[1]FUTURE TRENDS IN ALFALFA ESTABLISHMENT

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ABSTRACT

The establishment phase is critical to the economic success of an alfalfa production system, not only in realizing a healthy seedling stand, but in creating the potential for weed-free, high quality forage production over several years. Trends in management for the next decade include improved marketing analyses, improved crop production practices, greater use of technology and improved genetics.

Key Words: alfalfa, GPS guidance systems, allelopathy, variable-rate fertilizer, minimum tillage, no-till

INTRODUCTION

Because alfalfa is a perennial crop, inputs to crop production such as tillage operations, fertilizers, pest management options and seed are amortized over the life of the stand. Decisions that lower the risk of obtaining a poor stand, or in the worst case, stand failure, can mean the difference between successful or unsuccessful alfalfa crop enterprises. In the future, more emphases will be placed on pre-plant decisions based upon long-term market analyses, the potential of allelopathic and autotoxic effects from previous crops, and crop production practices such as minimum tillage or no-till seedbed preparation and the use of newer technologies to adjust soil pH and soil nutrient needs to specific areas of the field rather than the whole field. As higher-valued seeds (e.g., transgenic varieties) are introduced into the market, a trend to lower seeding rates will occur.

MARKET ANALYSIS

Before any activities in land preparations begin, an analysis of the short and long term marketing potential of a new alfalfa crop will be made. This includes creating a crop enterprise budget delineating fixed and variable costs. One example of an alfalfa enterprise budget can be found at the following URL: http://grant-adams.wsu.edu/agriculture/forage/pubs/eb1942e2002costofproducingalfalfahay.pdf. However, in order to estimate input costs more accurately, properly conducted soil tests, irrigation system analysis, hay storage facilities, transportation, and insurance inputs must also be analyzed. In the near future, growers will step beyond the crop enterprise budget to explore how the alfalfa enterprise compares as one crop compared to other potential crops or land uses for their short and long term business plans. Implementation and

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adherence to professional management systems and formalized business management processes will become a normal activity of their family farm business. Examples of farm business financial planning activities and spreadsheets can be viewed at http://www.wittmanconsulting.com/publications.htm.

Essential elements in marketing (Adapted from Vough, 2000)

1. Determine the primary market. (Will it be dairy, Pacific Rim export or pleasure horse?) Then, produce for that market.
2. Research supply and demand, both short and long-term.
3. Produce a consistent and reliable supply of a documented high-quality product.
4. Be realistic about the asking price.
5. Always have a written contract with the buyer.
6. Have an outlet for low quality hay.

The trends in the western U.S. will be towards more specific markets as the need to separate transgenic, conventionally grown and organically grown alfalfa becomes greater.

LAND SELECTION

The trend will be to put more emphases on previous cropping history.

Experience has shown that residue from previous crops and herbicides remaining in the soil can affect the production potential of a new alfalfa crop, particularly sulfonylureas (Caddel 2001), http://alfalfa.okstate.edu/pub/alfalfa-production/stand-estab.htm#herbicide and wheat crop residue. Water soluble extracts from wheat straw have been shown to inhibit the germination and growth of alfalfa (Kugler, 2006) as shown in Table 1.

Table 1. The effect of wheat straw soluble extracts on the germination and root growth of OK49 alfalfa.

Extract Source	Root length (mm) @ 72 hr.	% Dead Seed
Distilled water (check)	21.5	8.3
Masami (SWW)*	18.3	6.7
Cashup (SWW)	17.2	3.3
Declo (HRW)	16.8	3.3
WB528 (SWW)	15.5	3.3
WB788 (SWW)	15.2	0.0
Clearfirst (SWW)	14.9	0.0
Stephens (SWW)	14.2	8.3
Eltan (SWW)	10.1	15.0
Bruell Club (SWW)	9.1	13.3
Madsen (SWW)	7.1	18.3
Express (HRS)	7.3	21.7

Rod (SWW)	5.8	58.3
Mean	13.9	12.3
lsd (.01)	9.8	9.9
CV%	47	126

* SWW = Soft white wheat, HRW = Hard red wheat, HRS = Hard red spring wheat

Growers will also increase the interval between alfalfa crops as they recognize the negative potential effects of autotoxicity. Thus, the trend will be to secure crop histories and pesticide application records for analysis on the land prior to alfalfa planting.

ADOPTION OF NEW TECHNOLOGIES

The trend will be for greater utilization of newer technologies to lower input costs.

Higher fuel prices will eventually result in higher fertilizer costs. Growers will recognize the importance of minimizing the costs of fertilizer inputs by adopting technology that places the needed plant nutrients and soil amendments only on the parts of the field that are in need rather than broadcasting an averaged fertilizer application over the field as a whole unit. Variable-rate fertilizer applications applied as the result of GPS mapping of soil sampling techniques will result in increased efficiency of fertilizer inputs.

Figures 1, 2 and 3 adapted from (Rehm, et.al, 2001) show examples of a grid sampling scheme for a field and the variation in soil phosphorous that is evidenced by grid sampling.

Figure 1. An example of a systematic geo-referenced sampling pattern for square grid cells, with several samples collected within a given radius and composited.

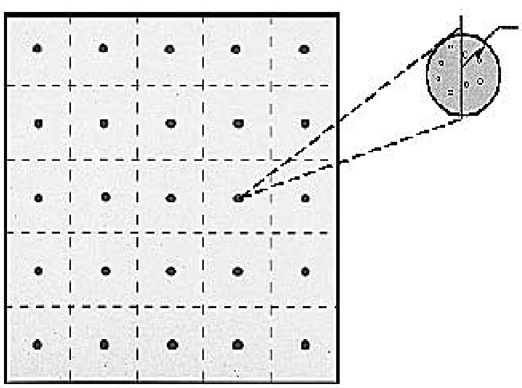


Figure 2. An example of what geo-referenced systematic grid sampling results for P ppm might look like.

18	18	20	19	13	11
16	16	18	15	12	10
15	15	16	12	10	8
9	10	9	8	9	8
7	8	8	9	6	6

Figure 3. Variable rate fertilizer applicator.

GPS guidance systems for tractors offer the potential for avoiding skips and over-plants, lowering labor costs and expanding acreages using the same equipment (Leer, 2004). Light bar systems mounted on tractors (approximately a $10,000 investment) tell the driver how close he is to driving straight, with an error margin of about 4 inches. Auto-steering systems (approximately a $40,000 investment) have an error margin of about 1 inch (Figure 5).

Figure 5. GPS Guided auto-steering system.

Table 2 shows the potential savings in seed costs over conventional seeding assuming a 1 inch overlap compared to 4 and 12 inch overlaps using GPS technology on a 100 acre new planting of high value (i.e., transgenic) seed.

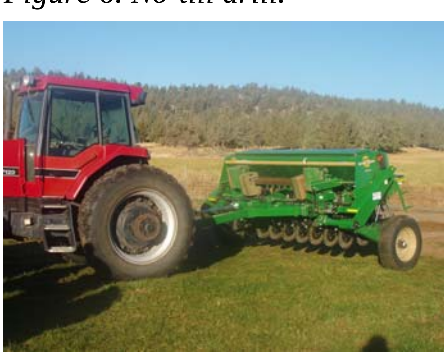
Table 2. Comparison of 1, 4 and 12 inch planting overlap of high-value seed $(6.75/lb) on a 100 acre square shaped field using a 13 foot planter set to plant 15 lb/ac.

Planting method	# of passes	# extra passes	# extra acres planted	Lbs of extra seed planted	Extra Cost of seed/100 acres
GPS Auto Steering (12.9/13 ft) (1 inch)	162	0	0	0	0
GPS Light bar (12.67/13 ft) (4 inch)	165	3	1.8	27	184.00
Conventional (12/13 ft) (12 inch)	174	12	7.5	112	756.75

In this example, the savings in seed costs were $757 or $7.56/ac and $184 or $1.84/ac with the use of auto steering and the light bar guidance system, respectively, for the 100 acre planting. If these savings were similar for other crops in the rotation, the investment in light bar and auto steering systems would be paid for after 5555 acres and 5291 acres of use, respectively.

The trend will be toward better placement of seed.

Figure 6. No-till drill.



For several years, seeding methods for alfalfa have concentrated on speed and ease of planting. As the value of seed increases, the trend will be toward minimum or no-till systems (Figure 6) for seedbed preparation, lower seeding rates and for more direct placement of seed in the soil. The use of aerial seeding, or air-seeding with ground rigs will diminish in favor of drills or one-pass seedbed refinement and planting. Neighbors will learn to share the cost and use of new equipment, or several growers will form cooperative agreements to purchase and share single-use implements such as Brillion planters (Figure 7) or build their own (Figure 8).

Figure 7. Brillion planter ($13,000)

Minimum tillage or no-till systems may have benefits beyond input cost savings, as income may be generated by practices rewarded by federally funded conservation incentive programs such as the Conservation Security Program (CSP) and possibly the "selling" of carbon credits for carbon sequestration markets.

Figure 8 . Grower-built alfalfa seeder.

The trend will be to lower seeding rates.

The common practice in many western states is to plant between 15 and 20 lbs of seed per acre. Some producers have been known to plant as much as 30 lb/ac in the belief that a very thick alfalfa stand will out-compete weeds. Research from around the U.S. has shown that seeding rates could be lowered by as much as 50% without reducing forage yield and quality when good seedbeds and seedling stand management are utilized (Hall, et.al. 2004). Bohle (2002) showed that seeding rates as low as 8 lb/ac produced as much forage after 4 years as 12, 16 lb/ac and higher in a four-cutting regime in Madras, OR.

Seeding rate (lb—PLS /ac	4 Year Total yield (t/ac)
4—3.1	29.4
8—6.2	31.6
12—9.4	31.8
16—12.5	31.7
20—15.6	32.6
24—18.7	31.7
lsd (.05)	1.7
CV%	3.6

Table 3. Four year forage dry matter yields at Madras, OR as effected by seeding rate.

The trend will be to improve seedbed conditions for new alfalfa seedlings and lower seeding rates, especially of high-value alfalfas.

ADOPTION OF NEW ALFALFA GENETICS

The trend will be to advanced genetics.

As crop inputs and competition for crop ground increases, growers will have no choice but pay more attention to variety selection. Accessing data from alfalfa variety trials from similar environments to the farm will help in variety decisions.
Table 4, adapted from Tim Woodward's presentation in 2002 to the attendees of the Washington State Hay Growers/WSU Hay Conference and Trade Show, illustrates the value of better performing genetics.

Table 4. Comparison of improved vs. obsolete alfalfa varieties in gross returns per acre

Entry	3-yr avg. t/ac	$/ac revenue @ $100/ton	Revenue of 125 acre circle/yr	Value of a 3-yr stand	Advantage over obsolete variety
53V08	11.77	1,295	161,875	485,625	60,750
Lobo	11.00	1,210	151,250	453,750	28,875
Vernema	10.30	1,133	141,625	424,875	------------

The table shows that an average additional of 1.77 tons/acre/year of hay production potential by an improved variety (53V08) results in an increased gross profit of $60,750 over an obsolete variety (Vernema) for the first three-years of the stand.

SUMMARY COMMENTS

Future trends in alfalfa establishment will be driven by the economics of adopting new methods of farm management and new technologies.
These include:

- More attention to whole farm business analysis using management accounting to evaluate an alfalfa enterprise as a profit center
- More attention to market analysis for short and long term supply and demand predictions
- Growing for specific markets: e.g., dairy, export, horse
- Marketing for specific transgenic, conventionally grown and organically grown alfalfa
- More attention to cropping and pest control product application histories prior to planting
    - Consideration of allelopathic and autotoxic potential
    - Consideration of herbicide carryover potential
- Adoption of GPS guidance systems on tillage and planting equipment
- Adoption of variable rate fertilizer and soil amendment application
- Adoption of minimum or no-till systems
- Seeding at lower rates with improved seed placement
- More attention to variety selection based on potential forage yield, pest resistance and transgenic traits

REFERERNCES

Vough, L. 2000. “Developing a hay marketing strategy.” Accessed 11-13-2006 at http://www.nrsl.umd.edu/extension/publications/foragefacetsno9.pdf.

Caddel, J. 2001. “Alfalfa Stand establishment.” accessed 11-13-2006 at http://alfalfa.okstate.edu/pub/alfalfa-production/stand-estab.htm.

Kugler, L. 2006. The effects of water soluble extracts from wheat straw on the germination of alfalfa. Accessed 11-15-2006 at http://www.wa-hay.org/Proceedings/06%20Proceedings/The%20Effects%20of%20Water%20Soluble%20Extracts%20from%20Wheat%20Straw%20-%20Kugler.pdf.

Rehm, G.W., A. Mallarino, K. Reid, D. Franzen, and J. Lamb. 2001. “Soil sampling for variable rate fertilizer and lime application”. Accessed 11-9-2006 at http://www.extension.umn.edu/distribution/cropsystems/DC7647.html.

Leer, S. 2004. “Purdue study drives home benefits of GPS auto guidance”. Purdue News. Accessed 11-9-2006 at http://news.uns.purdue.edu/html4ever/2004/040413.Lowenberg.gps.html.

Hall, M., C. Nelson, J. Coutts and R. Stout. 2004. “Effect of seeding rate on alfalfa stand and longevity.” Agron. J. 96:717-722.

Bohle, M. (in press) “Seeding rate effect on alfalfa yield, stem and plant counts” Central Oregon Agricultural Research Center 2006 Annual Report.