E R G O F I T O I N A C T I O N

Give Nature What Nature Wants

Pastures

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SIX REASONS TO GO EASY ON FERTILIZER.

KwaZulu-Natal Department of Agriculture and Environmental Affairs.

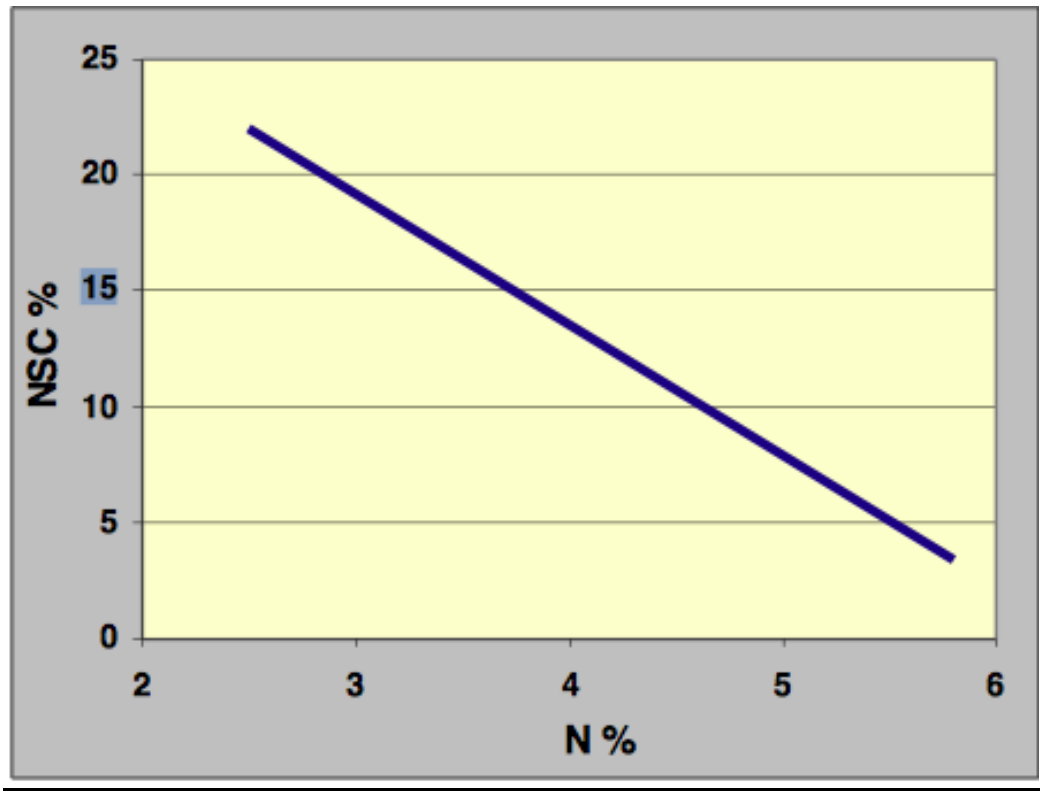
Many dairy farmers in South Africa apply high rates of fertilizer nitrogen (N) to their pastures. In fact, N rates applied on most of our dairy farms are considerably higher than in overseas countries such as New Zealand, Australia and the UK. The reason for using large amounts of N is to ensure maximum pasture yields, and thereby milk production. However, Nitrates are frequently used in excess of pasture growth requirements, and this is bad news for animals, plants and soils.

Let's look at some of the effects of too much Nitrogen.

1. Energy in pasture

On most intensive pastures, intake of digestible energy rather than protein content is the major nutritional limitation to animal performance. Non-structural carbohydrates (NSC), which include sugars, are the most readily available source of energy in plants. During the past decade, the importance of NSC with respect to pasture intake and animal performance has been increasingly appreciated by scientists. Plant breeders in many countries are attempting to improve NSC levels in pasture plants.

Of importance from an N fertilization perspective, is that NSC concentrations are markedly suppressed by high N concentrations in the plant (Graph 1). So the higher the N, the more unfavorable the protein: energy ratio for the rumen bacteria.



Graph 1: Relationship between nitrogen (N) and non-structural carbohydrates (NSC) in ryegrass pastures in autumn and early winter in KZN.

2. Protein and milk urea nitrogen (MUN)

A large proportion of the protein in pastures is of high degradability. This means that it is released in the rumen by micro-organisms. Ideally, most of the released N (from the protein and non-protein compounds) should be utilized by the micro-organisms for the manufacture of microbial protein.

However, in pastures receiving high rates of fertilizer N, the amounts of N released in the rumen exceed microbial requirements, and the excess N is absorbed into the blood stream as ammonia. Ammonia is toxic to animal tissues, and is therefore rapidly converted in the liver into urea. The urea is detectable in both the blood and the milk (MUN).

Now in terms of this process, the following points are worth noting. Firstly, dealing with the large concentrations of ammonia in the blood stream arising from the cow grazing high-N forages places enormous strain on the animal's liver.

Secondly, the conversion of ammonia into urea utilizes considerable amounts of energy, and this is at the expense of milk production. Lastly, there is convincing evidence that cow fertility decreases with increasing MUN levels.

So excess protein and NPN is detrimental to animal health, reproductive performance and milk output.

3. Pasture palatability

Many farmers have had the unpleasant experience of having hungry cows that are reluctant to graze lush green pasture. The fact is that excessive N reduces pasture palatability. Reasons for the rejection of high-N grass no doubt include its low content of sugars and large amounts of non-protein N, although an ammonia-based appetite repression mechanism may also be involved.

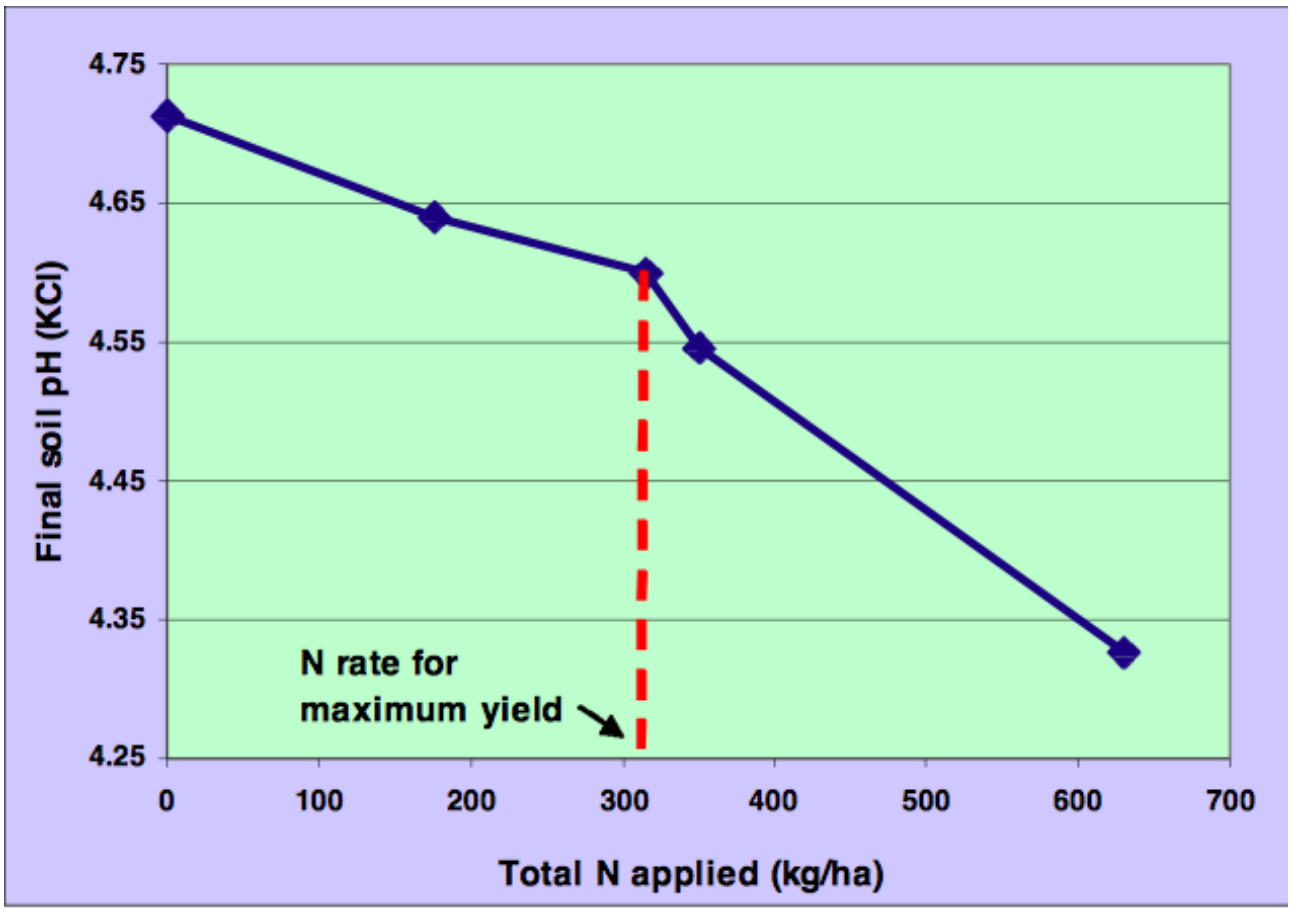
4. Soil health

All nitrogen fertilizers generate acidity in the soil. However, N fertilizers differ markedly in this respect, with the acidification potential increasing as follows: LAN < urea < ASN < ammonium sulphate (it follows, therefore, that while ASN and ammonium sulphate may be applied occasionally to augment pasture S levels, they should not be used routinely to supply N).

Acidification is least when the bulk of the applied N is taken up by the plant roots. When however N rates exceed plant requirements, acidification can be severe. This is well illustrated by data from an Italian ryegrass N response trial conducted on Cedara in 2001 (Graph 2).

This trial included numerous N rates (as LAN), with the maximum yield (14.6 t/ha) being obtained at 315 kg N/ha. As shown in the graph, acidification was slight up to 315 kg N/ha, but accelerated at higher N rates.

So in addition to excessive N applications having no benefit in terms of pasture yields, they imply a stiff penalty in extra long-term lime requirements for correcting the acidity generated.



Graph 2: The impact on soil pH of increasing amounts of N (as LAN) applied to Italian ryegrass (data for a single season; maximum yield was 14.7 t/ha; soil pH measured at the end of the season).

5. Economics

In contrast to immobile nutrients such as calcium and phosphorus which are stored in the soil, fertilizer N applied in excess of short-term pasture requirements is liable to be lost from the rooting zone. Losses may be caused by gas escaping into the atmosphere, or by leaching following heavy rain or irrigation. Nitrogen lost in these ways is essentially “money down the drain”.

The goal must be to match fertilizer rates with immediate pasture N requirements, thereby to maximizing the kilograms of pasture dry matter produced from every kilogram of N applied.

6. Environmental concerns

Environmentalists have legitimate concerns relating to N fertilizer use and soil and air pollution. Nitrogen not used by plants may contribute to nitrate pollution of ground and surface waters, or escape into the atmosphere as ammonia or nitrous oxide.

This has led to severe restrictions being imposed on fertilizer N use in certain Northern Hemisphere countries. Although restrictions of this type are not in place in South Africa, it is incumbent on farmers to exercise sound environmental stewardship.

Conclusions

While fertilizer N is an important and essential tool for optimizing animal carrying capacity, and thereby milk production, N applied in excess of pasture growth requirements impacts negatively on soil health, pasture quality and animal performance.

It is therefore important that N rates be accurately matched to pasture growth requirements. Seasonal variations in the pasture growth rate, and wide variations in soils on which pastures are grown, present a challenge to farmers.

Simplistic approaches, such as applying 50 kg N/ha (or 40 or 60 or 70) after every grazing, are not appropriate for the farmer optimizing profitability and sustainability. Advances in the past decade in understanding N dynamics in pasture systems provide a basis for more accurate N application rates for pastures.

ERGOFITO INTERVENTION:

It is impossible to effectively manage a pasture if the microbial activity in the rhizosphere is not balanced. Excess Nitrogen fertilizer will mineralize the humus in the soil, thereby rendering any additional fertilizer inutile. Root development is curtailed and minimal feeder roots will retard water retention and fertilization. The same applies to excessive application of N or lack of humus in the soil.

Yearly Application:

- Reduce all fertilization by 30%
- Apply 125 kg of **Ergostart Bio** per hectare (optional but recommended)
- Apply 15 Kg of **Ergofito Universal Plus** per hectare

Maintain normal fertilization (less 30%).

For feed pastures such as Alfalfa, apply the following:

- Reduce all fertilization by 30%
- Apply 125 kg of **Ergostart Bio** per hectare (optional but recommended)
- Apply 15 kg of **Ergofito Universal Plus** after each cut

The Brix content as well as the nutritional value of the grass (or hay) will increase dramatically resulting in a higher animal carrying capacity and milk and meat production.