No-Till Forage Establishment to Improve Soil and Water Conservation and Reduce Associated Production Risks

Steve Sparrow – *(Research & Education Grant)*

Western SARE — Sustainable Agriculture Research & Education

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Red clover showed promise as a short-lived perennial legume. – Photo by Robert H. Mohlenbrock, USDA-NRCS

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Situation:

Perennial grasses, which cover 68% of Alaska agricultural lands, need to be renovated periodically because of winter kill or stand depletion. Forage grasses are typically reestablished by reseeding into well tilled beds.

The dry, windy spring conditions that prevail in much of Alaska make it difficult to establish small-seeded crops. Spring seeding into tilled soil results in wind erosion and loss of soil moisture. Improved methods are needed for restoring degraded pastures, hay lands and grass seed fields.

Objectives:

1. Evaluate the efficacy of no-till planting, compared with planting into tilled soil, under various nitrogen fertilizer rates for establishing timothy (*Phleum pratens L.*) and smooth bromegrass (*Bromus inermis Leyss*)

2. Evaluate promising annual companion crops for forage production during perennial grass establishment in no-till and conventional till planting systems

3. Determine the effectiveness of no-till establishment of perennial grasses and red clover (*Trifollum pretense L.*) at various seeding rates

Farmer Field Conditions

Location	Field Composition	Field Quality	MAT*	MAP†	Soil pH
Fairbanks	smooth bromegrass hayfield	fair stand	-2.8	304	5.6
Delta Junction	abandoned Kentucky bluegrass seed field	very poor stand	-2.3	276	5.6
Palmer	smooth bromegrass hayfield	good stand	1.9	393	5.8
Point Mackenzie	timothy hayfield	fair stand	2.2	404	5.2
Sterling	Kentucky bluegrass red fescue mix	fair stand	1.0	482	5.4
Anchor Point	timothy, native grass and forbs	fair stand	3.0	645	4.7

*** Mean Annual Temperature (C) † Mean Annual Precipitation (mm)**

Actions:

Experiments were established on farmers' fields at two sites in interior Alaska and four in south-central Alaska. All soils were moderately to strongly acidic silt loam.

Nitrogen rate study under till and no-till

Manchar smooth bromegrass and Engmo timothy were planted at various locations under till and no-till. P and K application rates were based on site soil tests. N was applied as ammonium nitrate with seed at 0, 20, 40 and 60 kg per hectare. N rates on unseeded control were 0 and 40 kg per hectare.

Companion crop study

Toral oats, Gulf Westerworld ryegrass and Dwarf Essex fodder rape were planted with Manchar smooth bromegrass at Delta Junction and with Engmo timothy at Anchor Point and Point MacKenzie under till and no-till. P and K applications were based on site soil tests, and N was applied as ammonium nitrate at 40 kg per hectare.

Seeding rate study

Three seeding rates (normal, half of normal and double normal) were direct seeded into untilled soil for Manchar smooth bromegrass (normal = 20 kg per hectare), Engmo timothy (normal = 9 kg per hectare) and Altaswede red clover (normal = 13 kg per hectare).

Measures

Plots were harvested at early heading stage, dried, weighed and analyzed for forage quality: crude protein, neutral detergent fiber and acid detergent fiber.

Results:

Direct seeding of grass into established grass stands usually did not improve forage yields or quality. Seeding rate and N rate had little effect on establishment of newly seeded forages, especially in no-till.

Companion crops can increase total forage yields in the establishment year, but may depress perennial forage grass yields to the point that they do not recover in subsequent years. Few, if any, companion crops are likely to succeed under no-till.

Direct seeding of red clover and oats into existing sod may be successful under some conditions in Alaska, but further research is needed to determine under what conditions they are likely to work.

Grasses need periodic renovation because of winter kill or stand depletion.

Impacts or Benefits on Agriculture:

Based on the results of the project, the main impact for farmers in Alaska is to discourage them from using no-till seeding of forage grasses or using companion crops with forage grasses in Alaska until methods to better ensure success can be developed.

At field days (25 attending Autumn Harvest Day at Point Mackenzie in August 2001) and field conferences (120 attending Alaska Forage Conference in Wasilla in February 2002), farmers expressed appreciation that the work persuaded them not to use expensive, and likely unsuccessful, practices for establishing forage crops in Alaska.

Future research should explore why the practices did not work and developing techniques that might make them work better.

Perennial grasses cover 68% of Alaska agricultural land.

Smooth bromegrass.