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PLANT MATERIALS TECHNICAL NOTE

Calculating Seeding Rates When Using Alternate-Row and Cross-Seeded Planting Techniques

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Figure 1. Cross-seeding of Russian wildrye and alfalfa

Introduction

Certain plant species emerge and establish better, are more productive, and persist longer when planted as a single species within a row. Using alternate-row and cross-seeded seeding techniques can be beneficial with plants that are slow to emerge, or are not highly competitive, at least during early establishment, with other species. Some potential uses might include establishment of slow developing species for forage production, or forb establishment in pollinator plantings when grasses are also needed for site stabilization. Unfortunately, there has been only limited testing of these techniques with conservation species adapted to Montana and Wyoming. Species testing to date will be summarized in an upcoming Technical Note. Alternate-row plantings of Russian wildrye (*Psathyrostachys juncea*) and alfalfa (*Medicago sativa*) or sainfoin (*Onobrychis viciifolia*) have proven successful, the additional growing space allowing the slow establishing Russian wildrye time to become competitive with the alfalfa. This Technical Note provides guidance and clarification on determining seeding rates with these techniques using Russian wildrye and alfalfa as examples. It should be noted that equipment availability may influence actual seeding method and rate.

Calculating Seeding Rate

When calculating seeding rates (Pure Live Seed [PLS] pounds per acre) for an alternate-row or cross-seeded planting, begin with the full seeding rate for the species specified in Plant Materials Technical Note, MT-46 (Rev. 4), *Seeding Rates for Conservation Species for Montana* and adjust accordingly. Keep in mind landowners may have equipment that will not plant exactly the row spacing used as the basis for the calculations. In some cases, blocking off feeder tubes or other equipment modifications should be suggested in order to meet species requirements and to obtain the targeted number of seeds per linear foot. Use the following examples to help determine seeding rates for the species you are working with:

Alternate-Row Method

Example – Although Russian wildrye is highly competitive once the stand becomes established, it is initially slow to emerge and establish, and is therefore out-competed by many species when sown in a mix. To avoid this problem, it is recommended this species be planted alone in its own row, alternating with rows of other crops, such as alfalfa. When referencing Plant Materials Technical Note, MT-46 (Rev. 4), the recommended full stand seeding rate for Russian wildrye is 6.0 PLS pounds per acre (based on a target seeding rate of ~23 PLS seeds per linear foot at 12-inch row spacing). A footnote recommends a minimum of 18 inches between rows because Russian wildrye is highly competitive once established (it needs more room to grow), so the actual full stand rate needs to be converted for 18-inch rows. **Please note Plant Materials Technical Note, MT-46 provides conversion factors for calculating amount of seed needed per acre for various between-row spacing.** The following calculations demonstrate the basis for those factors.

a. For a solid stand planted on 18-inch rows – When sown in a solid stand with 18 inches between rows, the total amount of PLS seed of Russian wildrye needed is ~4 PLS pounds per acre. To help visualize this, a square acre measures 208.7 feet by 208.7 feet and equals 43,560 square feet. The calculation for determining the amount of seed needed is: ([208.7-foot long rows X 139 rows per acre @ 18 inches apart] X [~23 seeds per foot] ÷ 170,000 seeds per pound = ~4 PLS lbs./A). Simply use the conversion at the back of Plant Materials Technical Note, MT-46 and divide the full stand seeding rate of 6 PLS pounds per acre for 12-inch rows by 1.5 to arrive at 4 PLS lbs./A for 18-inch rows (12-inch rows are 67% as wide as 18-inch rows, so dividing the 12-inch seeding rate by 1.5 reduces the amount of needed seed for 18-inch rows by 67%).

b. For 18-inch alternate rows with alfalfa – An 18-inch alternate-row planting of Russian wildrye and alfalfa is a seeding with 18 inches between a Russian wildrye row and the adjacent alfalfa row. **It does not mean there are 18 inches between Russian wildrye rows. There are now 36 inches between rows of Russian wildrye and between rows of alfalfa.** Since the number of rows of Russian wildrye will now only be half of a full stand on 18-inch rows, only half the seed or ~2 PLS pounds per acre is needed ([208.7-foot long rows X 69.57 rows per acre at 36 inches apart between Russian wildrye rows] X [23 seeds per foot] ÷ 170,000 seeds per pound = ~2 PLS pounds per acre of Russian wildrye). Similarly, the recommended seeding rate in Plant Materials Technical Note, MT-46 (Rev. 4) for alfalfa is 5 PLS pounds per acre for a full seeding on 12-inch rows. In an 18-inch, alternate-row scenario, the amount of alfalfa needed would be approximately 1.6 PLS pounds per acre ([208.7-foot long rows X 69.57 rows per acre at 36 inches apart between alfalfa rows] X [~25 seeds per foot] ÷ 225,00 seeds per pound = 1.6 PLS pounds per acre of alfalfa). Again, simply using the conversion factors at the back of MT-46 allows for rapid calculation.

c. For 36-inch alternate rows with alfalfa – A 36-inch alternate-row planting of Russian wildrye and alfalfa is a seeding with 36 inches between a Russian wildrye row and the adjacent alfalfa row. **It does not mean there are 36 inches between Russian wildrye rows. There are now 72 inches between rows of Russian wildrye and rows of alfalfa.** Since the number of rows of Russian wildrye per acre will now only be 25% of a full stand on 18-inch rows, or 50% of the number of rows on 36 inches), only half the amount of seed needed for the 36-inch row spacing or ~1 PLS lbs./A is needed ([208.7-foot long rows X 34.8 rows per acre @ 72 inches apart between Russian wildrye rows X 23 seeds per foot] ÷ 170,000 seeds per pound = ~1 PLS lbs./A of Russian wildrye). In Plant Materials Technical Note MT-46 (Revision 4), the recommended seeding rate for alfalfa is 5 PLS pounds per acre for a full seeding on 12-inch rows. In a 36-inch row scenario, the amount of alfalfa needed would be approximately 0.84 PLS pounds/acre ([208.7-foot long rows X 34.8 rows per acre @ 72 inches apart between alfalfa rows] X [~26 seeds per foot] ÷ 225,00 seeds per pound = ~0.84 PLS pounds per acre of alfalfa.

Cross-Seeded Method

The cross-seeded method involves sowing seeds of different species perpendicular to each other. For instance, one species such as Russian wildrye is sown north:south, while a second species, such as alfalfa, is sown east:west. This technique, like the alternate-row method, reduces within-row competition among sown species. The practice typically involves planting a single species in one direction and a single species in the other, but some variations may include a mix of compatible species in one of the directions. The drawback to this technique, in comparison to alternate rows, is it requires two trips across a field. Although using the full stand rate of each species with a cross-seeded planting results in sowing more seeds per unit area than recommended in Plant Materials Technical Note, MT-46 (Rev. 4), it is suggested to use the full stand rates since research on this technique has been conducted with full rates. This of course, results in higher seed costs than a conventional, single direction seeding. It may be possible to lower the seeding rates and still achieve a successful planting, but this should be trialed on a small scale. Actual seeding rates may vary as a function of species, annual precipitation, drill configuration (between-row spacing; if blank rows are used, etc.), and other factors, and in some cases, the full stand rate for each species may be warranted.

a. Example – Using the Russian wildrye and alfalfa example again, let us say we want to design a cross-seeded planting with 18 inches between both parallel and perpendicular rows (note this row spacing may be too close for many low precipitation locations).

   Since we have two species each sown on 18-inch between-row spacing at the full seeding rate, we will be sowing a total of twice the number of seeds per unit area (23 + 26 = 49) targeted in Plant Materials Technical Note, MT-46 (Rev. 4) for a full stand seeding on 18-inch rows of a single species.

   As previously calculated, a full stand seeding of Russian wildrye on 18-inch rows requires ~4 PLS pounds per acre. Similarly, a full stand seeding of alfalfa on 18-inch spacing requires 3.3 PLS pounds per acre ([208.7-foot long rows X 139 rows per acre @ 18 inches apart] X [~26 seeds per foot] ÷ 225,000 seeds per pound = ~3.3 PLS pounds per acre). Since seed is planted in two directions, we will be planting twice the number of seeds per unit area as in a conventional, single species full stand seeding. For close row spacing (<12 inches) under irrigated or high precipitation areas, we would maintain the same PLS pounds per acre seeding rate as per MT-46, resulting in decreasing seeds per foot. Under dryland or low precipitation conditions, we decrease the full stand seeding rate per acre of each species according to MT-46, resulting in maintaining the same number of seeds per linear foot.

In some cases, producers may use planters with fixed row spacing and need to block off tubes and drills in order to obtain the desired row spacing. In these cases, it will be necessary to adjust the seeding rates to assure the proper amount of seed is sown per lineal or square foot.

It is important to note that small seeded species (such as many forbs) may have difficulty emerging through crusted or packed soils. In such cases, it is best to sow these species on the second pass in order to avoid soil compaction caused by tractor tires when planting the first species.

References and Additional Information

Majerus, M. 2009. Forage and Reclamation Grasses of the Northern Great Plains and Rocky Mountains. Valley Printers, Bridger, Montana. 161 pages.

Majerus, M., J. Scianna, and J. Jacobs. 2013. Seeding Rates for Conservation Species for Montana. Plant Materials Technical Note MT-46 (Rev. 4). Available at http://www.mt.nrcs.usda.gov/technical/ecs/plants/technotes/pmtechnoteMT46.html