

# Linking cultivated pastures with rangelands

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Photo: John Cunningham

## Introduction

**A** word of caution about pastures as a possible intervention to relieve rangeland degradation: Cultivated pastures, although offering an opportunity to increase forage yield and consequently carrying capacity of farming

systems, could under certain circumstances, result in increased degradation of the natural vegetation instead of relieving the pressure on the rangeland. For example, if animal numbers are increased through provision of extra forage from cultivated pastures or other supplementary feed, the stocking rate of the summer rangeland may be exceeded,

leading to increased, and not reduced, degradation of the natural vegetation. The ratio of supplementary resources (e.g. cultivated pastures) to other vegetation resources (summer rangeland) is the key to sustainable use. Therefore, an integrated (holistic) and careful assessment of all available forage resources in a particular farming system needs to be done before cultivated pastures are introduced.

### **The importance of cultivated pastures for increased livestock production**

The importance of livestock to rural development and poverty relief is extensively discussed in the Livestock Strategy Plan. Reference is also made to be expected “Livestock Revolution” which is based on the principle that once the income of people rises, they diversify their diet and tend to eat more livestock food products instead of traditional staple foods. If the steady increase in the total population (currently about 1.7% per year) and the potential markets in Africa and elsewhere that should be exploited for export, are further added to the equation, there is little doubt that the demand for livestock food products will increase. This will be partially accommodated by production in intensive systems such as broilers, eggs and pork, but ruminant meat and milk will have to provide the bulk of the supply in rural areas, because the majority of livestock farming is natural resource dependent.

That being the case, it is interesting that total cattle and sheep

numbers have not changed much since 1995. In fact, cattle numbers which were estimated as 14 million in 1995 also have not changed appreciably over the last 40 years, and sheep numbers at 29 million in 1995 similarly are not much different from the numbers in the mid fifties – they may even have declined in recent years. Whereas there may be economic reasons as well, the main reasons are associated with the limitations of the natural resource itself (rangeland quantity and quality, degradation, biome limitations, drought, etc.). It is evident; therefore, that increased production (both turnover and numbers) will have to come from cultivated pastures. Studies and experience have shown that the conversion of appropriate areas into pastures can be done profitably. Furthermore, it is also attractive because it can be done within the constraints of acceptable patterns of land use and resource conservation.

### **The integration of cultivated pastures into the farming system**

It should be appreciated that rangeland and cultivated pastures can be complementary in providing fodder to livestock. Before cultivated pastures are introduced into any system, however, an assessment should be made of the extent to which productivity is likely to be increased, the capital input needed, the livestock system which is envisaged, the availability of labour and management expertise, and perhaps most important of all, the attitude of each individual farmer to pasture establishment. There is perhaps few

other farming ventures that can so rapidly lead to financial ruin that an unplanned or poorly planned head-long dash into cultivated pastures.

It is essential before embarking on a pasture programme, to view the forage resources of a property holistically so that species can be selected which meet identifiable season-specific needs within the specific forage and livestock programme of the property concerned. So, for example, on a particular property it may not be profitable to maintain a cow herd all year round on cultivated pastures, but such pastures may be used to provide strategic grazing for cows or for weaners that have to be weaned prematurely. In other situations, legume-based pastures may be used to boost the protein concentration in the diet of livestock during the winter. A complete forage inventory of the property needs to be undertaken first, to identify the weak points in the fodder flow programme. The pasture programme then needs to be targeted specifically at these weak points.

Unfortunately, cultivated pastures will do little to reduce the risks associated with variable rainfall conditions unless they are irrigated. Also, any forage they produce will normally cost more than that produced by rangeland. A full economic evaluation is therefore essential before a decision is made to embark on a pasture programme, particularly in the semi-arid regions where pastures normally do not have a quality advantage over rangeland and where production may be extremely variable from year to year. This evaluation should provide an

estimate of the amount that can reasonably be spent on establishing and maintaining the pasture.

## **Pastures suitable for different biomes and regions**

### ***Legumes***

The energy crisis of the 1970s and the rapidly increasing cost of nitrogen fertilizers directed attention to the potential role of legumes in providing protein-rich forage and in their potential to reduce the nitrogen fertilizer needs of pastures. The re-awakening interest in legumes is based largely on the successes that have been achieved with their use in countries such as Australia and New Zealand and under certain circumstances in this country. For successful livestock production, a balanced diet is necessary and in this context legumes can be a valuable supplement. A monoculture of legumes will normally more than satisfy the protein needs of highly productive animals. However, as with other cultivated pastures, considerable management attention needs to be given to legumes if they are to be used effectively in livestock systems.

Pasture and forage legumes are unique among crop plants because of their ability to contribute to soil N by N fixation, which is sufficient for own use and to some extent to grasses and other crops established thereafter. In Australia it has been found that temperate annual legume pastures can contribute between 40 and 100 kg N/ha/annum of which 11% to 40% will be available to subsequent crops. A total of 16.9 million ha of land in South Africa is suit-

able for the establishment of legume pastures. Such an area of legumes would contribute in the range of 430 000 kg N/ha/annum, which at the present cost of mineral N fertilizers (R6720/t) should be worth about R29 million/annum.

Legume pastures can be integrated into fodder flow programmes in a number of ways, for example, by using them:

- To reinforce rangeland
- To replace rangeland
- In mixtures with grasses; or
- In rotation with cash crops

The first determining factor here is the environmental potential and the availability of adapted species for the area under consideration.

There is also wide variation in optimum soil conditions for the growth of different legumes and they generally have more specific requirements than grasses. They also require more careful management than grass pastures, especially in grass-legume mixes, but forage tree legumes are more robust and easy to manage. Perennial legumes in particular tend to be extremely susceptible to disease in their post-establishment years. Great care should therefore be taken when choosing legume species for use in particular circumstances.

### **Grasses**

South Africa is world renowned for the rich diversity in grassland flora. The value of this flora was only recognized locally when a number of species indigenous to South Africa were successfully adopted as pasture species elsewhere in the world. Selections from among these spe-

cies can (dryland conditions or irrigation), produce 2 to 15 times as much dry matter as native rangeland, for example, *Eragrostis curvula* or *Digitaria eriantha*. These selections are well adapted to the South African environment, and therefore should play a prominent role in the choices of cultivated pastures for the country.

### **Drought-tolerant fodder crops**

The climate of South Africa, particularly between longitudes 17° and 24° E (representing arid and semi-arid regions), is conducive to dry spells, seasonal droughts and cyclic long term droughts. It is therefore sensible to make provision for dry periods through usage of drought tolerant crops to feed livestock. Three drought-tolerant forage crops have received a great deal of attention over the years. These are the American aloe (*Agave mexicana*), the spineless cactus (*Opuntia aurantiaca*) and Old Man Saltbush (*Atriplex nummularia*).

### **The Potential Role of Pastures in different Types of Rangeland**

The major role of cultivated pastures in farming systems is to satisfy the forage requirements of animals during periods when the quantity and/or quality of forage produced by rangelands is inadequate.

Their primary role should be to:

- Provide forage during the periods of food shortage in the fodder flow programme; and
- Increase the total amount of forage and digestible nutrients produced on the property.

The role of the cultivated pas-

ture will depend on the nature of the livestock system and the quality and quantity of forage that is available. The role therefore, will be a function of rangeland type.

In sourveld, cultivated pastures can:

- Increase the length of the growing season, particularly in the spring and autumn periods;
- Increase the total amount and quality of forage produced on a property;
- Provide high quality green forage during the winter months (particularly for the dairy industry, using irrigated temperate pastures);
- Provide high quality forage for carry-over into the winter in the form of foggage, hay or silage; and
- Increase the level of animal production per unit area of land.

In sweetveld, on the other hand, the major role of cultivated pastures is likely to be one of the following:

- To provide forage for summer use when rangeland needs to be rested;
- To provide hay for drought periods;
- To increase the total amount of forage available for animal feeding, and
- To increase the level of livestock production per unit area of land.

Finally, in mixed veld, the major role of cultivated pasture is likely to be:

- The provision of forage in early summer, when it is often in short supply;
- To provide fodder during the summer in order to rest the rangeland;
- To provide high quality forage dur-

ing the winter months; and

- To increase the level of livestock production per unit area of land.

In accomplishing any or all of these objectives in the different rangeland types, the cultivated pasture can have a pivotal role.

### **Summarised challenges**

Given the current state of the natural resource in many parts of South Africa, together with an increasing demand for animal-based foods, poverty relief and socio-economic upliftment, increased efficiency of livestock production and a substantial increase in livestock numbers are required. This emphasizes that cultivated pastures would be required if major increases in forage production are to be realized.

The incorporation of cultivated pastures into farming systems can be economically successful but it will require a high level of management and sound, objective planning. There is no doubt that there is considerable, as yet, untapped potential for their use in many parts of the country. The development of this potential should make it possible to increase forage production to levels capable of supporting the envisaged expansion in livestock numbers in South Africa.

It should be noted that the areas suitable for cultivated pastures overlap with the crop production and high potential areas, which would require dual objectives and sometimes mixed farming.

Livestock production, however, should not be in competition with crop production, but complementary.

This has been shown in the winter rainfall cropping area where cultivated pastures, especially legumes, are playing a significant role in rotational cropping systems, reducing input costs significantly due to reduced N fertilization.

It is interesting to note that dairy farms are increasingly established in the eastern high potential areas, making use of cultivated pastures. The East London, Alexandria, Tsitsikamma and George areas, situated within the eastern seaboard, are at present responsible for 61.9% of the countries' milk production compared to only 13% in 1992. Total cow numbers have decreased significantly in the RSA as a whole, particularly in specific production areas, but there has been a significant increase in numbers in the eastern seaboard.

The scope for expansion of legume-based pastures within the winter rainfall cropping area to increase stock numbers, especially sheep, is significant. There is also considerable scope for cultivated pastures, especially legumes, in the summer rain cropping areas. Although the arid Karoo and Savannah areas have low potential, drought tolerant species can assist in stabilizing fodder flow, especially during dry periods. Bearing in mind the rich plant

species biodiversity, the potential for selection and improvement of well-adapted local species to increase and stabilise fodder flow is enormous and should be exploited.

How farmers and others will react in future with regard to the degradation or enhancement of South Africa's land resources is open for speculation. There are several possible scenarios: globalization and the local growth of other economic sectors may reduce the intensity of rural land use, which would probably slow down degradation. Alternatively, a shift in global and national market relationships could stimulate increased rural resource use without allocating adequate labour and other resources to agriculture. This could aggravate land degradation. In a third scenario, dwindling economic opportunities and deteriorating international terms of trade could lead to agricultural intensification. For this purpose, much more research and extension needs to be done by land users and supporting government agencies to develop small scale, intensive systems with high food yields, and that also optimise and conserve resources for long term sustainability.

### **Strategy**

The fact that 80% of the agricultural

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land allows only animal husbandry implies that livestock production is primarily natural resource dependent which indicates a prime responsibility of the livestock industry to the sus-



tainable usage of this valuable but vulnerable resource. History shows that the livestock industry, research institutions and policy makers have not been effective in grasping this concept. It is therefore imperative that role players within the livestock industry (research institutions, government departments at national and provincial level, primary producers as well as the related secondary industries) must recognize that the natural resource is vital to sustain livestock production.

Given the current state and limited potential of some vegetation resources over much of South Africa, and the low productivity of the national livestock herd, alternative fodder crops should be established as a priority. There is undoubtedly considerable, as yet, untapped potential for cultivated pastures in many parts of the country.

A total of 16.9 million ha of land in South Africa is suitable for the establishment of legume pastures. A national legume R & D programme must therefore be implemented.

South Africa is world renowned for the diversity in grassland flora. Selections from among these species can, under both dry-land conditions and irrigation, produce 2 to 15 times as much dry matter respec-

tively as rangeland. A national plant-breeding programme must therefore be implemented.

The climate of South Africa is conducive to seasonal, annual and long term droughts. Drought-

tolerant crops can alleviate the resulting feed shortages and therefore a high priority should be given to drought tolerant crops in the Nama-Karoo and Savannah.

It is clear that biomes and the respective grazing areas are not confined to provincial boundaries and for R&D to succeed, to eliminate duplication and to strengthen the efficiency and impact of research, it is essential that projects should be carried out across provincial boundaries. The complexity of solving a comprehensive problem such as vegetation deterioration, the linking of cultivated pastures to rangelands, warrants the inputs of various researchers and expertise. Furthermore, it is not possible for a scientific community, which is so compartmentalized, to obtain insight into the complexity of rangeland and cultivated pasture problems. This should be addressed urgently.

We have to take cognizance of three documents, namely the (i) Strategic Plan for SA Agriculture, (ii) the National Livestock Strategy and (iii) the Policy document of Veld and Pastures. Are we using these documents to the benefit of Grassland Science? If not, then it is time to do so!

