TECHNICAL NOTES

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Revision

FUNCTION AND OPERATION OF A MACHINE TO LAY WEED BARRIER FABRIC

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This Technical Note covers the installation of weed barrier fabric, operation and adjustment of the weed barrier laying machine, design to build a weed barrier machine and maintenance considerations for weed barrier fabric.

This technology specifically applies to windbreaks, shelterbelts and other woody plantings. Weed barrier fabric was developed to reduce weed competition, reduce planting maintenance, and conserve soil moisture by covering the ground around each individual plant. This enables windbreaks, shelterbelts or other woody plantings to reach effective height and maturity much sooner than plantings installed without fabric.

FUNCTION AND OPERATION OF A MACHINE TO LAY WEED BARRIER MATERIAL

The technology for installing windbreaks and shelterbelts has advanced rapidly. One of these technologies is a woven fabric often called weed barrier. This material was developed to reduce competition from weeds, reduce planting maintenance, and conserve soil moisture by covering the ground around plants. The process of laying this fabric by hand is slow and inefficient. Weed barrier is made of various materials, but black polypropylene material is generally recommended.

Aberdeen Plant Materials Center (PMC) field staff Boyd Simonson and Brent Cornforth developed a machine to rapidly and smoothly install weed barrier fabric. The features of this machine include:

- 3-point hitch
- Multiple adjustment points
- Readily available materials for fabrication
- User friendly for the operator
- Adaptable to different planting conditions
- Adaptable to different material widths

The attached drawings and parts list give essentially all the information needed to build one of these machines. The Aberdeen PMC field staff is available to answer technical questions.

APPLICATION OF WEED BARRIER FABRIC

The basic function of the machine is to lay the fabric and bury the fabric edges. The fabric is usually laid over small windbreak plants just after they have been planted. As the fabric is laid, these small plants bend under the fabric and the operator (rider), using a can of spray paint marks their position. A person immediately follows behind, cutting a small L or X shaped slit and pulls the small plants up through the fabric.

At the end of a roll, a trench is dug 1 shovel width wide by 1 shovel length deep just in front of the press wheels. The last foot of one roll and the first foot of the next roll are placed in the trench and dirt is placed on top. This will hold the new roll tight until the press wheels and closer disks anchor the next few feet of material. An alternative method to seam the new and installed roll ends together is to roll the ends together and then install three to four long staples through the rolled ends into the soil surface to ensure the seam does not come apart.

Site preparation should be performed to make the ground surface as firm and smooth as possible so the installed fabric is close to the soil surface. Close soil contact controls weeds and prevents the fabric from whipping in the wind. If the fabric is loose, rock or staples can be placed on or into the fabric between plants, not at the point where a plant pokes through. We recommend placing as little soil as possible on top of the weed barrier. Weeds can sprout and grow down through the material. Wire staples are commercially available to hold down the center of the material if needed.

There are possible variations on this operational pattern. If the plants are large and/or stiff, the operator may have to make the cut as the fabric is installed, to prevent breakage of stems. The fabric can also be installed prior to planting, with or without pre-dug planting holes. If the plants are tall or stiff, the tool bar and fabric roll may have to be set high, and the operator will need to make the cuts and pull the plants through as the tractor moves very slowly. However, if you move too slowly, you may not get adequate soil covering the fabric edges.

The weed barrier fabric comes in 300, 500, and 750 feet rolls. A smoothly operating crew can lay a 500 feet roll in about 3-5 minutes. When installing 300 foot rolls, you usually spend more time changing rolls than laying fabric. Aberdeen PMC crews use the 500 foot rolls. The 750 feet rolls may be too large to handle easily, so try some 500's and 750's and you are the judge. The material comes in several standard widths from 4 to 12 feet. Most applications call for and this machine was designed for the 6 foot width. The fabric is coated with silicone to aid the manufacturing process. This coating makes the fabric slightly waterproof initially, but the coating breaks down in about two weeks in sunlight. The PMC staff recommends purchasing weed barrier material that is guaranteed for five years against ultraviolet deterioration. Fabric appears to hold up well for at least 10 years or more.

OPERATION AND ADJUSTMENT OF MACHINE

The operation and adjustment of the machine is greatly facilitated through the use of clamps rather than bolt holes or welded attachment points. The following descriptions detail the adjustable points and their application to varying conditions.

The 3-point hitch is clamped to the tool bar. This allows the centerline of the machine to be slightly offset from the tractor centerline if needed. The area between the top link of the 3-point hitch and the gauge wheel assembly on top of the tool bar makes an excellent location to carry an extra roll or two of fabric.

The gauge wheels allow the height of the entire machine to be adjusted. Usually, these are set to relieve pressure on the hitch and allow proper down pressure on the disks and press wheels, but tall plants may require the tool bar to be set high to reduce stem breakage.

The opening disks are adjustable left and right, up and down, and around a vertical axis. This allows a proper edge trench to be made under different soil conditions and the soil to be thrown to the outside. The closing disks perform just the opposite action. Note the press wheels act to tuck the fabric into the trench immediately in front of the closing disk and not to pack the soil after the closing disk has passed.

The press wheel and its adjustment are key to the entire process. They are adjustable in four dimensions; left and right by moving the wing pipes on the tool bar, front to back along the wing pipe, up and down, and around a vertical axis using their mounting clamp. The left and right adjustment places the wheels a few inches inside each fabric edge. The front to back adjustment places the wheel just behind the roll of fabric. This position is best unless the plants are large or stiff. As mentioned, large or stiff plants will require the roll of fabric to be higher and the wheel

to be farther back. The up - down adjustment needs to be coordinated with the opening and closing disks to control their depth. The rotational adjustment controls the tension of the fabric from right to left. If you want, and the plants will allow it, turning the wheels slightly toward the centerline (so their front edge rubs the inner edge of the trench) will pull the fabric quite tight. If the plants are large or are planted in a broad, shallow V ditch (for water harvesting), the fabric may have to be laid with more slack and fabric staples used to reduce fabric whipping.

The front adjustable floating bar carries the roll of fabric. It is supported from clamps on the tool bar, and hinges freely up and down. The chain hanger controls maximum downward travel. The fabric control arms slide along this bar and are held with quick release clamps. One of these clamps must be released and the control arm moved each time a new roll of fabric is mounted. This can be as often as every four to five minutes in a smoothly operating process.

The beet harvester flange is a standard part of sugar beet harvesters. It is a conical, hard rubber roller with some resistance built into the bearings. This resistance is very important and prevents the roll from unwinding freely and maintains tension in the direction of travel. The conical roller fits into the core of the fabric rolls and is self-centering.

The seat should be angled and mounted low so the operator can almost touch the ground when the machine is operating. The seat can be moved to the right side for left handed operators. Note there is a 'T' shaped foot rest on the back of the tool bar. We recommend a seat with strong arms to help prevent the operator from over-reaching and falling under the stabilizing bar.

The wing pipes are unobstructed inside, and make an excellent location for additional weights. Solid bar stock inserted into these pipes improves the performance of the press wheels and closing disks.

As mentioned earlier, one possible design for a dryland windbreak row is to place the plants in the bottom of a wide (6-8 feet), shallow (4-6 inch) ditch. This broad 'V' acts to collect and concentrate rainfall close to the plants and may allow dryland plantings in areas commonly not considered for woody plantings due to low rainfall. To apply the fabric in this situation, there must be a way to depress the center of the fabric in the middle of the ditch during installation and hold it down after installation. No mechanism currently exists to do this. If you have a need, be creative. If it works, tell us and we will spread your idea around to other users. Perhaps a third wheel coming forward and down from the stabilizing bar could press on the fabric on the left side of the centerline, between the press wheels and staples to secure the fabric in the bottom of the trench.

WEED CONTROL FABRIC ADVANTAGES AND DISADVANTAGES

Thousands of miles of polypropylene woven fabric have been applied to conservation tree plantings for weed control throughout the mid-west and western United States. This material both eases and can complicate subsequent management of conservation plantings, even when properly applied.

Fabric Advantages

- Applied only once
- Greatly increases tree and shrub establishment and survival (increases survival from 20% to 80%+)
- Increases growth rates immediately following planting
- Easier and more timely weed control
- Long lasting weed control
- Comparable cost to other weed control methods averaged over 5-10 years

Fabric Disadvantages

- Initially expensive
- Requires specialized machinery-trained crew to install
- Proper installation is critical to prevent pulling loose in winds
- Does not break down, especially within the shade of plants
- Stems may be girdled by fabric as trees and shrubs grow
- Suckering of some shrub species is greatly restricted within first 10 years
- Dense sod can become established on top of fabric, negating benefits and complicating future maintenance
- Ideal habitat for voles and mice

Sod growing on top fabric

Fabric Management

- Inspect annually or more often if needed
- Ensure edges are firmly anchored
- Ensure openings are not parallel to grain of fabric to avoid stem damage
- Monitor and control vole and mice infestations
- Keep soil and organic matter off surface of fabric
- Control aggressive weeds that may establish in fabric openings
  - Enlarge openings as needed to prevent stem girdling
  - Consider other weed control methods when thickets are desired

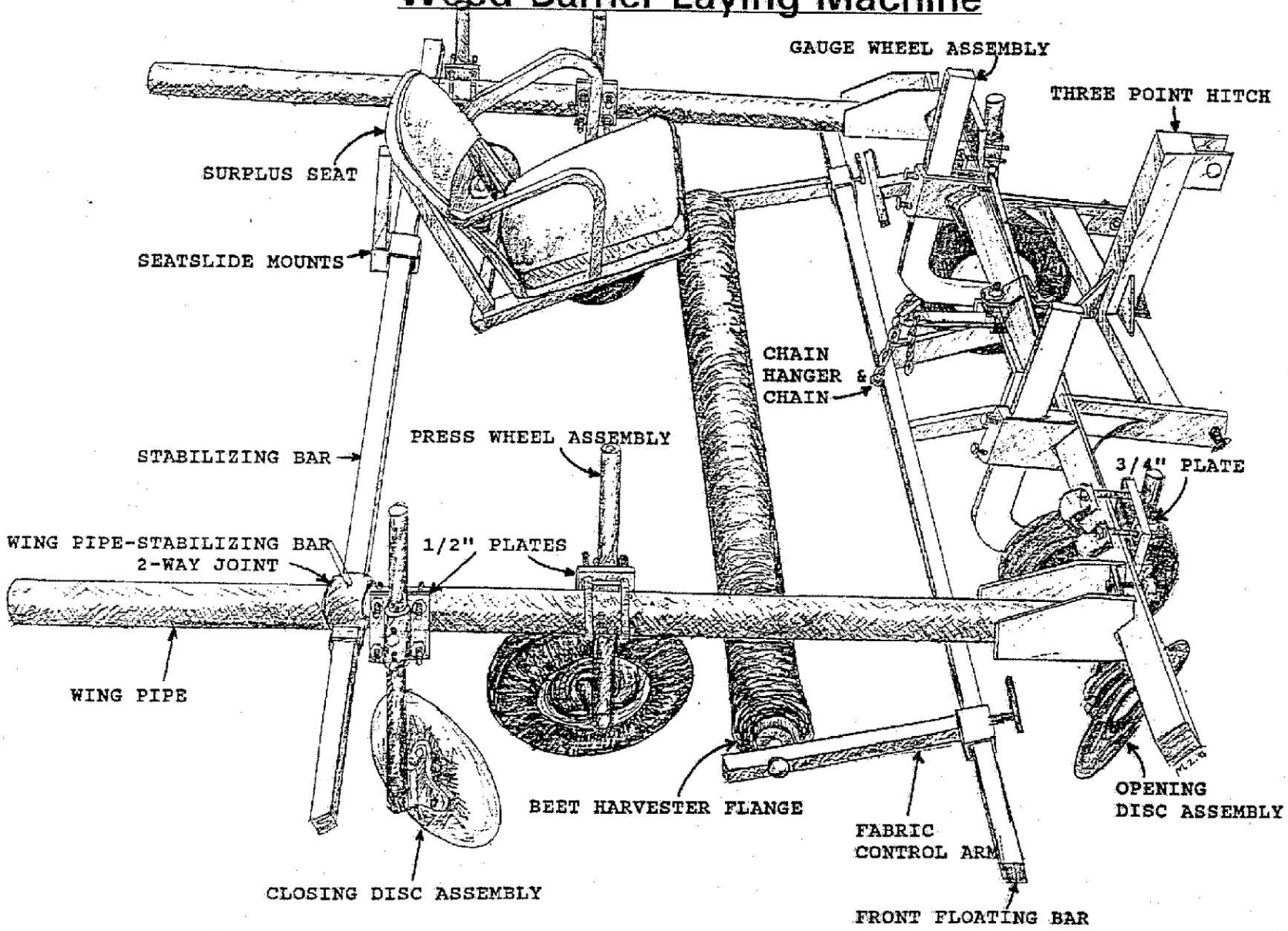
Stem girdling after 8 yrs

Reduced suckering outside fabric. Chokecherry roots on top of soil immediately under, and parallel to fabric edge.

Conclusion

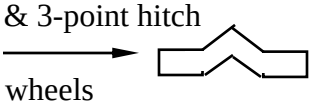
Fabric has greatly increased tree planting success and vigor in conservation plantings. However, it requires regular maintenance to prevent future damage to the planting. Since fabric can inhibit suckering of some shrub species other weed control measures may be more appropriate for certain types of plantings and/or landowners. Research continues to develop weed control materials that will provide effective initial control with minimal long term negative aspects. New fabric types with varying amounts of photo degradation to address potential girdling problems have been released. Conclusions as to the success of these new fabric types are not expected to be determined for several years.

Weed Barrier Laying Machine



ABERDEEN PLANT MATERIALS CENTER

WEED BARRIER MATERIALS LIST

	MATERIAL	QUANTITY
Square Tube	3” x 1/4” wall	50”
	2” x 1/8” wall – inside diameter 1 5/8”	15”
	1 1/2" 083 wall	36’
Schedule 40 Pipe	2 7/8” outside diameter	12’
	3 1/6” inside diameter	4”
	1 1/4" outside diameter	56”
	1 3/8” inside diameter	8”
	1 9/16” inside x 3/16” wall	16”
Steel Shaft	2 1/4" solid	10’
	1 1/2" solid	80”
Tool Bar	2 1/4"	8’-6”
Flat Iron	3/4" thick x 6” wide	12”
	3/4" thick x 1 1/2” wide	22:”
	1/2" thick x 6” wide	32”
	1/2" thick x 5” wide	64”
	1/2" thick x 3” wide	68”
	1/2" thick x 1 1/2” wide	43 1/2"
	1/2" x 1/2" square rod	64”
Channel Iron	3” wide x 1/4" wall	12”
Tool Bar Clamps	3/4" bolt clamp wings & 3-point hitch	4
	5/8” bolt clamp straps 	6
	5/8” bolt clamp gauge wheels	2
U-Bolts for 3’ Pipe	1/2" U-bolts 5” long	8
Wheels	16” Gauge 4.80-8	2
	16” Smooth 480x8, 15 1/2” O.B. 5/8” bore	2
Discs	14” diameter bearing hub	4
Set Bolts	1/2” x 2” & Nuts	26
Cones from Beet Harvester	4” W-1017436 Flange Cone Roller	2