Soil fertility management for forage crops is a continuous process that begins well before the forage crop is established. In the pre-establishment phase, the soil conditions are adjusted to provide optimum soil fertility when the crop is established. The fertility program during the establishment phase should deal with last-minute small adjustments in soil fertility and any requirements such as a starter fertilizer for getting the plants established. After the crop is established, the fertility program should focus on maintenance of good fertility levels in the soil for the life of the forage stand.

This fact sheet will deal with the establishment phase of soil fertility management for forages. The soil fertility management time-line is illustrated in Figure 1.

If the pre-establishment fertility goals have been met, few things need to be taken care of at the establishment phase. In the establishment phase, the primary goals of soil fertility management are to fine-tune the soil pH or nutrient levels and to ensure that the conditions are optimum to establish the crop.

When only a small amount of limestone is needed to make an adjustment in the soil pH, it should be applied after primary tillage and worked into the surface before planting. If a large amount of limestone is needed, the lime application should be split and some mixed deep into the soil with primary tillage, and the rest should be applied after primary tillage but worked into the surface. These measures will give the best distribution of limestone and will ensure that the surface pH where the seedlings are developing will have a better pH level.

If a soil test taken just before establishment indicates the need for additional fertilizer, the size of the requirement will determine how this should be applied. For instance, if the pre-establishment goals have been completely met and there is no soil test recommendation, there usually is no need to apply any fertilizer. If the soil test recommends addition of only a small amount, the recommend amount can be banded at planting or broadcast on the soil surface. But, if the soil-test indicates a need for a large amount of fertilizer, the best approach would be to split the fertilizer application with the bulk of the nutrient needs met with plow-down fertilizer or manure. A small amount of the total fertilizer requirement, such as 20-40-40 per acre, should be banded at planting or applied to the surface to meet the immediate needs of the crop as it is established.

**STARTER FERTILIZER FOR FORAGE SEEDINGS**

Applying a small amount of fertilizer near to the seed at planting time is a well-accepted practice in corn production. This practice is known as starter fertilizer. The strategically placed source of nutrients for the young plant has been shown to consistently provide an early growth response and often a yield increase in corn. However, the response of forage crops to a starter fertilizer has not been as consistent. Generally, it is assumed...
that a starter fertilizer will give a beneficial response only
under very adverse conditions such as soils that are very cold
and wet, soils with poor physical properties, and soils that are
very low in fertility. If a starter fertilizer is used for a forage
seeding, there are at least three major management consider-
ations. (1) The starter fertilizer should have a high phosphorus
content. Many fertilizers meet this requirement. Dry fertilizer
examples include 10-20-10, 10-20-20, 10-10-10, and 8-32-16.
Fluid fertilizers include 10-34-0, 7-21-7, and 9-18-9. A fertil-
izer containing urea should not be used as a starter. (2) The
starter should be banded 1 inch directly below the seed. This
is especially important for legume seedings. (3) Finally, the
rate should be kept below about 60 pounds of nitrogen plus
potash in the starter band. This is an important precaution to
avoid reduced germination and salt damage to the seeding.
If a starter fertilizer cannot be banded as described above, a
small amount of fertilizer can be broadcast as a starter. How-
ever, the broadcast method is less effective than band place-
ment because it will only give a beneficial response under
very adverse environmental conditions—when the soil ferti-
licity level is low. Routinely broadcasting a small amount of fer-
tilizer as a starter is not recommended under most conditions.

**INOCULATION OF LEGUMES**

Legumes have the ability through a symbiotic relationship
with rhizobia bacteria to fix nitrogen from the air in a form
that is available to the plant. This process fixes enough nitro-
gen to completely meet the needs of the legume for nitrogen.
For this process to take place, the plant roots of the legume
must be infected by rhizobia bacteria that are specific for
each species of legumes. In many soils, rhizobia bacteria
are present to infect the plant roots, particularly if the same
legume species has been grown in the field in the recent
past. However, a general recommendation is that all legumes
be inoculated with the proper rhizobia species at seeding.
Inoculation is very inexpensive and thus provides good
insurance that the plant will have adequate nodulation and
thus good nitrogen nutrition.

The inoculant must be specific for the legume being
planted. Since the inoculant contains living bacteria, the
inoculant should be kept in a cool, dry place. The best storage
place is in a refrigerator. The worse place to store inoculant is
on the dashboard of a truck because heat and direct sunlight
will kill the bacteria. Finally, all inoculants have an expiration
date. After this date the inoculant may not have adequate live
bacteria to do an adequate job of inoculation. Always be sure
to check this date before using an inoculant.

Inoculant can be applied in several ways. The most com-
mon method is to mix the inoculant with the seed just before
planting. A sticker may be used to ensure that the seed is well
coated with inoculant. Some seed is pre-inoculated when
purchased. The same handling precautions hold for pre-inoc-
ulated seed as for the inoculant itself. Another way inoculant
is commonly applied is by direct soil application. In this
method the inoculant is applied in a granular form through an
insecticide or fertilizer box on the seeder. Fluid preparations
of inoculant can be directly applied by spraying them in the
seed row. Fluid seeding, where the seed is suspended in liq-
uid fertilizer and sprayed on the prepared seed bed, has also
become popular. It is important with this method of seeding
that the seed not be left in contact with the fertilizer solu-
tion too long, because the prolonged exposure can reduce the
effectiveness of the inoculation. More details on inoculation
can be found in *Agronomy Facts 11: Inoculation of Forage
and Grain Legumes*.

pH is extremely critical for this symbiotic relationship
between the legume and the rhizobia to be successful. Thus,
establishing a soil pH between 6.5 and 7.0 at seeding is criti-
cal. It is sometimes recommended that nitrogen fertilizer be
added at seeding time to take care of the needs of the legume
until it is adequately nodulated to meet it nitrogen require-
ments. Generally, this has been found to be unnecessary. In
fact, adding nitrogen from fertilizer or manure can reduce
nodulation.

For grass forages some nitrogen, 20 to 40 pounds per acre,
should also be applied at seeding. An additional 30 to 50
pounds of nitrogen can be applied in the late summer of the
seeding year if production warrants. In no-till seedings in sod,
such as pasture renovations, no nitrogen should be applied at
planting. Nitrogen applied in these situations will stimulate the
existing grasses and can provide too much competition to the
new seeding resulting in a seeding failure.

**SUMMARY**

At establishment the fertility program should deal with any
last-minute small adjustments in soil fertility and any require-
ments for getting the plants established such as a starter fer-
tilizer. If the soil fertility goals were met in the pre-establish-
ment phase little or no fertilizer or manure should be required
at establishment. In general, forage crops do not respond to
starter fertilizers unless the conditions at planting are very
adverse. The most important aspect of fertility management
for establishment of legume forages is proper inoculation to
ensure adequate nitrogen nutrition of the crop.