Acocks, 1988) as without the occurrence of fire, these grasslands would progress to a woody state (Fynn, 2003). *Themeda triandra* is an indicator of veld in good condition in a fire-climax grassland (Hardy & Hurt, 1989) when occurring in abundance. Frequency of the use of fire affects species composition, cover and herbage production of the grass sward (Short, 2010).

According to Trollope (2002) the factors that affect the behaviour of a fire are:

- fuel characteristics, fuel load, fuel distribution, fuel compaction and fuel moisture;
- air temperature;
- relative humidity;
- wind; and
- slope.

These factors affect the availability of heat energy, the rate at which heat energy is released and the vertical distribution of the heat energy, which will determine the nature of the fire. Generally, headburns (with the wind) are more intense fires and have the greatest effect on trees, with the least effect on grasses (Trollope, 2002). Backburns (against the wind) are more intense at ground level and do more damage to the grass plants (Trollope, 2002), thereby suppressing regrowth. Fire frequency, fire intensity and season of burn are three critical factors that can be manipulated by the manager. The decision on when and how to burn should be based on a set of management objectives and a sound ecological knowledge. The final decision should be based on seasonal rainfall, veld condition and available biomass.

Why use fire?

Fire can be used to remove excess / ungrazed herbage, to control bush encroachment and for firebreaks. Access to light is important in mesic grasslands, therefore shading out by moribund (at the point of dying) material is detrimental to the survival of certain grasses. The defoliation of moribund material (through the use of fire) will stimulate tillering (Mentis *et al.*, 1984; Short, 2010), which results in a more even utilisation of the grassland during that growing season.

Fire creates a more homogeneous grazing environment and thereby alters grazing patterns (Acrhibald & Bond, 2003). Since regrowth in the season following a fire is more nutritious than subsequent seasons without burning (Mentis *et al.*, 1984), improved animal performance levels may be expected. Mesic grasslands are fire-prone and fire-dependant therefore needing fire in order to maintain biodiversity (Lechmere-Oertel, 2014). Fire is therefore necessary in these grasslands to maintain the health of the grassland. Withholding or removing fire from a mesic grasslands can result in a shift towards a woody and often weedy component. Withholding fire as well as excessive use of fire can be problematic.

When to burn

Burning should be done in accordance with the local Farmers' Associations guidelines. The decision to burn should be based on seasonal rainfall and the availability of readily available grass (biomass). Mesic grasslands should be burnt between late winter and early spring. Burning to remove moribund material should be done with a cool head fire in the early mornings or late afternoon, or after a light rain (to reduce the intensity of the fire).

The goal is to have a patchy burn that leaves the mulch layer unburnt (Lechmere-Oertel, 2014). Regrowth of grasses is stimulated by temperature and day length, so burning when grasses are dormant (not actively growing) doesn't damage the growth points of the grasses. Veld should have a full growing seasons rest prior to a burn, in order to build up sufficient fuel load. Burning should be done between winter (May/June) and spring (September/October) (Everson & Everson, 2016).

Seasonal variations in temperature and rainfall have an effect on plant growth, therefore it is important to take the season into consideration when deciding when to burn, in order not to damage the plant growth points.

For recommended burning regimes, refer to the Bioresource Program recommendations for the 590 agro-ecological zones in KwaZulu-Natal.

When not to burn

The season the burn is applied is of critical importance. The manager needs to ensure the growing point of the grass is low-lying to ensure it isn't damaged by the intended fire. Late growing season fires reduce grass production and result in an increase in forbs (Kirkman & Morris, 1999; Tainton & Mentis, 1984). Autumn burns (burning for a "green bite") reduces diversity and basal cover (Tainton & Mentis, 1984) and leaves the grassland prone to soil erosion, soil capping and loss of soil moisture.

Frequency of burn

For mesic grasslands, a burn should be implemented every two to five years, depending on conditions, biomass, grazing and resting regime and veld condition. A higher burning frequency destroys the natural pollinators of mesic grasslands (Lechmere-Oertel, 2014). Coastal grasslands can be burnt more frequently since they experience higher growth rates than mesic grasslands (Lechmere-Oertel, 2014). The drier the climate, the longer the interval between burns needs to be (Lechmere-Oertel, 2014). Excluding fire from veld in the long-term reduces production and grass quality (Everson & Everson, 2016).

Advantages of using fire

Burnt grasslands have improved livestock production (and in particular, sheep production), while performance on unburnt veld is significantly lower (Kirkman & Morris, 1999; Lechmere-Oertel, 2014). Removal of dead or undesirable material is likely to result in more uniform grazing post-burn (Kirkman & Morris, 1999; Lechmere-Oertel, 2014). The use of fire in mesic grasslands can help suppress woody plants, provided it is used under very specific conditions (Lechmere-Oertel, 2014).

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Conditions suitable for controlling bush encroachment are: dry vegetation with a fuel load exceeding 4 000 kg/ha; air temperature >25°C; relative humidity <30%; moderate wind (<20 kg/hour) and woody plants should be actively growing (Trollope, 2003). Good firebreaks and extra personnel and equipment should be on hand.

Disadvantages of burning

Herbage production in the season following a burn is lower, relative to unburnt veld (Tainton *et al.*, 1977). Without careful planning and implementation, the use of fire as a management tool may fail over the long term, since regular disturbances (and over-application) can result in a spread of alien plants (Wolfson, 2003), thereby decreasing the veld condition and the quality of the herbage on offer to livestock. A high frequency of burning results in decreased species diversity (Kirkman & Morris, 1999), which reduces the stability of the ecosystem. In addition, exposed soils are more prone to soil crusting (Mills & Fey, 2004). An inappropriate burning regime (too frequent) will result in a shift from palatable to unpalatable species (Everson & Everson, 2016), which can ultimately result in a loss of basal cover leaving the soil prone to erosion. This in turn puts extra pressure on the remaining grass, thereby aggravating the cycle. A too-infrequent burning regime can be very detrimental to a mesic grassland as it leads to a moribund state (Lechmere-Oertel, 2014).

Post-burn management

Match stocking densities to those recommended for your area (refer extension personnel), and implement a short period of occupation (a quick rotation) with adequate periods of absence to allow the grass time to recover. It is important that non-selective grazing is practised, without over-grazing the veld. Sufficient time after grazing should be allowed for the veld to build up food reserves and maintain vigour. Consult extension personnel for detailed recommendations.

What are the legal implications?

The use of fire is legally regulated in South Africa. There are implications for negligence. The National Veld and Forest Act No 101 of 1998, legislates the formation of a Fire Protection Association in addition to the burning of firebreaks on an annual basis (www.daff.gov.za). Farmers' Associations require a fire management plan approved by the local Fire Protection Association. The Conservation of Agricultural Resources Act 43 of 1983 (CARA) makes it a legal obligation to control invasive alien vegetation on a farmers unit. CARA also legalizes the rehabilitation of natural veld (www.daff.gov.za).

Monitoring the changes in veld

Any changes in fire and grazing management that promotes a more stable and resilient ecosystem will better support livelihoods, livestock production and biodiversity (Lechmere-Oertel, 2014). Assessing the impact of the applied management strategy is an important factor for decision making. The manager needs to evaluate whether the change in fire management or the addition of fire will have a positive effect on biodiversity and productivity. Frequent veld condition assessments will help with monitoring changes in the vegetation. Veld management should be an adaptive-management style (Danckwerts *et al.*, 1993) and is a fine balance between managing for the needs of the livestock and managing for biodiversity. The changes in the veld will ultimately inform the manager as to whether he is implementing the correct management strategy or not.

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Research & Technology
BULLETIN
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MAKING YOUR HAY BALE USING A BOX BALER

D. ZANDILE NDLOVU

For livestock farmers it is essential to provide feed for their animals at all times. Feeding is needed for their growth and reproduction, as well as production of farm products such as milk. During times of drought, they need to have bales available.

Materials

Farmers can now make their own square/ rectangular bales using a **BOX BALER.** The box baler can be made of wooden planks or any plastic container.

Box baler sizes: There are two sizes of wooden planks balers: **Big Box Baler** has a length of 100 cm, 50 cm width and 40 cm height. **The Small Box Baler** is 75 cm X 50 cm X 40 cm, length, width and height respectively (See Figure 1).

FIGURE 1: Box Baler made by Khulekani Xaba of Alien Invasive Species for the Department

The farmer will need to cut grass or any material to be baled at the correct growth stage, and leave it to dry. Rake it together for ease of collecting.

Method

Begin by laying ropes across the inside of the box. The number of ropes depends on what the farmer is baling, with fewer ropes for baling maize stover and more for baling grass. Figure 2 show the ropes in the box.

After laying the ropes, the box can be filled with available material such as grass or maize stover. The material to be baled should be dry so that it does not become mouldy, which may result in nutritional disorders.

FIGURE 2: Laying the ropes before filling with maize stovers

Once the box is full, it needs to be pressed down so that more material can be added. Compacting can be done by feet or create a presser that will fit well in the baler (See Figure 3).

FIGURE 3: Compacting the material when making bale

Once filled to capacity, the Box Baler needs to be lifted on the side and the bale pushed out (See Figure 4).

FIGURE 4: Removing the bale from the box

Storage

The bales can then be stored properly and used when necessary.

Advantages of Box Baling

i) Maize stover can be collected, baled and stored in a smaller space than when just piled up.
ii) Hay bales can be used for supplementing livestock during feed shortages.
iii) When cutting grass at home, it can be baled so that it is used to feed animals rather than going to wasted.
iv) There is no need for tractors and expensive baling equipment, as just the brush cutter or sickle can be used to cut grass.

Disadvantages

This is labour intensive when cutting is done by hand and it will take time to collect sparse material to fill the box.

Conclusions

Farmers need to plan ahead for time of feed shortages. The Box Baler is a solution to bale grass or maize stovers, without the use of a tractor. The time it takes to fill the box is really dependent on the availability of material and dedication of workers. However, it is an acceptable technology for available material making small bales despite being labour intensive

Acknowledgment

This technology was introduced by Mrs Nobuntu Mapeyi of Eastern Cape Department of Agriculture at GSSA Congress 2011.

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2015/17

FODDER RADISH AND OTHER FORAGE BRASSICAS

SIGRUN AMMANN, DERRYN NASH & DAVE GOODENOUGH

Fodder radish, (*Raphanus sativus* var. *oleiformis*) is commonly used as a winter feed mainly in the eastern parts of South Africa (KwaZulu-Natal and Eastern Cape). It is often known as Japanese, or Jap, radish. In other parts of the world it is mostly used as a cover crop. Forage brassicas include kale, also known as Chou-Moellier (*Brassica oleracea* var. *viridis*), forage rape (*Brassica napus*), swedes (*Brassica napus* var. *rapifera*) and turnips (*Brassica rapa* var. *rapa*).

All these differ in their characteristics and uses. In New Zealand there are also leaf turnips which produce no bulb and only have a swollen taproot with multiple growth points. Swedes and turnips both have a fleshy bulb with swedes having an obvious neck between the leaves and the bulb while turnips have no neck. Kale and forage rape both have no bulbs. Kale has a swollen stem with an inner soft marrow while forage rape has a fibrous stem.

FIGURE 1: Kale (*Brassica oleracea* var. *viridis*)

FIGURE 2: Forage Rape (*Brassica napus*)

FIGURE 3: Swede (*Brassica napus* var. *rapifera*)

FIGURE 4: Turnip (*Brassica rapa* var. *rapa*)

Uses

Generally fodder radish and forage brassicas are used as winter feed in South Africa but in other parts of the world like New Zealand, kale is also used in summer while forage rape and turnips are additionally used in late summer and early autumn. In the eastern areas of South Africa the summer planting of forage brassicas often suffer heavily under insect attack and have to be sprayed. The warmer temperatures also resulted in poor yield compared to summer production of grasses. Good weed control is necessary for summer production.

Fodder radish and bulb turnips are most commonly used in KwaZulu-Natal with the turnips used mainly in the colder southern parts of the province. The ARC has developed a new long-duration fodder radish **called "Endurance" with soft leaves**, which retains its quality longer and grows for almost seven months from planting while the other fodder radish varieties last for five, sometimes six months from planting with substantial leaf loss and bulb deterioration towards the end of the fifth month and into the sixth month. The forage brassica species have various days to maturity and, depending on the specific variety, vary from 90 to 180 days.

The main function of these forage crops is to provide feed during periods of feed shortage and to serve as a fodder bank especially for the bulb species which can be utilized over a three to four month period.

Fodder radish and brassicas should be limited to 70 to 80% of the diet for dry cows and only 30% for lactating cows. Brassicas are high in protein and energy but very low in fibre and thus animals should also be fed hay or pasture to slow the rate of passage and to allow for more effective digestion.
Animals should not be given sudden unrestricted access to brassica crops but rather introduced slowly over a one- to two- week period. Grazing strips can be provided with electric fencing. Even though brassica and fodder radish are very high in moisture content, it is important to provide the animals with sufficient water while grazing these forage crops.

Establishment

All the forage brassicas including fodder radish do not tolerate waterlogging and have relatively high nitrogen, potassium and phosphate requirements. Boron is also sometimes required. For forage brassicas sufficient molybdenum is important. A soil sample before planting is essential.
The seed can be drilled or broadcast. Drilled rows should be at 30 to 50 cm spacing for bulb types while others can be drilled at 15 to 20 cm rows. The wider the spacing within the row up to 50 cm, the bigger the resulting bulb.

TABLE 1 Recommended sowing rates

	Drilled (kg ha^{-1})	Broadcast (kg ha^{-1})
Fodder radish	2 - 3	3 - 4
Turnips	1 - 2	2 - 3
Swedes	1 – 2	-
Kale	3 - 5	5
Forage rape	2.5 - 3	-
Leaf turnips	3 - 4	5

Suitable sowing dates are from February to the latest mid-March to allow for good bulb development and utilize soil moisture from the summer rains for good establishment. In some areas it is necessary to spray for aphids, especially root sucking aphids which can be common on fodder radish.

Effect of intra-row spacing on fodder radish

A trial was done to determine the effect of intra-row spacing of 25 cm and 50 cm between plants in the row and rows spaced at 50 cm. The data shown in Figure 5 shows the narrow row-spacing to be preferential in harvests two and four. The data also shows that there is no adverse effect in terms of yield if the plants are spaced closer together.

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It was always thought that the wider spacing allows for bigger bulbs and thus higher yield but this is apparently not necessarily the case.

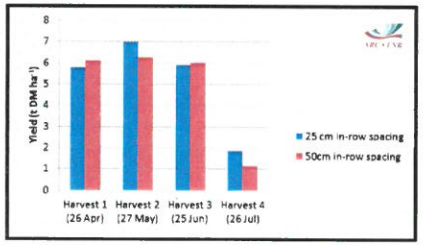

FIGURE 5: Dry matter yield (t DM ha^{-1}) in response to intra-row spacing of 25 cm and 50 cm with inter-row (between rows) spacing at 50 cm.

Effects of controlling root aphids in fodder radish

Root or bulb sucking aphids can be a major problem in fodder radish. Spraying a systemic insecticide such as imidacloprid early on when the crop is young can make a substantial difference to the yield, especially if the fodder radish is kept for later harvesting. The results are shown in Figure 6 below.

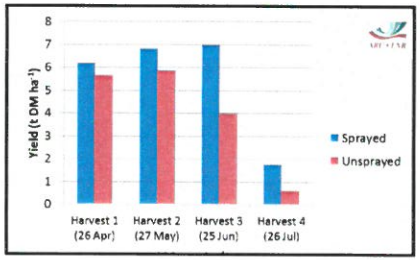

FIGURE 6: Dry matter yield (t DM ha^{-1}) in response to spraying to control root aphids.

Production of fodder radish (*Rapahnus sativus* var. *oleiformis*)

Harvesting can be done from three to five/six months after planting and for the long duration types up to 6½ months or from three to nine weeks after the first frost if planted in February to mid-March. In the data shown in Figure 7, the bulb yield increased until July for the soft-leaved and standard varieties, while the long-duration varieties still had a significant increase in bulb yield during August with the peak reached at the end of August/early September. Only the long-duration varieties had a bulb yield in late September.

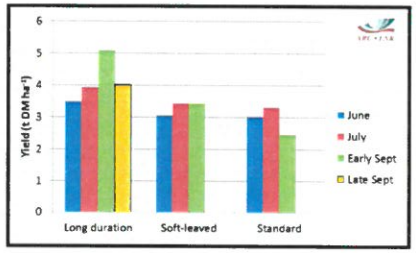

FIGURE 7: Root/bulb DM yield (t DM ha^{-1}) at ARC Cedara planted 11 March 2010 with four harvest dates.

Figure 8 shows the leaf yield which for all three types of fodder radish peaked in July. The standard varieties suffered substantial leaf deterioration after July and to a large extent the soft-leaved varieties as well although they retained more leaf than the standard varieties. The long-duration varieties retained their leaves the best and there was some leaf-retention to late September.

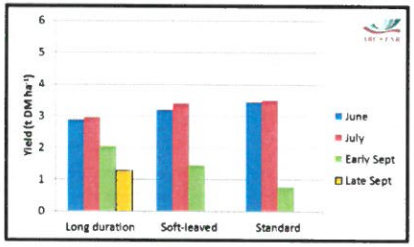

FIGURE 8: Leaf DM yield (t DM ha^{-1}) at ARC Cedara planted 11 March 2010 with four harvest dates.

The exact month, or months after planting when peak yield is achieved for leaves and bulbs depends on the planting date. For an early February planting the peak yield can already be reached four months after planting due to the faster growth rates in the warmer temperatures. For the 2010 planting at ARC Cedara, which was at the latter end of suitable planting dates, the total yield amounted to approximately 7 t DM ha^{-1} (Figure 9). The long-duration varieties were able to increase in biomass until early September while the other varieties peaked in July, deteriorating significantly thereafter.

A similar trial run in 2005 yielded a maximum dry matter production of 5 t DM ha^{-1} at the second harvest, which was six weeks after the first frost on 5 July. The trial was planted on 24 February. Yield will vary with rainfall and temperature.

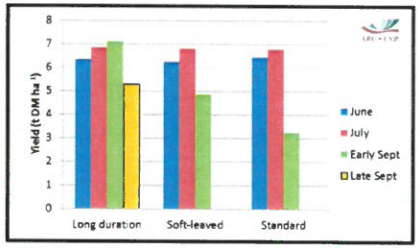

FIGURE 9: Total Yield (leaf + bulb) (t DM ha^{-1}) at ARC Cedara planted 11 March 2010 with four harvest dates.

Animal health risks

As mentioned above animals should always be introduced slowly to brassicas to allow them to adapt and should not be hungry when they feed on brassicas. Brassicas can be highly metabolisable and hungry animals can bloat very quickly.

Due to the high sugar content and low fibre content there can be a risk of acidosis if the brassicas make up a substantial component of the diet. At high nitrogen applications there is a risk of nitrate poisoning. Brassicas also contain glucosinates which can interfere with thyroid functioning and SMCO (S-methyl cysteine sulphoxide) which can depress intake and can cause haemolytic anaemia. It is thus important to feed hay or pasture together with brassicas in the diet.

TABLE 2 Varieties listed in the South African Variety List in November 2015

Fodder radish	Kale	Forage rape	Swedes	Turnip
Anaconda, Doublet Geisha (soft-leaf), Groundhog Lomo (soft-leaf), Melotop Nooigedacht, Samurai STAR 1650, STAR 1651 Sterling (soft-leaf), Terranova or Endurance (long, soft leaved)*	Chou Moellier/ Marrow stem Sovereign	Giant English Giant Essex Hobson	American Purple Top Champion Purple Top	Australian Purple Top Early Purple Top Globe Green Globe Mammoth Purple Top Marco

*this variety is not yet listed but will be in 2016.

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MAKING AND STORING HAY

DERRYN NASH

Roughage (mainly grass or maize silage) is the cheapest source of feed for the ruminant animal. The better the quality of the roughage the better the animal will perform and less concentrates will be required to feed it to the required level of performance.

Why make hay

Grass does not grow all year around. Tropical grasses (usually Eragrotis spp) grow well after the rains in spring and summer. Spare grass during the growing season needs to be conserved as hay to feed when the grass does not grow in autumn and/or winter. Spare grass from temperate pastures, can also be conserved but are quite high in water content and needs a lot of drying before baling. The grass can be baled and wrapped with plastic and put up as silage or stored, well compressed, in an airtight bunker. This can be a very expensive option because it must be from pastures that are usually planted annually, irrigated and well fertilised. Making hay or silage will always reduce the quality of the grass being cut.

What kind of hay

Veld hay: Veld in Sourveld areas can be conserved for winter by cutting for hay in autumn. Cutting veld later than autumn will result in very low quality hay as seen in Table 1.

TABLE 1 Quality of veld hay baled in different months of the year (Bredon, Stewart and Dugmore, 1987) (results on an as is basis)

Month baled	Crude Protein (%)	Energy (ME MJ/kg)
February	6.1	7.1
March	5.1	6.7
April	3.9	5.8

Sourveld which is dominated by unpalatable species eg *Cymbopogon spp, Hyparrhenia spp, Aristida spp* is not suitable for making hay. The hay is unpalatable and should only be used for bedding. If roughage is in very short supply and there is an emergency this hay should be sprayed with liquid molasses and urea to help improve digestibility.

Veld in Sweetveld areas can be grazed all year around therefore it does not need to be baled, camps can be closed off and grown out for winter.

Planted Pastures for hay: Usually *Eragrostis curvula* is planted as a permanent pasture and cut for hay. It can be cut three or four times a season depending on rainfall. The quality of the hay depends on when it was cut - grass in full flower will have a lower quality than grass cut just before flowering.

Eragrostis teff is an annual, ie must be replanted every year, which can make very good quality hay. This is much preferred by the horse fraternity for feeding their horses. Depending when the pasture is planted, two to three cuts can be taken.

Both these species are fine leafed and can be cut, dried and baled in two days depending on stage of growth and weather conditions. Both pastures must be fertilized after cutting with 50kg N/ha and 50kg K/ha. If potassium is not applied the lands will quickly be "mined" of minerals that are being removed in the bale. Chicken litter or manure can be used instead of inorganic fertilizers.

How to make hay

Do NOT bale grass leftover from grazing animals. It has low quality, which is why they did not eat it, and it will just become worse after baling. It will also be full of dung pats further reducing its palatability.

Timing is everything, the quality of the grass cut will determine the quality of the hay baled. Cut the grass in the early morning when you know there is good weather for the next few days. The hotter and drier the weather the quicker the grass will dry for baling. Cut and leave the grass to dry on the topside, turn and dry underneath. Once the grass is 15 to 20% dry matter rake into windrows and bale.

Do not bale grass when it is still too wet, it will spoil with bacterial or fungal growth and it may get so hot that it bursts into flame in storage. Hay can be made mechanically into small square bales, small round bales or large round bales.

FIGURE 1: Examples of a square baler (top) and a round baler (bottom).

Making hay by hand

It is possible to cut with a sickle or brush-cutter and make small square bales by hand if one is a small scale farmer without access to mechanisation.

Storing the hay

Storing hay outside will cause spoilage from the weather. The aim is to minimise the spoilage to acceptable levels. Figure 2 shows how much hay is lost in a bale of various sizes depending on how deep the spoilage due to weathering goes. Between 10 and 50% of a bale can be lost depending on how it is stored.

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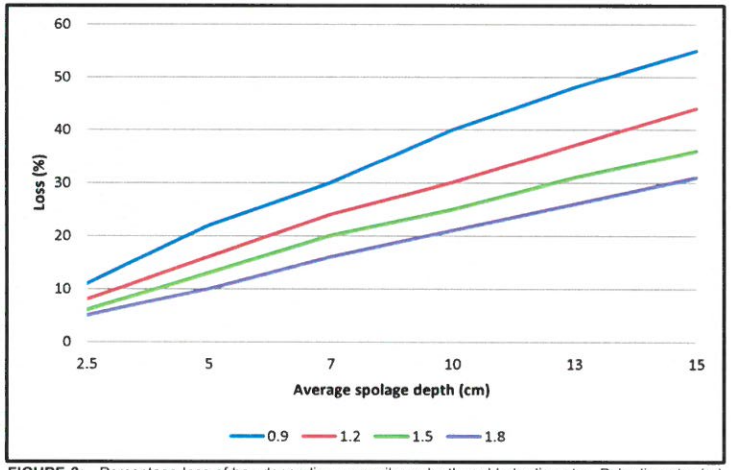

FIGURE 2: Percentage loss of hay depending on spoilage depth and bale diameter. Bale diameter (m) is shown in the legend.

The best place for a bale is under cover on dry ground. If one has to store outside, it is most important to keep the bale off the wet ground as the dry grass will absorb the soil moisture upwards. Store on a well-drained site or on pallets or poles. Do not store bales under trees as the sun will not dry them out after rain. Store the round bales in a row going from north to south if possible. This means the sun can shine on both sides of the bale during the course of the day (sun is going east, west). The slope should be in the same direction so water can drain along rows and not across them. Do not store rows close to each other as the rain being shed off the bale will accumulate between them and spoil them. The rows should be at least one metre apart. See Figure 3.

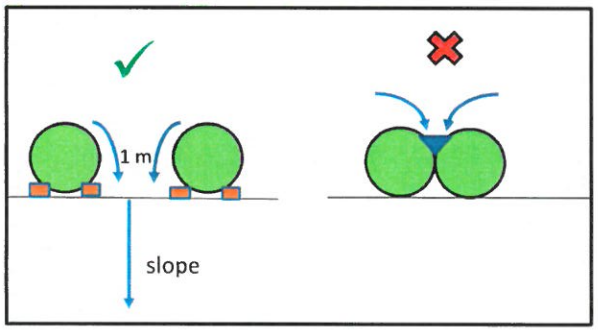

FIGURE 3: How to store bales to keep as well as possible

It is best to stack square bales or small round bales off the ground and cover with a tarpaulin. The best storage is under cover in a shed, however, this is expensive.

Buying hay

Most people have to buy their hay in.

Questions to ask if buying in hay bales:

1. What grass is it and if not veld, was it fertilised?
2. When was the hay baled: month and growth stage (flowering or not)?

Check the following

1. *What colour the bale is?*

   A nice pale green colour is best for *Eragrostis* hay while veld should be a reddish colour and not too stalky

2. *How tightly baled is it?*

   A loose bale will be more prone to spoilage and weigh less

3. Be aware ticks may be imported onto your farm in the hay bales.

If you are buying a lot of hay from one source take a representative sample and send it to Cedara laboratory for a quality analysis. This will allow you to use the bale in the best way and feed your animals optimally by balancing what they need in addition to the hay.

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FORAGE CEREALS FOR DRYLAND PASTURE PRODUCTION

SIGRUN AMMANN & DERRYN NASH

Forage cereals" is the collective term for a group of annual cereal species that have been bred for pasture production. They are rye and stooling rye (*Secale cereale*), white oats (*Avena sativa*), black oats (*Avena strigosa*), red oats (*Avena abyssinica*), Triticale or Korog (*x.Triticosecale*) and wheat (*Triticum aestivum*). Triticale is a cross between wheat and rye.

Forage cereal species are temperate in origin (cool season species) and are thus planted in autumn for late autumn and winter production, with some producing forage into the early spring months. There are a few varieties that grow until early summer. Different types within each species occur which relates to the flowering behaviour or floral induction i.e. what triggers the onset of flowering determines the type. Winter types require vernalization, while spring types do not. Vernalization refers to environmental conditions of cold temperatures and short days, followed by longer days or increasing day-length. The length of time to flowering determines the duration of the pasture or how long it will persist, since the plant will not regrow after flowering. Stress signals of various kinds can also trigger flowering if they are acute enough.

For forage purposes and specifically for autumn planting, the so-called spring types are classified as short-duration types. The winter types are split into medium- and long-duration types. The medium-duration types require less cold days for flowering than the long-duration types which will only flower after a more extended period of cold. Amongst the long-duration types there are now also varieties that may extend into early summer.

Types of forage cereals and their role in a fodder flow

Short-duration types

These are varieties that have no cold or short day requirements to induce flowering. Hence they will grow from seedling to flowering plants in the shortest time that the prevailing moisture and temperature conditions allow.

The short-duration types will grow relatively quickly after establishment and produce grazeable forage once or twice depending on the planting time, moisture availability and the growth stage at grazing. They can be planted in early autumn (March) to provide grazing in late autumn/early winter. Alternatively the short-duration types can be planted later, after maize silage is harvested, and then provide grazing in early to mid-winter. If used for grazing they should be grazed at about 20-30cm plant height.

Growing them out too tall before grazing will result in elevation of the growth point and thus limit regrowth for subsequent grazing. If there is a third grazing, the plants are often already reproductive and thus carrying a large proportion of stem rather than leaf (low leaf: stem ratio) resulting in lower forage quality due to the higher fibre content. The short-duration varieties can alternatively be used for silage by letting the pasture grow out to accumulate herbage bulk to just before inflorescence emergence and then cut for silage. This gives a single cut only as there will be no regrowth after cutting.

The fast, upright growth habit and versatility with regard to sowing date i.e. early to late autumn, and their relatively short growth period, make these varieties good gap-fillers in the fodder flow.

In some instances the short-duration ryes are planted in a mixture with ryegrass to provide bulk in the early winter after which they do not regrow and the pasture reverts to ryegrass only. This is a somewhat controversial practice and at this stage not backed by research. It has been successfully used on some farms, especially where winter temperatures are low such as the western areas of KZN.

Medium duration types

Varieties in this category will grow for a longer time period and remain vegetative (in leafy stage) for longer than the short-duration types because they require some cold days to induce flowering. Generally from an autumn (March) planting medium-duration types would start flowering from mid-winter onwards. Medium duration varieties are slower growing at establishment than the short-duration types but faster than the long-duration types.

The medium-duration types produce best when they are planted in mid-autumn and can still utilize some residual soil moisture from the summer to establish well. They produce three to four grazings, depending again on the grazing management and the temperature and moisture conditions. Generally, varieties in this category produce forage mainly in mid-winter up to late winter. The late winter grazing is likely to be more stem than leaf, as the plants start to change to the reproductive stage. These varieties are a good source of feed for dryland situations where grazing is needed mainly in the winter months but not into spring. Medium duration types may combine well with forage peas to provide a good quality first harvest with the peas in flower or reproductive.

Long-duration types

The varieties with the longest cold requirement for flowering to commence, are categorized as long-duration types. These varieties have the longest growth duration and last up to early spring with some varieties even extending through to late spring/early summer. With the long growth duration comes slow establishment and slow growth in the autumn and winter. They are prostrate or low growing, especially during autumn and winter. This applies particularly to the ryes and less so to the oats. Rye in this category is often referred to as stooling rye because of its denser, low growing tufts. Due to the flat growth habit of the long-duration ryes, they have traditionally been used more for sheep than cattle. However the long-duration oats varieties and some of the newer stooling rye varieties are suitable for cattle.

This group is the most diverse in terms of duration and thus the number of grazings will depend very much on the actual variety. Variety trial data is very helpful to assess the performance and duration. Some of the varieties will give five grazings up to early September, while others will give six or even seven grazings up to October/November depending on rainfall and temperature and on the grazing management used. Again towards the end of the growing season the plant material will be more stem (low leaf:stem ratio) with a lower forage quality as flowering begins.

Long-duration types should be planted in early to mid-autumn to allow for good establishment with residual soil moisture from the summer rainfall and allow good tuft development before the lower temperatures reduce growth rates. Figure 1 shows the typical growth curves of the three types.

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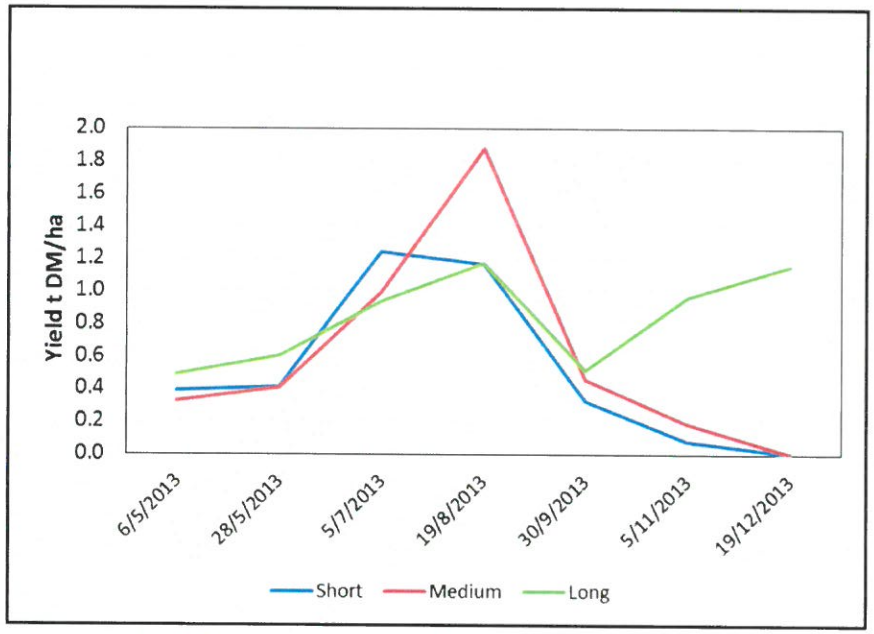

FIGURE 1: Dry matter yield of a forage cereal trial by the ARC at Cedara in 2013

Establishment

White oats has the largest seed of all the forage cereals and thus needs to be planted at the highest sowing rate of 50 to 60kg/ha. All others can be planted at 40 to 50 kg/ha. The seed can be drilled using a minimum till planter or a conventional seedbed can be prepared. At establishment the P and K should be corrected as per the soil analysis results.

Pasture management

Nitrogen at 30 to 40 kg N/ha can be applied once the seedlings have established. Another dressing is then applied after grazing. The number of nitrogen applications will depend on the number of grazings that can be obtained, which depends on the type and the variety planted. If the pasture is anticipated to become reproductive during the next regrowth phase then no more fertilizer needs to be applied. Applying nitrogen fertilizer with no prospect of rain may be expensive and needs to be a strategic business decision.

For grazing the pasture should be used when it is between 20 and 30cm high.

Figure 2 shows some locally available varieties and where they fit with regards to growth duration.

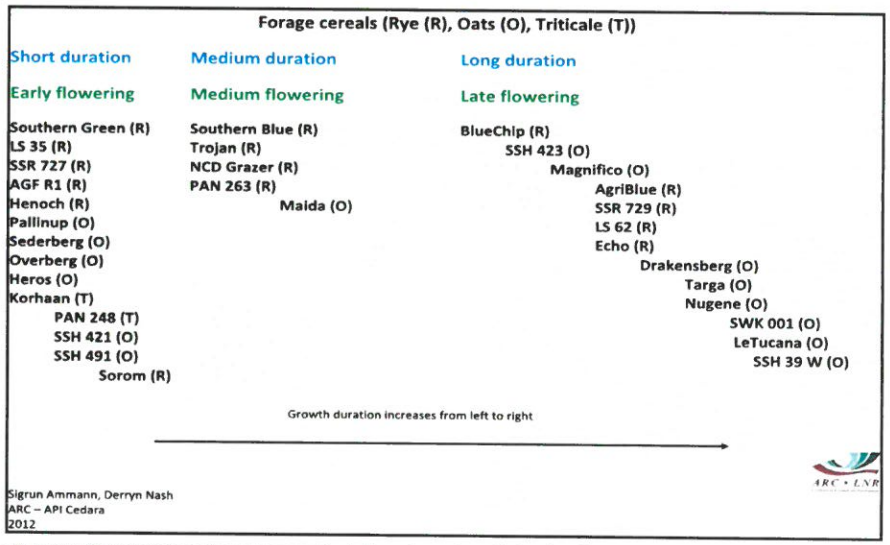

FIGURE 2: Characterization of varieties according to flowering and growth duration: Growth duration increases from left to right.

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VELD MANAGEMENT PRINCIPLES

SHEILA HOUSEHAM

An important goal in grazing management is to minimize the negative effects grazing has on herbage production and species composition. This is achieved by implementing five principles.

These principles are:

(1) match the stocking rate to the carrying capacity;
(2) use a rotational rest;
(3) use fire appropriately, at the correct time and for the correct reasons;
(4) ensure fences are in the correct location and make camps a uniform size; and
(5) **balance what's good for the veld with what's** good for the animal.

(Refer to Agri Update 2014.03 for Grazing Management Terminology).

Photosynthesis is a process that occurs in leaves, whereby energy from the sun is converted into chemical energy available for plant growth and functioning. The availability of energy to the plant (or lack thereof) affects the roots – root biomass, root depth and the quantity of new roots that develop. Roots are important for accessing moisture and nutrients, plus anchoring the plant firmly in the ground. A poor root system will jeopardize the longevity of a plant. A strong root system will enhance root and shoot growth and is achieved by allowing the plants a period of rest to replenish their reserves and to strengthen their root systems. This is the most fundamental grazing principle.

The response of grass plants to grazing are:

(1) intensive grazing without rest has a negative effect on plant growth and persistence;
(2) dry matter production increases with lenient grazing and decreases with heavy grazing;
(3) frequent grazing at the correct intervals increases forage quality; and
(4) grazing management (frequency, intensity and timing of utilisation) has an effect on species composition.

Veld condition assessments should be used to determine grazing capacity and to plan a veld grazing system.

The type of animal grazing the veld has a significant effect on selection. Small stock (eg sheep and goats) are highly selective in their feeding habits, while cattle are predominantly bulk grazers and are less able to select both species or plant parts. Once veld has deteriorated it is nearly impossible to get it back to its original state. When grazing, apply the rule-of-thumb **"take half, leave half"** – this refers to dry matter production, not to plant height. In other words, take half of the bulk of dry matter produced and leave half to enable the plant to survive.

For sweetveld, manage your grazing for quantity since this is the limiting factor. Sweetveld retains its quality throughout the year, but quantity is limiting. For sourveld, manage for quality, since quality starts to decline in autumn, with poor quality grazing during the winter months.

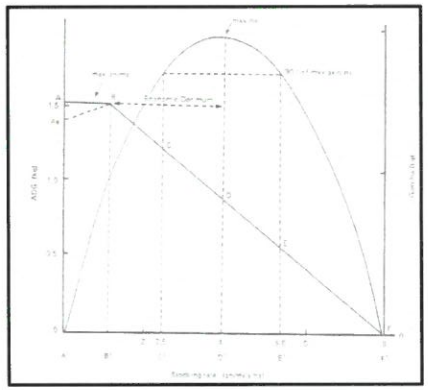

FIGURE 1: The theoretical relationship between stocking rate and average daily gain and between stocking rate and livemass gain per hectare (Edwards, 1981).

The Jones-Sandland model (Figure 1) is an animal performance model indicating that livemass production per hectare (kg/ha) is higher at medium stocking rates than at low stocking rates up to a critical stocking rate (D^1), at which kg/ha peaks. At stocking rates higher than D^1, livemass production per hectare decreases. Livemass gain (kg/ha) generally increases with increasing grazing severity up to a critical stocking rate, thereafter production per hectare decreases as stocking rate increases. From this model, it can be noted that to achieve 90% of the maximum livemass production (kg/ha), there are two possible stocking rates that can be implemented – a high stocking rate (E^1) and a low stocking rate (C^1) (Figure 1).The point C^1 (which has a lower stocking rate than E^1) has lower individual animal performance than the point E^1. However, the gain per hectare is the same for both stocking rates. The higher number of animals at E^1 compensates for the lower individual animal performance at this stocking rate.

High performance grazing is a strategy that enables selective grazing of preferred plants and aims to maximise animal performance. High utilisation grazing is when heavy utilisation is implemented on both preferred and non-preferred plants and aims to maximise utilisation. Chronic intensive grazing is detrimental to plants since it reduces the leaf area available for photosynthesis on an ongoing basis.

Rest is important to grass plants and allows them time to replenish their reserves so they can survive the seasons ahead. There are two types of rest: one that is solely for the benefit of the grass and another type of rest that is aimed at benefitting the animals utilising the grazing. **"Rests" aimed at bulking up material for the benefit of livestock are not considered "rests" but** rather periods of absence and does little to benefit the vegetation in the long-term. Rests implemented for the benefit of the vegetation aims to maintain species diversity and plant vigour.

Spring and autumn rests restore root reserves, summer rests allow seed production and a full **season's rest allows all physiological functions to occur. Full season's rests** (from first rains to first frost) are advocated for sourveld and mixed veld areas. In sweetveld areas full seasons' rests are used to improve degenerated veld or to accumulate dry matter for a hot burn to control bush encroachment. Veld grazed by sheep needs rest more frequently than if grazed by cattle, due to the severity of defoliation that sheep inflict. Give veld a full growing season's rest once every three to five years to maintain vigour. **"Survival of the rested" is the usual result.**

Fire should be used for (1) removing unpalatable growth from the previous season, and (2) to control encroachment of undesirable plants. Sweetveld areas seldom need fire to remove unpalatable material, since it can be readily grazed year-round. In sourveld areas, spring burns are often done to stimulate a **"green flush" but this is not advocated, since it is not** beneficial to the grassland. During periods of moisture stress, burnt grasslands suffer more than un-burnt grasslands. Late burning in spring is detrimental to grass species.

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The larger the camp, the bigger the variation within the camp, which increases the selection occurring within the camp and complicates management. All vegetation within a camp should be as uniform as possible to promote uniform utilisation. Divide camps into similar aspects and where possible, similar soil types. Use watering points and supplements to force animals to move and graze in different areas especially if camps are large.

Veld management needs to balance what's good for the animal with what's good for the grass. Heavy grazing of veld may benefit livestock in the short-term but will be detrimental to grazing in the long-term. Look after grazing.

Once veld has changed for the worse, it will take time and dedication to improve it. Rather manage for good quality grazing and maintain veld condition for successive generations to come.

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TATTOOING AS METHOD FOR SMALL STOCK IDENTIFICATION

ERIKA VAN ZYL, PETER OOSTHUIZEN & PHUMZILE MSUNTSHA

The Animal Identification Act, 2002 (Act No. 6 of 2002), stipulates:

"It is compulsory for livestock owners in South Africa to mark all cattle, sheep, goats and pigs with a mark allocated by the Registrar of Animal Identification."

The national register for Animal Identification Marks acts as the first line of defense against stock theft. It enhances identification of property and supports traceability.

All livestock owners must apply for a registered identification mark with the Registrar of Animal Identification. An application fee is levied. **Application forms** for an identification mark can be obtained from **extension offices, Magistrate's offices, Stock Theft** units of the SAPS or from the Registrar of Animal identification itself.

The forms can also be downloaded from the Department of Agriculture, Forestry and Fisheries website (www.daff.gov.za) or can be contact at:
Tel: (012) 3197449/33;
Private Bag X 138, Pretoria, 0001

Small stock tattooing

The preferred way to put a permanent identification mark on small stock is by tattooing. The sites for tattooing are the ear, and less commonly, flank and tail web. Tattoos provide an excellent means of permanent identification since they normally last the life of the animal.

The disadvantage of tattoos is that they are difficult to read from a distance. It is often necessary to restrain the sheep/goat to read the tattoo - especially with flank and tail web tattoos. Tattoos may be difficult to read on dark-skinned animals. Regarding small stock, the Animal Identification Act enforces the following:

- Small stock must be tattooed by the age of one month
- Purchased animals must be tattooed within 14 days after a person becomes the owner of the animal. Within these 14 days, the animal can be resold, bartered or given away without remarking the animal, since it already has the previous **owner's mark on it. The seller must provide the** new owner with a document of identification, which must be kept for a year
- The characters of a tattoo may not be larger than 20 mm (wide or high)
- The mark may have 1, 2, or 3 characters
- The characters must be placed next to each other
- The first owner can place the tattoo in the left ear, the second owner in the right ear.

Method of tattooing

The tattooing instrument or tattoo applicators consist of a plier-type device which has dies in the form of letters or numbers (Figure 1). The dies are made of sharp, needle like projections that pierce the ear when the handles of the instrument are squeezed together. An indelible ink is rubbed into the small puncture wounds. After healing, the tattoo is permanent.

Tattoo applicators range from very simple to more complex. Cost and convenience will dictate the choice of applicator.

Inks are available in black, green, red and white and in paste or liquid form. On light-skinned animals the color of the tattoo is less important. Black ink is most commonly used in white-skinned breeds and green in dark-skinned breeds. On such animals holding a flashlight at the back of the ear will help when reading the tattoo.

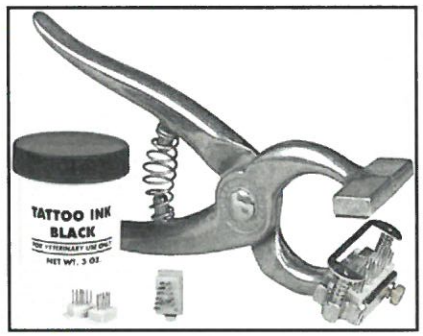

FIGURE 1: Tattoo applicator and ink

Alternatively, animals can be tattooed inside the rear flank or in the thin webbing at the base of the tail. In the case of the earless sheep, these alternative tattoos provide an option. A disadvantage of flank tattooing is that the animal has to be turned on its side to be able to read the tattoo. Sometimes the animal has to be shaved to see the tattoo.

It is imperative to clean the tattooing equipment thoroughly after each use as it is likely to become contaminated with blood. This can lead to the transmission of diseases. This is especially important if an individual tattoos for other farmers, not to unwittingly pass blood-borne diseases from one animal to another or from flock to flock. If equipment is shared, ensure that all tattoo letters and/or numbers are disinfected, at least by immersion in alcohol (70%) methylated spirits, before being used on their own animals.

The tattooing process

Ear tattooing

After loading the tattoo pliers with the relevant characters, be sure to check if the tattoo pliers is in proper working order. Immediately replace characters that are broken or worn.

1. The tattoos should be tested on a piece of cardboard to be certain that the characters are in the correct order in accordance with the certificate of registration.
2. Restrain the animal gently and securely and hold **the animal's head to prevent jerking during** tattooing.
3. Flatten the ear as best as possible to be able to see inside the ear. Clean the ear with a cloth soaked in alcohol to remove wax and dirt. Dry the area.
4. Apply tattoo ink generously on the clean area. **Plastic gloves can be used to keep the operator's** hands clean.
5. Place the ear between the jaws of the tattoo pliers. Locate the two ribs of the cartilage that divide the ear into top, middle and lower thirds. Make sure that the symbols of the tattoo are parallel to and between the cartilaginous ridges of the ear, providing that it will not interfere with later ear tagging. Alternatively the tattoo can be placed in the top of the ear just above the cartilage rib and approximately equidistant from the base and tip of the ear, or in both locations for example flock mark and individual animal number (Figure 2).

FIGURE 2: Example of tattooed ear showing the correct position of the tattoo

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6. Choose an area free from freckles or warts that might disfigure the tattoo. The accidental piercing of a good-size vein may spoil the tattoo and cause bleeding.
7. The imprint onto the ear is then made with the tattoo applicator (Figure 3). Make the imprint with a quick, firm movement of closing the tattoo pliers, squeezing the handles firmly. Use just sufficient pressure to ensure that only the skin is pierced and not through the ear.

FIGURE 3: Making the imprint

Tattoo needles must make holes large enough to let an adequate amount of ink into the skin (Figure 4). If the ear/skin sticks to the needles, gently peel it off the pliers. Immediately apply more ink and rub vigorously and continuously for at least 15 seconds to ensure penetration. If each hole is not completely filled with ink, add more ink and repeat the rubbing process.

FIGURE 4: Applying the ink on the ear. In this case green ink is used

8. This is the only chance to achieve a good tattoo, so take time and do a proper job. One or more of the punctures may bleed. Gently squeeze a paper towel over the bleeding area until the bleeding slows substantially (about 10 or 15 seconds). Do not disturb the tattooed area until the healing process is complete. This may be from 5 to 21 days depending on the age of the animal.

Flank tattooing

This method is more labour intensive and time consuming, compared with ear tattooing and it is not used often.

1. The tattoo should be tested on a piece of cardboard to be certain that the characters are in accordance with the certificate of registration.
2. The animal usually has to be laid on its back and restrained.
3. Locate the skin fold in the flank. The inside of the flank normally has exposed skin, while the outside is covered with hair/wool (Figure 5).

FIGURE 5: Applying black ink to the flank

4. Clean the area to be tattooed with a cloth soaked in alcohol, dry the area and apply the tattoo ink on the cleaned area.
5. Position the pliers over the skin fold with needle side on the inside of the flank. Only skin must be felt inside the head of the pliers i.e. do not tattoo into muscle.
6. Press down firmly and then release the pliers. Gently pull the skin away from the needles.

7. Follow the same procedure as described for ear tattooing.

FIGURE 6: The finished flank tattoo

Tail web tattooing

This method is more suitable for goats, but it is not a method that is popular.

1. The tattoos should be tested on a piece of cardboard to be certain that the characters are in accordance with the certificate of registration.
2. Restrain the animal gently.
3. To position the pliers, pull the end of the tail upward and spread out the sides to get an idea of how much area you have to work with. A helper can either hold the end of the tail or help spread the sides (Figure 7).

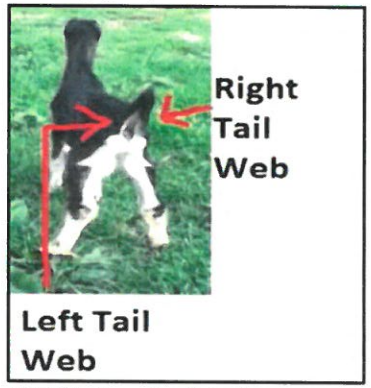

FIGURE 7: The position of tail webs

4. Clean the tail web with a cloth soaked in alcohol to remove wax and dirt. Dry the area.
5. Apply the tattoo ink on the clean area to be **tattooed. Plastic gloves will keep the operator's** hands clean (Figure 8).

FIGURE 8: Green ink applied on the tail web

6. Clean the area with a cloth soaked in alcohol and applies the tattoo ink on the cleaned area.
7. Position the pliers over the area with the most "skin room," towards the side edge of the tail and almost in the middle, between the base and tip of the tail. The letters should not be too close to the hair, away from the tail bones.
8. Press down firmly and release the pliers. Gently pull the skin away from the needles.
9. Follow the same procedure further as described for ear tattooing.

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RAISING "BOUGHT IN" OR ORPHAN CALVES, KIDS AND LAMBS

DERRYN NASH

Introducing animals from different places onto your farm can be a risk as they may bring in a disease to which your animals have had no previous exposure and therefore carry no resistance. The disease can therefore be spread to your own animals.

Animals brought in from outside areas should be kept separate from your own livestock for at least a week to make sure they are not sick. Be sure that the person you are buying from is a good stockman who will not sell you sick or weak animals that may die when they are moved. To lessen the effects of change, which is stressful, it is a good idea to inject each animal with a tetracycline injection according to its weight when moving it. This will help control pneumonia and gallsickness.

Transport

If you are transporting the young animal by vehicle, make sure it is not stressed by adverse temperatures or wet weather on the trip. Try not to move it on the back of an open vehicle, especially during cold/wet weather. Do not restrain animals by tying their legs with wire or rope. Rather put a calf into a feed bag with its head sticking out. A lamb or kid can be transported in a box with holes in it for air.

Housing

An animal needs to be housed in a **clean, dry and draught free** environment with access to sunlight and shade. Wet bedding or a damp enclosed environment with the smell of dung and urine will cause adverse health issues e.g. urine scalds on the skin and pneumonia. Animals need space to get up, lie down and move around comfortably, they should not be left to sleep in mud. They also need company and to see and hear other animals.

FIGURE 1: *Young kids being bottle fed*

Feeding

Correct feeding of the young animal is vital for health and good growth. Ensure, if at all possible, that a young animal has had enough colostrum (first milk) from its mother before being taken away from her. **Colostrum is vital in ensuring that the mother's** immunity to diseases is passed on to her offspring. The offspring must drink the colostrum within six hours of being born. If this does not occur the youngster may be prone to numerous infections as it grows up. If the animal has not had colostrum, try to find some from another animal, or even better, keep some in the freezer to be used in these cases. Never put colostrum in a microwave or stove top to heat up. Let it thaw naturally and then warm to body temperature by placing the container in a bath of warm water. A calf needs at least 2 litres of colostrum at its first drink and a lamb or kid about 200ml. The more colostrum the animal drinks in the first few days the better. A standard **baby's bottle can be used for** kids and lambs while a 2 litre plastic coke bottle with a latex teat works well for calves. Feed a calf 2 litres of full cream milk or a good quality milk replacer twice a day, once in the morning and once in the afternoon. A lamb or kid needs to be fed 600ml to 1.0 litre (depending on its size) of milk a day - split into three feeds per day for the first two weeks and then twice a day thereafter. Make sure the milk is clean and at body temperature when fed. Access to *ad lib* calf feed or lamb creep and water must be allowed from three days old. Take the water away from the animal when feeding the milk or it may drink the water after the milk and overfill its stomach leading to ill health.

Welfare

If an animal gets diarrhoea it must be fed electrolytes (available already made at your co-op e.g. Lectade, Diakur or Replensol) or home- made with 2 teaspoons (10g) of salt mixed with half a teaspoon (3g) of potassium chloride, 2 teaspoons (10g) of baking soda and 20 teaspoons (100g) of glucose in 2 litres of clean warm water – use this instead of milk for a day (**"flat"** coke is also acceptable but it must be have no fizz left in it). The animal may need antibiotics given orally or injected. If the dung is very runny it is good to give the animal kaolin powder in the electrolyte: a heaped teaspoon for a kid or lamb and two heaped table spoons for a calf. This will help to slow down the rate of passage of food through the digestive system. Dehydration can kill a young animal within 12 hours so it is imperative to treat a sick animal immediately. Keeping the bottle and teat clean and sterile between feeding is most important.

Weaning

A calf must be fed milk until it is eating at least one kilogram of calf meal a day. When weaning off milk first stop the evening feed of milk for a week then stop the morning feed. Do not move or stress the calf in any other way during this time and ensure it continues to eat the calf meal. A calf can eat up to three kilograms of meal a day after weaning, depending on its size, and it will only really start to digest forage properly at three months of age. It is very important to keep feeding the calf well as it grows or it will be stunted and never grow to full size. A lamb or kid may be weaned after 8 weeks of age as long as it is still given a supplementary feed at a rate of at least 250g per day with plenty of good quality roughage for example Eragrostis hay. **Never** wean an animal when the weather is cold and wet. Rather wait until the weather is settled because weaning an animal is already very stressful without adding the additional stress of bad weather.

Endoparasites

Worms can severely affect **an animal's growth** performance and it is necessary to deworm the young animal regularly, especially in the warm months of spring and summer. A young calf on milk may suffer from milk tapeworm and ordinary tapeworm. They should be treated for this from one month to six weeks of age, especially if they develop diarrhoea. Diarrhoea containing fresh or digested blood is caused by coccidiosis. This is very dangerous to the animal and it must be treated immediately with a sulphur based drug available at the co-op (Sulfazine or Vecoxan oral or Norotrim injectable). After weaning, roundworms are the worm to worry about, but there are many remedies to dose the animal to keep them under control. Be sure to follow the dosage and instructions on the bottle. Worms usually cause diarrhoea or a pot belly on the animal. Goats can be dewormed according to a colour chart of its eye showing how anaemic it is (FAMACHA) however the owner needs training from an animal health technician in this regard.

Vaccinations

For female calves the most important vaccination is for contagious abortion (CA). For all calves a vaccination for botulism, anthrax and quarter-evil is very important. Consult with the local extension

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officer, animal health technician, SPCA or veterinarian for help with a vaccination programme for your animals.

FIGURES 2 & 3: *Young weaned calves with supplementary feed*

Young goats and lambs must be vaccinated against pulpy kidney before deworming for roundworms. Deworm for milk tapeworm before weaning. Boost their immunity from their mother with Pulpyvax around weaning and deworm for roundworms. A month thereafter it would be advisable to vaccinate the animal with Multivax P and to do so annually for the life of the animal. Multivax P will help prevent the animal from getting a number of diseases, one of the most important being pasturella or pneumonia. If you cannot get Multivax P at least vaccinate for pasturella and again for pulpy kidney (vaccine for pasturella only is also available and is cheaper). Follow the dosage given on a deworming bottle for dosing sheep. However, the dose for a goat should be based on the heaviest animal in the flock. **A goat's** metabolism is much faster than that of a sheep and they excrete the dewormer much more quickly so it does not work as well. Also use electrolytes (1.0l a day) if the young animal shows symptoms of a runny tummy or dehydration.

General rules

Young rams and bulls can be castrated by burdizzo at 3 months of age. A skilled animal practitioner should help as severe damage can result from this being done incorrectly causing a lot of pain and even the death of the animal. Females must not be mated when too young or too small as they will not recover to grow to full size and may well abort. Allow your animal to be exposed to a few ticks to build an immunity to tick borne diseases in the area. However, they should not become covered with ticks in such a way that their growth is affected. Spray or dip them to kill the ticks when there are too many on the animal.

Growing animals need better nutrition than fully grown animals that are not productive. Make sure you have the capacity to feed and medicate your animals before purchasing them. Your animals will cost you money to grow them. Be sure that you are prepared to spend that money before you become an owner.

"Young animal kit": Before you start to raise young animals you need a basic kit including:

- Burdizzo for castrating
- Ear tag applicator, ear tags and pen to identify your animals
- Teats and bottles
- Washing up liquid to clean teats and bottles after each feed
- Milton to sterilise teats and bottles
- Electrolytes for sick animals
- Wound spray for open wounds
- Eye powder or paste for eye infections
- Dewormer to control tapeworms and roundworms
- Antibiotics- tetracycline and sulphur based injectables, syringes and needles (single use only for needles, syringes can be sterilised)
- Weigh band and thermometer
- Buy vaccines when you need them and make sure they are kept in a fridge.

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RESEARCH PROJECTS APPROVED IN 2017

Researcher	Short Title	Location	Period
E van Zyl	The value of the inclusion of legumes in dryland pastures and secondary veld.	Dundee	2017-2022
E van Zyl	The control of Seriphium plumosum in the Sandy Sourveld of KZN.	Dundee, Nguthu	2017-2022
DZ Ndlovu	The effect of concentrate supplementation on the performance and carcass yield of Indigenous Goats grazing pastures in the Moist Midlands Mistbelt of KZN	Cedara	2017-2019

ONGOING RESEARCH PROJECTS

Researcher	Short Title	Location	Period
M Khanyile	Indigenous knowledge on fish harvesting and utilization in the Umhlabuyalingana District Municipality (KZN)	Umhlabuyalingana Local Municipality	2014-2018
J Mann	The finishing of beef steers off tall fescue (Festuca arundinacea) pasture	Cedara	2016-2020
TJ Dugmore	Investigation of differences in the composition of the mineral and the associated chemical componenets effecting the nutritive value of kikuyu herbage from the various dairying areas on the Eastern Seaboard of South Africa	Cedara	2017-2020
PA Oosthuizen	An investigation into the effect of different breeding strategies on an Nguni herd's performance	Dundee	2008-2020
M Magawana	The effect of night time kraaling on cow productivity and fertility of cattle at Kokstad Research Station	Kokstad	
S Ngcamu	the effect of different management/breeding strategies has on Nguni performance	Bartlow Combine	2012-2022
DI Nash	The effect of accelerated calf rearing and managing of Friesland dairy heifers on future milk production potential	Nottingham Road	2014-2019
M Magawana	Establish the effect of having an unrestricted breeding season on animal fertility and productivity in a system with no fencing vs a restricted breeding season	Kokstad	2008-2020
E van Zyl	Investigate the potential of Sericea lespedeza as summer grazing for sheep and establish production norms for NW KZN	Dundee	2010-2020
DI Nash	Evaluation of Festuca arundinacea (Tall Fescue) varieties, herbage quality and grazing management to determine suitability as a lower input pasture for dairy systems	Cedara	2014-2019

Researcher	Short Title	Location	Period
DI Nash	Evaluation of the effect of Glyphosate, soil temperature and soil moisture on the establishment of ryegrass oversown into kikuyu	Cedara	2014-2017
DL Berjak	Evaluation of medium and long duration forage cereal varieties to be grown in a mixture with forage legumes	Cedara	2016-2020
CF Luthuli	Performance of goats supplemented with sweet potato vines	OSCA	2015-2019
Donna Berjak (Candidate Scientist)	Lucerne cultivar evaluation at Kokstad Research Station	Cedara, Kokstad	2014-2018
M Magawana (caretaker	The effect of cattle to sheep ratio and stocking rate on veld condition (Simulation Trial) on KRS	Kokstad	1989-2020

DEMONSTRATION RESEARCH PROJECTS

Researcher	Short Title	Location	Period
J Mann	DEMO: The grazing of beef breeding cows on kikuyu for 12 months of the year	Cedara	1989-2020
PA Oosthuizen	DEMO: Small scale dairying in an integrated farming system	Dundee	2003-2020
PA Oosthuizen	DEMO: Genetic conservation and characterization of indigenous sheep	Dundee	2007-2020

NEW PROPOSED PROJECTS FOR APPROVAL IN 2018/19

Researcher	Short Title	Objective	Impact
K Mkhize (Makhathini)	The characterization of the indigenous Zulu sheep (Imvu) in Zululand	To quantify the productive attributes and traits of Imvu and their adaptation to the hot, disease ridden environments of KZN	Establish the commercial value of this breed and its ability to cope with heat stress and its disease resistance, both crucial with global warming. This breed has potential to become a very good income source for the communal farmers in Zululand
Phumzile Msuntsha (Dundee)	Wool sheep demonstration for small-scale wool producers farmers	To improve productivity of wool sheep in small-scale communal system in the Nquthu area	Improve the income of communal households through wool production

Researcher	Short Title	Objective	Impact
A Pienaar (Cedara)	To develop a weigh band for beef cattle to estimate weights where weighing facilities are not available	More accurate weight estimates as a management tool	To develop a weigh band for beef cattle to estimate weights where weighing facilities are not available
M Khanyile (Makhathini)	The effect of graded levels of green algae ulva meal (*Ulva rigida*) on the growth and performance of *Tilapia rendalli*	• Evaluate dried green algae as a feed source for Tilapia • Determine the Physio-chemical attributes, fatty acid composition and shelf life of *Tilapia rendalli* fillets	An alternative feed source identified for animal production
M Khanyile (Makhathini)	Survey on the DNA of indigenous fish species in different river systems found in Ukhanyakude District Municipality	To determine if the local eco-types of fish in different river systems are genetically different	If no genetic/DNA differences in the fish from different river systems, there will be a basis for supplying fish to a another catchments/river systems in Zululand.
M Khanyile (Makhathini)	Demonstrate aquaculture production systems for warm water species	• To demonstrate aquaculture production systems • To produce fingerlings • Use as a training facility • Document to describe the system and inputs	Training, demonstrate technology and the production of fingerlings for farmers and re-stocking of pans on the Pongolo floodplain

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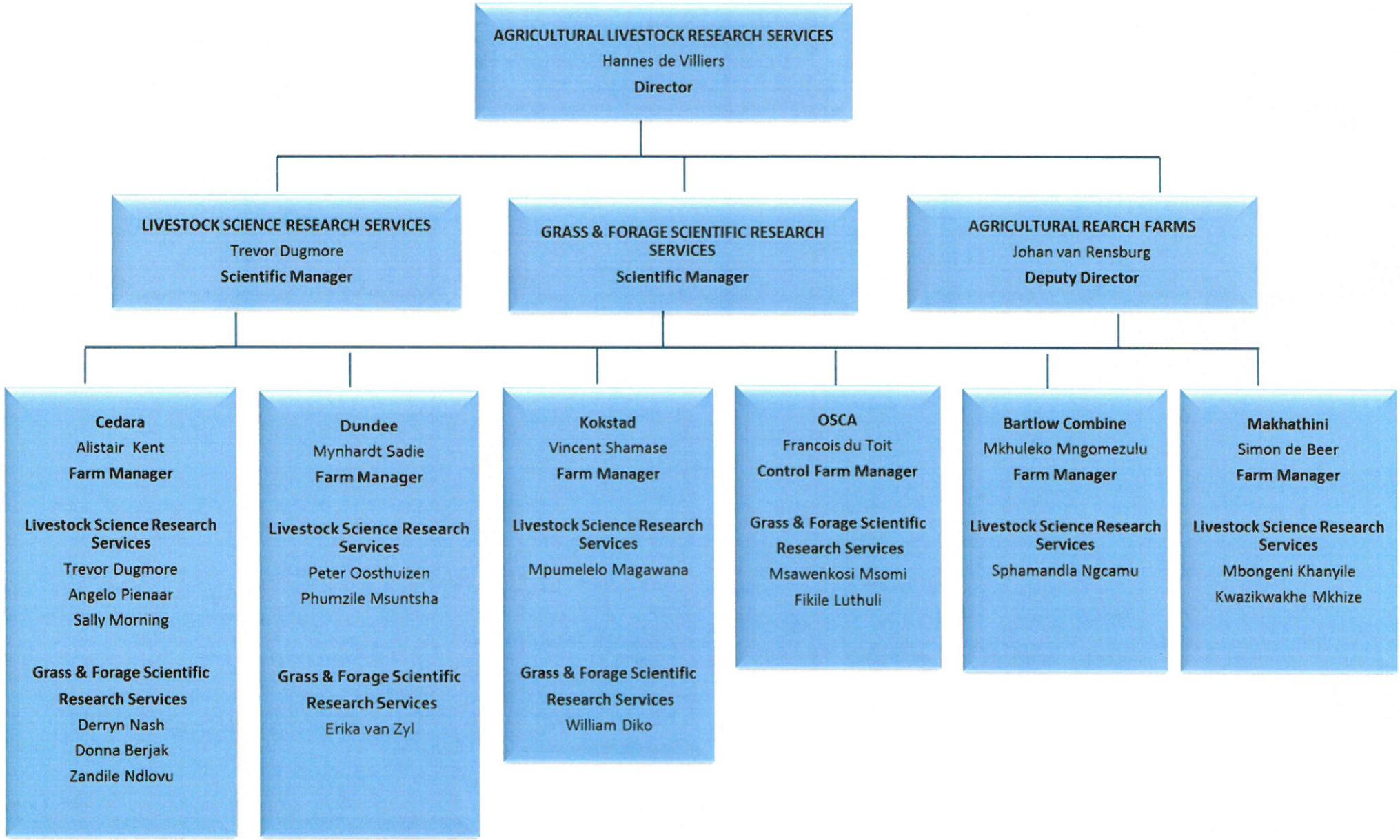
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