Alfalfa

Importance
1. Queen of forages
2. One of the oldest domesticated crops
3. Grown in all 50 states
4. Highest feeding value of the forages

Genetics
- Currently > 300 varieties
- > 30 varieties per year released
- 9 major germplasm introductions into U.S., Russia, Turkey, Flandes, Chile, Peru

Species
- *Medicago sativa* spp. *sativa* (purple flower alfalfa)
- *Medicago sativa* spp. *falcata* (yellow flower alfalfa)
- *Medicago sativa* spp. *media* (purple/green/yellow or “variegated”)
Alfalfa: Establishment & Management

Why is Establishment Important?

• The basis for several years’ production is determined within 2-3 weeks after planting.
• Perennial forage seedings are more expensive than other crops.
• The failure rate of forage seedings is higher than with other crops.
• Therefore, the cost of failure is substantial.
• Half the job is planning – site selection, fertilization, weed management, species & variety selection and planting method.
What are the important factors in relation to stand establishment?

- Soil pH
- Soil fertility
- Seedbed preparation
- Time of planting
- Depth of planting
- Seed-to-soil contact
- Seeding rate
- Quality of seeds
- Weed control
What are the reasons for greater seeding failures?

- Alfalfas are small-seeded
- Easy to seed too deep
- Soil surface dries quickly
- Bare soil blows
- Seedling vigor poor
- Crusting on high-clay soils
What are the steps to be followed for successful Alfalfa establishment?

1. **Site selection:**

   A good *planning does half-of-the-job!* Should start planning at least a year ago ---

   *Matching species needs soil characteristics*

   - Soil surveys
   - Soil tests
   - Previous crop experience
2. *Species/varietiy selection:*

- Adaptation – related to persistence
  - soil
  - climate
  - relevant pests
- High yield
- Intended use
- Local variety testing
3. Planting of high-quality seed:

- Certified seed
  - guaranteed purity - genetics
  - free of noxious weeds
  - fewer other weeds
- Seed treatment
  - fungicide
  - seed coating
- Legume inoculation
Company: Target Seed LLC  
Parma, ID 83660
Kind: Alfalfa
Variety: TS-4007
Lot No.: 4500 - 53- 07
Net Wt.: 50 lbs.
Date tested: 03-08

Pure seed: 96.90%
Weed seed: 0.03%
Other crop seed: 0.02%
Inert material: 0.05%
Germination: 75.00%
Hard seed: 15.00%
Germ. & hard seed: 90.00%

Noxious Weed Seed: None
Experimental Variety, Oregon
**QUALITY OF THE SEED LOT**

Pure Live Seed (PLS) is the best indicator

\[
\text{PLS} = \frac{\% \text{ Germination} \times \% \text{ Purity}}{100}
\]

<table>
<thead>
<tr>
<th>Seed lot 1</th>
<th>Seed lot 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purity:</strong> 99.92%</td>
<td><strong>Purity:</strong> 95.62%</td>
</tr>
<tr>
<td><strong>Germination:</strong> 73.00%</td>
<td><strong>Germination:</strong> 92.00%</td>
</tr>
<tr>
<td><strong>PLS = 73%</strong></td>
<td><strong>PLS = 88%</strong></td>
</tr>
</tbody>
</table>
Calculate seed needed on basis of PLS

Pound bulk seed needed = \( \frac{\text{lb/acre recommended}}{\% \text{ PLS}} \)

If 10 lb PLS /acre is recommended at $3.00/lb:

<table>
<thead>
<tr>
<th>% germ.</th>
<th>% PLS</th>
<th>lb/a bulk</th>
<th>$/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed lot 1</td>
<td>73</td>
<td>73</td>
<td>13.7</td>
</tr>
<tr>
<td>Seed lot 2</td>
<td>92</td>
<td>88</td>
<td>11.4</td>
</tr>
</tbody>
</table>
4. **Fertilization:**

- Look at soil test results
- Opportunity to incorporate P

**N at planting:**

- If low soil test, up to 20 lb/A recommended
- Supplies N until legumes start fixing N
- Small amount common with companion crops
- Tillage stimulates some N - mineralization
- Small amount if straw plowed down
- Encourages weeds more than forage
General Guidelines for Fertility Programs:

- Legumes, if properly inoculated, *do not need* N

- Legumes are more sensitive to *soil pH and phosphorus*

- Alfalfa has a higher requirement for *potassium*

- If legumes represent $\geq 40\%$ of mixtures, no N fertilizer is needed
### Yield and nutrient concentration relationship

#### Nutrient needs of forage legumes:

<table>
<thead>
<tr>
<th>Crop</th>
<th>Yield (tons/A)</th>
<th>N (lb/A)</th>
<th>P₂O₅ (lb/A)</th>
<th>K₂O (lb/A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>5</td>
<td>-</td>
<td>75</td>
<td>225</td>
</tr>
<tr>
<td>Red clover</td>
<td>3</td>
<td>-</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>Legume-grass mixtures</td>
<td></td>
<td></td>
<td></td>
<td>average</td>
</tr>
</tbody>
</table>
Phosphorus nutrition

Fertilizer sources:

• Superphosphate 0-20-0
• Triple superphosphate 0-46-0
• Liquid formulation
Potassium deficiency symptoms

Older leaves

Younger leaves
Alfalfa: Establishment & Management

5. The Ideal Seedbed Preparation:

- Very firm and relatively level
- Not cloddy or excessively rocky
- Free from live plant competition
- Free from seed of competing species
- Moderate amounts of mulch or plant residues on soil surface
- Good moisture and fertility
What are problems with this *ideal seedbed*?

- Soil crusting
- Wind and water erosion
- Desiccation/scorching
Which is better? Traditional or stubble seedbed?
6. **Seeding rate:**

Related to:

- Seed size
  (amount of stored reserves)
- PLS
- Germination vigor
- Soil conditions
- Expected mortality
7. *Planting depth:*

Planting *too deep* is probably the most common reason for forage seeding failures.

- Ideal ¼ to ½ inch
- Up to ¾ inch on sandy soils
8. Seed-to-soil contact:

Very important to initiate germination:

• Forage seeds require ample water (~100% of their own weight)
• Water moves from soil to seed
• Good seed-to-soil contact results good and uniform germination

A well-prepared seedbed without clods will ensure this

- adult footprint not deeper than ¼ in
- ~10% seeds visible on surface after planting
9. **Planting date:**

Plant at the time of year when odds are best, based on rainfall pattern and temperature

Most common month in Wyoming is *May*

Alternatives to May seeding:

- Late summer (August)
- Dormant (Nov-March)
- Early spring (March/April)
10. Weed control:

- One of the most important factors affecting establishment

- Cultural practices

- Herbicides use
  - Pre-emergence
  - Post-emergence
  - Use of RR alfalfa

- Clipping
~81 Diseases of Alfalfa in the U.S.

53 Fungi
12 Nematodes
7 Bacteria
6 Viruses
1 Mycoplasma
1 Parasitic higher plant (dodder)

- In Wyoming, 13 diseases, including the newest, Brown Root Rot.
- Only 4 diseases are serious on alfalfa - 3 fungi and 1 nematode.
- Dodder is considered a noxious weed.
Alfalfa Stem Nematode 
\((Ditylenchus dipsaci)\)

Plant symptoms:

- Seedlings - swelling, distortion, necrosis and death
- Older plants:
  - stunting (shortening of stem internodes)
  - swollen stem buds and stems
  - white flagging
  - rotten crowns (advanced stage)
Verticillium wilt (Verticillium albo-astrum)

A fungal disease

Plant symptoms:
• Wilting and death of mature plants
• Vascular discoloration in root

Field symptoms:
• Scattered wilting and dead plants beginning Year 2 & 3
• Stands become weedy
Phytophthora Root Rot (*Phytophthora megasperma*)

Another fungal disease

**Plant symptoms:**
- Seedling death
- Stunting and root rot of mature plants
- Death of older plants

**Field symptoms:**
- Stunted and dying seedlings or mature plants
- Worse in high clay, high water table or overwatered
- Alfalfa stands become weedy
Brown Root Rot
*Phoma sclerotioides*

A new disease in Wyoming!

Source: Robin Groose
Alfalfa weevil larva feeding on alfalfa leaf

• Alfalfa weevil feeding pattern is a skeletonizing of leaflets
• Larvae tend to feed between veins of leaflets

INSECTS

Advanced infestation creates a silvery appearance from a distance

Control measures:

This insect causes the most damage to alfalfa in the U.S.
Control measures:

• Natural
• Resistant varieties
• Cultural
• Biological
• Chemical
Alfalfa improvement depends on successful stand establishment and management

- The #1 challenge is the establishment!
- it’s essential to know the key factors responsible for successful establishment
- site selection, variety selection, planting time/method, fertilization, and weed management are among the most important factors to be considered

Good planning is the key for successful pasture renovation

- this needs to be planned at least a year ahead

As always, best returns depend on effective utilization and well-managed livestock and forage programs