TECHNICAL NOTE - PLANT MATERIALS TX-6

Re: Grass Hedges in South Texas

The attached Technical Note was developed by the Kika de la Garza Plant Materials Center, Kingsville, Texas. This information, gathered from two studies in South Texas, is appropriate to all regions of Texas and the South Central Region. It is being furnished to all field offices, Ecological Sciences Technical Specialists, and the State Office Technology Staff to keep abreast of current technology in order to provide assistance to our customers and partners.

KIKA DE LA GARZA PLANT MATERIALS CENTER
KINGSVILLE, TX
1996 TECHNICAL NOTE

Grass Hedges in South Texas

Grass hedges, narrow strips (1-3 feet wide) of stiff erect densely growing grass planted across the slope, offer the potential to be a cost-effective vegetative tool in trapping sediment, building terraces, stabilizing gullies, and providing protection against wind erosion. Grass hedges function to slow water runoff, trap sediment and prevent gully development. They inhibit the flow of water through them, thus slowing and ponding water and causing sediment to deposit in back of the hedges. Grass hedges are less prone to failure because water passes over a broad area secured with perennial root reinforcement. Tall, dense perennial grass hedges provide better wind protection than annually sown vegetation especially in dry years. They also can provide a faster growing, denser barrier than traditional woody wind breaks.

This report will present information gathered by the Kika de la Garza Plant Materials Center (PMC) on grass hedges in Texas since 1994.

INTRODUCTION

In order to better understand the uses for grass hedges, the PMC initiated two studies in 1994. We looked at shade tolerance of "Alamo" switchgrass (Panicum virgatum) and "Sunshine" Vetiver grass (Vetiveria zizanioides), and we looked at their sediment tolerance. Vetiver and switchgrass were chosen because both have been listed in the literature as good grass hedge species. Desirable attributes for grass hedges are strong, deep roots, and numerous, thick stems at least 18-24"tall. Vetiver will produce over 50 stems/ft^2 that are at least 3/4" thick. Switchgrass will produce over 100 stems/ft^2 that are at least 1/8" or thicker.

The shade treatment revealed that neither switchgrass or vetiver will grow vigorously under 80% shade. Stem production for both species was cut by 50-75% compared to those growing in the sun. This indicates that for shady forested areas, vetiver and switchgrass will not produce effective hedges. One will have to look at shade tolerant woody species such as sumac, blackberry, elderberry and viburnums.

The sediment tolerance study showed 100% mortality for plantings buried under 10" of sandy soil. However, both switchgrass and vetiver grass showed no survival or growth differences between plant buried under 5" of soil and unburied plants. This study showed that both vetiver and switchgrass have good tolerance to deposition. Switchgrass plantings were single

seedlings in paper cones with 5 1/2" roots and leaf blades extending 6" tall. Vetiver was 6" tall with 3" roots planted as a single culm bare-root transplant. This study indicated that these size plantings will tolerate some sediment burial that might occur in the concentrated flow area even at the initial planting stage.

TRANSPLANT USE

Given that switchgrass and vetiver grass reveal admirable attributes for grass hedges in non-shady areas, the question presents itself as to what spacing should be used for these transplants. So we tested both vetiver and switchgrass at 3", 6" and 12" spacings on clay and sandy-loam soils. The results from these tests were that the 12" spacing was too wide for water control but probably is adequate for control of wind erosion. Two years after planting, vetiver had an average of over 50 stems/ft^2 and a plant base width over 8" wide. However, there was still a gap between plants that averaged 4.5". Switchgrass produced similar results, producing 97 stems/ft^2, a plant base width of 7.7" and gaps that averaged 3.3" (see table 1). It is felt that these gaps that average over 3" wide would simply produce piping and undermining of the transplants in a concentrated flow area.

The 6" spacing again was too wide. At the end of the first year, vetiver and switchgrass on both clay and sandy-loam soils had gaps over 2" wide. However, by the second year the hedges were vigorous and very close to being solid (see table 2).

In 1995, we decided to test not only a 3" spacing but also month of planting and number of culms or seedlings per planting unit. We also added Big sacaton (Sporobolus wrightii) as a plant species for evaluation. It is felt that Big sacaton has good attributes for a grass hedge. It is a tall, dense, native plant. Furthermore, it is drought tolerant , saline and alkaline tolerant and when it is fully grown it is coarse and unpalatable. This makes it a good plant for western Texas as well as for pasture and rangeland locations.

Under above average moisture conditions (30.1") at the PMC, there was no appreciable differences between planting in March or May (see table 3). For switchgrass and Big sacaton, there also was no difference in survival between 1 seedling versus 4 seedlings. Switchgrass seemed to produce more stems from a single seedling. Vetiver grass showed significant differences based on whether it was a single culm bare-root transplant or a four culm transplant. From our results, it is critical to plant at least a four culm vetiver transplant to secure adequate survival.

The 3" spacing gave us almost a completely gap-free hedge. Other than the 1-culm transplants of vetiver, the transplants at this spacing had average gaps less than .2".

Based on our tests on the level soils at the PMC, we conducted a field trial at Pawnee, TX. We planted three hedges on a Monteola clay soil. The three hedges were planted across a 40' wide concentrated flow area that received runoff from the existing field terraces. The slope from the 20 acre drainage area was 1-3%. The terraces were spaced approximately 200' apart. The top terrace was a single row of switchgrass in 3" wide by 6" deep paper cones planted at a 3" stem spacing. The second row was split in half with one side vetiver and the other switchgrass. The vetiver was planted as a single row of 4-culm bare root transplants on a 3" spacing. The third row was all vetiver. Planting was done on March 10, 1995. There was a small washout of about 10' in the middle of the two bottom rows, so we replanted on April 18, 1995. We planted double rows of 4 culms of vetiver spaced 2" apart in a zigzag fashion. We also staked a 5" diameter vetiver bundle 10' long across the middle of the flow area. The farmer grew sorghum and applied 150# of 20-14-5 fertilizer. No herbicides were used. Evaluation of this treatment was done on December 5, 1995. The off-center planting at Pawnee grew under severe drought conditions. The total rainfall from March through October was 15.7", which is 7" below normal.

The hedges did not come together in the first year (see table 4). Evaluation of this trial indicated that switchgrass appears to produce fewer large gaps between plants than vetiver. Under our planting pattern switchgrass appears to do better on the more droughty, higher elevation planting sites. The grass bundle or wattle held together nicely, securing the transplants and preventing downcutting. However, obviously since there was a drought, it was not thoroughly tested. We have tested both vetiver and switchgrass bundles at the PMC. If you use rooted clumps, these bundles will sprout. This sprouting of the bundles helps to secure the bundles in place.

In summary, these are our preliminary guidelines for using transplants as grass hedges. Plant transplants any time from the average frost-free day into May. Start at the top of the hill. Space hedges no farther than 2 feet in vertical drop. When planting in the concentrated flow area, use a double row of transplants. Spacing of transplants in the row should be at a 3" interval. Spacing between transplant rows in the concentrated flow area should be between 6 and 12". When using vetiver use a minimum 4-culm bare-root transplant. Use a 5" grass bundle on the downhill side of the transplants between the 1/4 points of the concentrated flow area. As you get out of the concentrated flow area, use a single row of switchgrass at a 3" interval or a double row at a 6" interval.

SEEDING

The use of seeding to build terraces has a labor and cost-effective appeal. So the PMC tested several seeding rates to determine if seeding could produce an adequately dense hedge.

In 1994, the PMC tested 1lb.(#), 2#, 4#, 6# and 8# seeding rates of "Alamo" switchgrass. Evaluation of this planting indicated that we needed higher seeding rates. So in 1995, we tested 10#, 20# and 30# seeding rates. In general, it appears that between a 10# to 20# seeding rate is adequate to give a good hedge producing over 30 large stems/ft^2 in the first year. However, what was interesting about this study was the impacts of shading. We planted four rows of the drill. When we sampled the four replications, we measured the two middle rows for the first two replications and the two outside rows for the last two replications. There was a significant difference between them for the number of large (greater than 1/8") stems. The middle row at 20#/acre had an average of 8 stems/ft^2 while the outside rows had an average of 30 stems/ft^2 (see table 5).

From our testing, these are our preliminary guidelines for seeding grass hedges. Seed switchgrass with a no-till drill on fields that use conservation tillage to reduce washing away or burial of the seed. Seed on old terraces instead of rebuilding with machinery. Plant four rows at a 20#/acre seeding rate. Do not use seeding in the concentrated flow areas.

MANAGEMENT OF GRASS HEDGES

The PMC evaluated the effects of fertilizing and mowing on the growth of switchgrass and vetiver grass. A 7.5 gram 16-8-12 fertilizer tablet was added to each transplant in a replicated study. Evaluation of the samples taken did not indicate a stimulative effect to either switchgrass or vetiver. It is possible that the soil had enough residual fertility to mask any difference between fertilized and unfertilized plants, it is also possible that the fertilizer tablet was an insufficient quantity to provide a stimulative effect.

Our mowing trials revealed that mowing at a 60 day interval did not stimulate stem growth for either switchgrass or vetiver. In fact, there was a slight decrease in stem growth and an increase in gaps between plants for the mowing treatement.

These are our recommendations for managing grass hedges. On cropland locations, you probably do not need to fertilize. If using broadcast fertilizer, apply only phosphorus and potasium in the first year. This will help avoid weed competition. If planting on a noncropland location, get a soil test or use a slow-release fertilizer tablet. Mow the hedges only once a year at the end of the dormant season.

CONCLUSION

We believe the grass hedge concept has the potential to be a very cost-effective vegetative solution for waterways, terraces, gully control, small drop structures, wind breaks and sand dune stabilization. This technology may especially provide an alternative low-cost practice to conventional waterways and terraces. It has the attractiveness of not requiring costly, heavy machinery for installation. Nor does it require the movement and potential compaction of top soil. It takes less land to install this practice. It also is a very flexible system. It captures sediment but allows water to slowly filter downstream. This reduces the risks of terrace breaching and with a living system minor damages are self-healing. Furthermore, by slowing runoff water it provides more opportunities for nutrient uptake and removal.

Before grass hedges are adapted as an inexpensive conservation practice, it needs refinement and expanded use in Texas to demonstrate its practicality and to increase its visibility to the general public. The PMC plans to continue work on grass hedges over the next couple of years in order to fully understand their benefits, limitations and overall use in South Texas.

1. PLANT SPACING

SANDY LOAM S

1.

	*1 GAPS	*2 STEMS	*1 GAPS	*2 STEMS	*3 BASE WIDTH
"Sunshine" Vetiver	7.2	30	4.5	53	8"
"Alamo" Switchgrass	7.0"	89	3.3	97	7.7

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Table 2

6" PLANT SPACING

CLAY SOIL

	1994		1995		
	*1 GAPS	*2 STEMS	*1 GAPS	*2 STEMS	*3 BASE WIDTH
Vetiver	1.7	29	1.6	43	10
Switchgrass	2.1	62	0	126	9.6
SANDY-LOAM SOIL					
Vetiver	2.3	24	.7	43	8.6
Switchgrass	2.6	46	.3	87	7.2

*1 Average distance in inches between plants
*2 Number of stems/ft.^{2}
*3 plant base width in inches

Table 3

3" PLANT SPACING

SANDY-LOAM SOIL

1995

	MARCH 22			MAY 8			
	%SURVIVAL	*1 GAPS	*2 STEMS	*3 BASE WIDTH	SURVIVAL	*1 GAPS	*2 STEMS	*3 BASE WIDTH
Vetiver 1 culm	63	1.7	33	4.5	33	2.2	46	5
Vetiver 4 culms	97	0	53	4.8	93	.8	30	5.8
Switchgrass 1 seedling	100	.03	79	4.5	100	.06	79	4.6
Switchgrass 4 seedling	100	.07	64	4.8	100	.06	59	4.5
*Big sacaton 1 seedling	100	.17	15	5.3	100	.03	32	5.4
*Big sacaton 4 seedling	100	0	18	5.8	100	.2	22	4.9

* Planted on April 17, 1995
*1 Average distanace in inches between plants
*2 Number of stems/ft.2
*3 Plant base width in inches

Table 4

1995
PAWNEE
FIELD TRIAL

	*1 HEIGHT	*2 BASE WIDTH	*3 STEMS	*4 GAPS	*5 LARGE GAPS	*6 MAX GAP
TOP HEDGE						
Switchgrass	29	3.1	28	1.8	9	6
MIDDLE HEDGE						
Switchgrass	22	2.5	33	1.8	3	4
Vetiver	30	2.5	5	3.5	9	12
BOTTOM HEDGE						
Vetiver		4.4	4	3.2	20	12

*1 Average height of plants
*2 Plant base width in inches
*3 Number of stems/ft.^{2}
*4 Average distance in inches between plants
*5 number of gaps that exceed 3" between plants
*6 longest distance in inches between two plants

Table 5

1995
SEEDING TRIAL
CLAY SOIL

	10#/acre		20#/acre		30#/acre	
	*1 TOTAL STEMS	*2 LARGE STEMS	*1 TOTAL STEMS	*2 LARGE STEMS	*1 TOTAL STEMS	*2 LARGE STEMS
Middle Samples	53	10	67	8	73	14
Outside Samples		28		30		29

*1 total number of stems/ft.^{2}
*2 total number of stems/ft.^{2} greater than 1/8"