DRILL SEEDING STEEP SLOPES FOR ESTABLISHMENT OR INTERSEEDING

By **Richard L. Brammer,** General Superintendent, Reclamation Division, Randall & Blake, Inc., Littleton, Colorado. A speech presented during the 1981 Annual Meeting of the International Erosion Control Association.

As seeding contractors, Randall & Blake, Inc. have and will go to great efforts to plant seed into the soil using a drill. In the low precipitation areas that we often operate in, we need all of the help we can get to promote successful seedling establishment.

The prime reason for drill seeding is the positive placement and uniform dispersion of seed at a regulated depth into the soil where levels of moisture are more consistent and the actions of wind and water will not remove the seed from the treated area. These simple considerations provide for a more consistent stand of established plants versus any broadcast method and develop a seedling that is more drought hardy. The seedlings are rooted *in the soil* not on the top of the soil trying to root down into the surface.

Many people argue that in nature all seed is broadcasted in one way or another. This is a valid point; however, natural broadcasting of seed is very inefficient in terms of the amount of energy that a plant must expend in order to reproduce. A single plant may produce thousands of viable seeds. However, only a few of these may ever get the chance to germinate due to the uncertainty of being broadcasted into a habitat conducive to germination. In essence, drill seeding is an improvement upon natural seed dispersement by placing all of the seed into niches favorable to not only germination, but also a viable existence.

It is a common notion that doubling the seed application rate when broadcasting will obtain the same results as drill applications. Even if this was always certain, it can be extremely cost ineffective when broadcasting with some native species that cost $60.00 or $120.00 per pound. The total seed cost could reach $200.00 to $300.00 per acre. From another standpoint, water for hydroseeding may be miles from the treatment site. Exposure of some seed (for example, blue grama) to even short periods of soaking will trigger germination, and that combination with powdery dry soils can be lethal in zeric areas. These factors all culminate in whether you have to go back and try again — we want to give it the best shot the first time, especially when our work is the best testimony of our capabilities.

Safety is primary. If the slope is too steep or too rocky, then use other methods of seeding.

Throughout the plains and intermountain valleys of the western states "drill seeding" has been utilized as the major method of planting seed into the soil. It is not a new idea, as horse drawn seed drills can be found hiding around in farm lots. Improvements have been developed as agricultural trends and construction methods improve. The drill was improved upon following the dust bowl era and the Great Plains Program promoted returning marginal agricultural land back to its best use — grass lands. Reclamation along the Interstate Highway System increased the use of native grasses and likewise prompted further improvement of the drill. The Vegetative Rehabilitation and Equipment Workshop has improved the Rangeland Drill for use after forest fires and shrub land conversion to improve grazing capacities on native rangeland. But to date, there is still a gap in the commercial development of an "off the shelf" drill that will work with the native collected species (blue grama, little and big bluestem) and withstand the continual rigors of rocks, slopes and rough ground that are the result of mining or other extreme soil disturbances.

If you have seen one seed drill you have *not* seen them all. Some handle smooth seed, some trashy; some have 3 point hook-ups, some are towable; some work and some don't. Let's consider the types of feed systems. The simple open throat will feed smooth seeds (wheatgrasses, cereal crops and bluegrasses) and adjusts by opening or closing the plate in the bottom of the box. A picker wheel is required to feed the sticks and stems that are common with native collected seed (blue grama, galleta, bluestems). These systems are more complex to adjust and require some imagination to calibrate, such as adding filler materials like sawdust or peatmoss that will

help give uniform feeding with some fluffy seeds. The seed boxes should have dividers so that on a slope all of the seed doesn't slide to one end of the box.

Most dryland seeding is performed with a mixture of different sized seed, and an agitator is required to keep the seed from segregating in the box. Many extremely small seeds, like sand dropseed, should be planted separately through a small seed box or it will shake out of slick seed mixes like wheatgrasses, unless there is a lot of fluffy seed in the mix such as blue grama. I will always advocate the value of experience on the job site because seed of the same species will vary in trash content from lot to lot. Blue grama is a prime example because only a limited acreage has been alloted to seed production and the rest has to be collected from native stands. To separate it down to 99% clean destroys more seed than you save in *looks* by having "*clean*" seed. The germination is still there when it is tested for pure live seed even if trashy material remains attached.

If slope is less than 3:1, seed drills will provide good seed/soil contact without high seed rates or water at the site.

The drop tubes which connect the seed boxes to the planting bottoms need to be very flexible to bend and withstand the impacts when going over rocks and rough ground. The diameter should also be large enough to let the sticks and stems go through. The planting bottoms also need broad enough openings to allow the stems and fluff to pass. There are modifications that help the standard bottom. Most bottoms are steel castings and will break after traversing miles of rocks and rough ground. These castings are not always easy to find when you are miles from a farming area. One fabricator (Tye, Inc.) produces a welded steel bottom that will take more abuse and can be repaired with a welder. The planting bottoms have depth bands on the disc that control the depth of seed placement. These are also easy to destroy in rocky ground and some are stronger than others. Packer wheels can be used in sandy soils to assist in depth control, but rocks will destroy them in a short time. Individuals that specify their use should check the site conditions first.

The limitations of where you can operate a drill are very basic. If it is too rocky for the disc to place the seed into the soil, then call in the broadcasters. If it is too steep to operate equipment safely (then someone should have designed the slope flatter, which is a subject in itself), then your options are more costly, labor intensive, and the resulting vegetative cover is less effective due to the repose of the slope.

Basically, if you can traverse the slope with a tractor, either wheel or crawler type, you can drill it — *safety is prime*. Wheel tractors with dual wheel arrangements can work a 3 to 1 slope in most instances. You can go beyond this with 4-wheel drive, a good experienced operator and a texture of soil that is stable enough to support the weight. Sand, gravel, round rocks, or mud will put you at the bottom of the hill in a hurry. Crawler type equipment will handle 3 to 1 and even steeper slopes depending on the soil texture. A low profile, wide tracked John Deere 350 is our main tool for drilling steep slopes; then safety becomes our limit. Specification writers should know safety limits and not try to exceed them. I have seen many specifications calling for drill seeding on 2 to 1 slopes — that is not a responsible recommendation and personal injuries are not a good tradeoff for lack of experience.

When you start thinking that a tractor can be held onto a slope by cables from above; then "call in the hydroseeders" and utilize a slope chain to bury the seed: it is less costly than an injury. There are some very complicated machines being tested by the Inter Agency Equipment Development Center at San Dimas, California, that are held onto slopes with a grade-all. These are a good alternative to hydroseeding and slope chaining, but are limited in reach.

Another excellent practice with a drill seeder that will see expanded use is *interseeding*. Again, this is an old range improvement practice and the term refers to planting more seed in poorly established stands of grasses. *Minimum tillage* is another term for planting in standing vegetation. A good example is in mine reclamation where the first treatment did not produce the required density of plant establishment or the diversity of plant species is lacking. By utilizing the litter remaining from weedy annuals and the protective cover of the desirable species, new seed can very effectively be planted with minimum tillage. A specially designed minimum tillage drill is equipped with rippers or discs that only disturb the soil in a narrow band in front of the planting disc. This treatment is very effective when growing your own mulch cover by planting annuals prior to planting the perennial species. This is a very effective way of increasing soilbiomass and microbial levels in subsoils of low productivity. It is an attractive alternative when mulch prices rise due to trucking costs or excessive competition with the livestock industry during drought years. **WTT**