National Alfalfa & Forage Alliance

Coexistence for Organic Alfalfa Seed and Hay Markets

Introduction

The first genetically engineered (GE) trait in alfalfa, Roundup Ready®, was initially made available June, 2005, through March, 2007; plantings were subsequently suspended pending further regulatory review. Other GE traits for improved crop production and value are under development. It is important that the industry have mechanisms to maintain current production practices for specific markets which may reject or be sensitive to new GE traits, while allowing for the adoption of new technologies which are deemed to be safe, effective and economically valuable.

This National Alfalfa & Forage Alliance (NAFA) document addresses coexistence issues relevant to organic alfalfa seed and hay producers. Coexistence issues specific to alfalfa seed exporters and alfalfa hay exporters are addressed in companion documents.

Organic Alfalfa Markets

Organic farming has become one of the fastest growing segments of U.S. agriculture. U.S. producers are turning to certified organic farming systems as a potential way to lower input costs, decrease reliance on nonrenewable resources, capture high-value markets and premium prices, and provide an end-product which is increasingly in demand. It is vital to develop mechanisms which allow the coexistence of conventional, GE and organic agricultural systems, all of which have an equally valid role in the marketplace.

Organic milk production is one the fastest growing segments of organic agriculture in the U.S. Between 2000 and 2005, the number of certified organic milk cows on U.S. farms increased by an average of 25% each year, from 38,000 to more than 87,000 (USDA, 2007). Total U.S. dairy cow numbers were down slightly from 9,119,000 in 2000 to 9,043,000 in 2005. The Agricultural Marketing Research Center (AgMRC, 2008) estimated that in 2005, organic milk accounted for just less than 1% of the milk market (Shultz, 2006). The Organic Trade Association estimated the retail value of organic milk products was $2.1 billion in 2005 and J.P. Morgan predicts this market to be worth $3.5 billion by 2010.

Many organic dairy producers feed a ration that is heavily forage based. Hay is often used to supplement feed from pasture. Statistics for present and future requirements are not well documented, however, Organic Valley Dairy, the largest organic dairy cooperative in the U.S., estimated that organic dairy producers needed approximately 450,000 tons of organic hay in 2006 (Seimon, 2007). Organic hay sold to dairies is predominantly pure alfalfa or alfalfa/grass mixtures. The need for organic hay will increase correspondingly with the anticipated growth in the organic dairy industry.

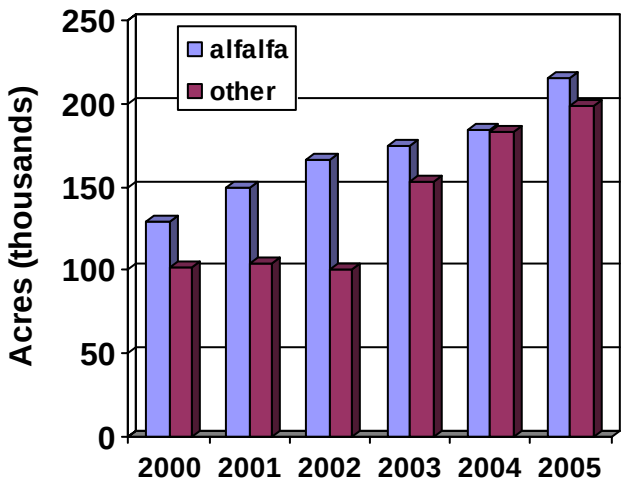

Figure 1. Harvested Acres of Organic Hay in the U.S.

The most recent USDA organic crop statistics are from 2005. A summary of the number of harvested acres of organic hay and haylage is reported in Figure 1 (USDA, 2007). In this report alfalfa acres include pure alfalfa and alfalfa/grass mixtures. The "other" category is grass hay or grass/clover mixtures. Clearly organic alfalfa hay is a key component to many organic dairy diets. In 2005, organic alfalfa hay made up only 204,380 (0.9%) of the 22,439,000 acres in the U.S. (USDA, 2007). In most years, organic alfalfa hay can attract a significant premium over conventionally grown hay.

In a report titled "Organic 2006: Consumer Attitudes and Behavior, Five Years Later & Into the Future," the Hartman Group (2006), a marketing research firm, found that one of the primary reasons consumers buy organic food is to avoid GE products. The USDA National Organic Program (NOP, 2005a; NOP, 2005b) is a process-based certification program for organic producers that prohibits, among other things, the use of feed produced from GE varieties. Under current NOP guidelines, if a product tests positive for GE, a producer would not lose the right to sell that product as USDA Certified Organic, as long as their "Organic Systems Plan" approved by a NOP certifier has been followed (USDA, 2005b). Although the NOP Certification is process-based and does not guarantee a non-detectable level of GE adventitious presence, some organic dairies fear that consumers' trust in the USDA certification system might be in jeopardy if organic foods are found with even low levels of GE traits. Commercial release of GE alfalfa may lead many organic dairy producers to test organic hay for GE traits prior to feeding and if GE alfalfa is found in organic alfalfa it would greatly compound the organic feed shortage. "If farmers can't source adequate organic feed, they will not be able to produce organic milk," George Siemon, President of Organic Valley Dairies, said in a press release (Siemon, 2007).

Key Production Issues

The following broad areas must be addressed in order to facilitate the continued successful production of non-GE organic alfalfa.

1. Non-GE foundation seed must be available to conventional variety seed producers who produce commercial generation planting seed for organic forage producers. This is a genetic purity issue.

2. Non-GE, organically certified foundation and commercial planting seed must be available to organic forage and seed producers. Such seed may only be treated with NOP-approved seed treatments and inoculant strains. However, if certified organic seed is not commercially available, NOP guidelines allow that conventional planting seed may be substituted. This is a commercial seed production issue.

3. There must be sufficiently segrated production areas, field isolation standards and/or crop management guidelines that allow for the commercial production of non-detect organic seed and hay. These are commercial seed and hay production issues.

4. There must be an effective dissemination of trait stewardship and information programs that advise and direct producer activities to ensure non-detect and certified organic commercial production of seed and hay. This is an industry-wide coexistence issue, which includes the development of strategies for the mitigation of undesirable gene flow between GE and organic alfalfa production fields.

Strategies to Produce Seed and Hay for GE Sensitive Organic Markets

1. Accessing and Producing GE Non-Detect Seed

The single most important step in producing non-GE organic hay or seed is to plant the seed or hay production field with a high quality, conventional seed lot that has been tested for GE traits, planting only GE non-detect seed. In addition to NOP certification, some organic hay or seed customers may require GE trait testing to assure non-GE status of the organic alfalfa end product. Protein-based detection kits are now commercially available from Strategic Diagnostics, Inc. and Envirologix Inc., and a testing protocol has been developed and validated by the manufacturers and others (Teuber et al., 2007). Third party commercial testing is available and widely used by the seed and grain industries today. Several state and private seed laboratories offer protein and/or DNA-based testing.

Appropriate isolation or distances to non-organic or GE alfalfa fields should be maintained so as to mitigate future GE trait in-flow and/or the unintentional application of non-organic practices. Science-based, pollinator-specific pollen-mediated gene flow data are being collected to refine current isolation distances between GE alfalfa seed production and seed production for GE sensitive markets. The basis for current isolation standards is discussed in a peer reviewed publication describing the biology of alfalfa and alfalfa production in the U.S.; a comprehensive overview of gene flow in alfalfa and procedures to mitigate gene flow (CAST, 2008).

Unlike the vast majority of biotech crops grown today, the primary commodity for alfalfa is forage hay (99.5% in U.S.), not seed. As a seed generation is required for gene flow and seeds are rarely, if ever formed in hay production fields, there is very little opportunity for genes to flow between alfalfa fields (Putnam, 2006). For gene flow to occur in a hay field a sequence of events must all occur: concurrent flowering between GE and conventional hay fields, pollen flow between the fields from local pollinators and then, a viable cross-pollinated seed must be produced, dehisced, germinate and successfully compete in an established alfalfa hay field. This series of events requires five to seven weeks after flowering depending on climate. As it is desirable to harvest hay fields prior to bloom to maintain hay quality, producers strive to harvest well before viable seed is established. Even in grazing situations, the chance of viable seed being produced from a neighboring field, pollinating and then establishing is very low, due to the sequence of multiple events that must occur, each having a low probability (Putnam, 2006). Harvest of organic hay before the ripe seed stage eliminates potential pollen mediated gene flow from neighboring GE alfalfa seed or forage production fields.

2. Non-Dormant Variety Alfalfa Seed for Southern Organic Markets

Most U.S. non-dormant alfalfa seed is produced in California. The California Crop Improvement Association (CCIA) estimates that 50% of the alfalfa seed produced in California is used for domestic markets (Larry Teuber, Director, CCIA). In 2005, the University of California (UC) Seed Biotech Center hosted a meeting of alfalfa seed production stakeholders to develop consensus seed-to-seed isolation guidelines sufficient to meet the non-detect adventitious presence (AP) standards currently demanded by some export customers (this non-dedect goal is similar to the goals expressed by some organic producers and organic seed retailers). This stakeholder group adopted a consensus 3-mile isolation distance based on honeybee-pollinated gene flow experiments conducted by UC scientists (Teuber et al., 2004; Van Deynze et al., 2004). All commercial Roundup Ready alfalfa seed production in California has been planted with at least 3 miles isolation from the nearest conventional seed production field. This isolation requirement was incorporated in the NAFA Best Management Practices for Roundup Ready Alfalfa Seed Production (BMP's for RRA Seed Production) document, the new industry standard protocol for GE alfalfa seed production stewardship (NAFA, 2008). The NAFA BMP's for RRA Seed Production requires that the location of all Roundup Ready variety seed fields be reported to and confirmed by the local crop improvement organization. Crop Improvement Associations routinely coordinate seed field isolation in many crops electronically or on paper (CCIA, 2008). GE sensitive producers may use this information to plan seed field isolation. The NAFA BMP's for RRA Seed Production document also recognizes the establishment of GE free seed production zones based on local seed grower consensus. The Imperial Valley of California produces more than 75% of the California alfalfa seed export market, and is currently recognized by the industry as a de facto, non-dormant variety, GE free alfalfa seed production zone. Potential hay-to-seed pollen-mediated gene flow with honeybees was examined by Teuber et al. (2007). In these studies, isolation of seed from flowering GE hay of 350 ft or more was adequate to reduce potential gene flow to non-detect levels. Current isolation standards offer a significant opportunity for the potential production of organic non-dormant alfalfa seed in California.

3. Dormant Alfalfa Variety Seed for Northern Organic Markets

The Pacific Northwest produces virtually all of the proprietary winter-dormant variety alfalfa seed produced in the U.S. Dormant "variety not stated" (VNS) and common seed are sometimes produced in the Plains states (e.g., ND, SD, NE, KS and OK), but this production varies considerably from year to year and seldom contributes more than 5% of total U.S. alfalfa seed production. Canada is also a large producer of dormant alfalfa seed. The U.S. imports proprietary, VNS and common seed from Canada, representing 10-15% of the dormant U.S. seed supply.

The NAFA BMP's for RRA Seed Production document identifies isolation requirements for the conventional (general use), domestic market. Alfalfa seed production in the PNW is primarily pollinated by leafcutter bees. The production of non-detect GE seeds under leafcutter bee pollination may require almost six times the current NAFA best practice of a 900 foot isolation distance. This isolation distance can be accomplished by:

a) Producing seed in "de facto" GE free production areas that have a high density of conventional alfalfa seed production acres with multiple producers. There will

likely be one or more default GE free production areas based on current NAFA best practice isolation standards.

b) The NAFA BMP's for RRA Seed Production document also recognizes the establishment of GE free seed production zones based on local seed grower consensus. Seed producers in parts of two counties in southwestern Idaho are in the process of petitioning the state for GE free alfalfa seed production status. Other areas may follow if there is an economic incentive to do so. Market incentives have been successful in gaining seed/grain producers for GE free soybean and corn production for specific GE sensitive markets.

c) Communication and cooperation between seed producers and between seed production companies has always been an important component of coexistence. Industry input in drafting and implementation of NAFA best practices demonstrates the growing consensus that coexistence is an industry and grower priority, rather than an individual company concern. It will be in the individual and collective best interests of companies and producers to work with each other to assure each company can produce seed of the required seed quality appropriate for various markets. This has been the basis for Certified seed production since the early 1900's. There are both formal (e.g., web-based seed field isolation "pinning" maps for sunflower seed production in California (CCIA, 2008)) and informal (e.g., sweet corn seed production pin map administered by Idaho Crop Improvement Association) examples of this successfully working.

d) The Roundup® herbicide label for seed production currently allows the application of Roundup to alfalfa seed production in only eleven western states. Elsewhere, where Roundup has not been registered for use in seed production (e.g., ND, SD, NE, KS, OK), there will be no licensed Roundup Ready alfalfa seed production. Most U.S. seed companies have significant contract conventional seed production in Canada. Canada will likely remain a long-term GE free seed production area appropriate for production of organic quality seed of U.S. developed varieties and U.S. re-exported seeds. Historically, the Plains and western Canada typically have much less insect pest pressure in alfalfa seed production and as a result currently produce virtually all of the organic alfalfa seed sold in the U.S.

   In the Plains where most of the U.S. organic alfalfa seed is produced, the potential for GE gene flow into the organic seed crop will be largely limited to the GE hay-to-conventional seed interface. This is due to the fact that Roundup herbicide is not registered for alfalfa seed production in these states. Potential hay-to-seed pollen-mediated gene flow is significantly less than potential for gene flow between adjacent seed fields (Teuber et al., 2007). Seed producers who require GE free seeds (e.g., organic markets) should use greater isolation from any other alfalfa field. As described above, organic GE sensitive seed companies may use the GE seed field location information available from their local crop improvement organizations to assist in planning organic seed field isolation and as a basis for independent process-based inspections. These coexistence tools and isolation standards protect the ability of various seed producers and seed companies to produce alfalfa seed for GE sensitive organic markets.

4. **Stewardship Programs, an Ongoing Process**

The Association of Official Seed Certifying Agencies (AOSCA) now offers the Alfalfa Seed Stewardship Production Program, a voluntary, fee-based identity preserved program of process certification for the production of alfalfa seed destined for GE sensitive markets (2008). This identity preserved process certification includes the testing and third party verification of genetic origin and non-detect GE trait status of planting seedstock and observance of a minimum stated isolation distance from GE alfalfa seed production. The Idaho Crop Improvement Association (ICIA, 2008) manages a similar process-based certification for sweet corn seed produced for export markets. This certification has been widely embraced by both sweet corn seed producers and the export markets to which they sell. The alfalfa seed industry strongly encouraged the development and implementation of the new AOSCA identity preserved program which is well suited to serve the needs of the GE sensitive alfalfa seed producers.

The NAFA best practices have been validated in two years of commercial seed production (Fitzpatrick et al., 2007). For seed fields with greater isolation than NAFA minimums, conventional variety seed was successfully produced to a “non-detect” purity status. For example, zero of 45 seed lot samples tested positive for the Roundup Ready trait when using 1 mile or 3 miles of isolation under leafcutter or alkali and honeybee pollinated conditions, respectively. A 3,000-seed sample, the industry standard for other GE testing in crops, was verified to be without GE using commercially verified protein test strips (Strategic Diagnostics, Inc.). Each lot was tested in five 600-seed sublots giving a sensitivity to detect AP at 0.04% with 95% confidence (Remund et al., 2001). Furthermore, in all 111 cases, at a given isolation distance for each pollination system, the scientific models for estimating gene flow developed using “worst-case” scenarios based on small-fields (<5 acres) overestimated the amount of actual commercial-practice pollen-mediated gene flow.

The industry encourages the assistance of the U.S. government to support the orderly coexistence of U.S. alfalfa organic, GE and conventional market sectors. U.S. government involvement to encourage the domestic and international organic industry and its consumers to accept additional process based certifications should be encouraged. The U.S. alfalfa seed industry continues to strongly encourage national and international seed and governmental organizations to work toward the adoption of uniform low level presence (LLP) tolerance standards for GE traits that have been deregulated in one or more OECD countries. The adoption of uniform standards and official recognition of a process-based identity preserved seed production system would be of significant benefit to the U.S alfalfa seed industry as it seeks to serve the expanding organic seed and hay market. Strategies for production and global movement of seed for GE sensitive markets are well established for many crops. Scientific studies on gene flow in alfalfa and verified best management practices allow these basic principles to be applied to address GE and GE sensitive markets in alfalfa.

Coexistence Principles

Coexistence is not a new phenomenon in agriculture. For decades, it has been a requirement for many producers of crops, such as sweet corn and canola, in situations where neighboring crops may affect marketability of a specific quality trait. Scientific data and decades of experience in the seed and hay industries are the appropriate

basis of coexistence and stewardship programs that are responsive to changing agricultural markets. Coexistence is based on good communication and mutual respect between neighbors and individuals who have adopted different approaches to agriculture. Furthermore, producers serving GE sensitive markets must understand contractual quality specifications and their ability to deliver those specifications to their customers (CropLife, 2006; SCIMAC, 2006; Sundstrom et al., 2003; Woodward, 2006). Likewise, the producer-licensees and licensors of GE varieties must understand and observe GE variety stewardship requirements. Science and process-based principles, combined with the availability of tools for monitoring and communication, are the keys to producing alfalfa for diverse markets. The U.S. alfalfa industry is well-developed and is amenable to addressing specialized contract requirements and has a proven history of successfully delivering quality products to meet customer specifications for decades.

Market Tolerances

In developing coexistence strategies, it must be acknowledged that commercial agricultural product purity is not absolute. Existing tolerances vary by customer preference. The Roundup Ready trait has been reviewed by the Food and Drug Administration (FDA) and has been found to be safe; that finding has not been disputed in the current regulatory review of Roundup Ready alfalfa. Thus, tolerances for low level presence should be considered in that context. Practical, acceptable low level tolerances for impurities such as variety off-types, weeds and inert materials have been established for many crop products and are managed within process-based strategies such as the Certified Seed (AOSCA, 2003) and the National Organic Program (NOP) (USDA, 2005a; USDA, 2005b). Tolerances of impurities for the organic market are primarily a question of market preference. Buyers and sellers determine the value of such seed and hay in relationship to other quality classes of seed and hay. To-date, there is no uniform tolerance established for low-level GE trait presence in conventionally grown crops (e.g., >5% and 0.9% GE in Japan and Europe respectively, must be labeled as such in food). GE trait sensitive markets are estimated to comprise less than 3-5% of the U.S. hay market and 30% of the U.S. seed market (Putnam, 2006). Approximately 1% of alfalfa is currently produced organically (USDA, 2007). The implementation and refinement of protocols to enable successful coexistence between diverse production systems, recognizing differing market tolerances, are critical steps to assure alfalfa quality that is adequate for all primary markets for the crop.

Conclusions

Methods of assuring organic customers of the non-GE status of both alfalfa seed and hay are available using current methodology. These steps are neither extraordinary nor expensive. This process includes the elements of:

- Sowing of non-GE seed that has been tested prior to planting;
- Taking steps to ensure adequate isolation prior to planting;
- Application of identity preserved protocols to assure lot identity and non-GE status.

NOP and seed certification systems are both well established process-based programs that have delivered high quality products. Both systems tolerate low level thresholds for impurities that reflect market classes for either pesticides, weed seeds or varietal seed impurities allowing producers to coexist and meet the needs of organic markets.

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The National Alfalfa & Forage Alliance (NAFA) strongly supports the availability and continued use of biotechnology in agriculture. These advances will allow American farmers to effectively compete in the world market and will enable American farmers to supply abundant, safe, high quality food, fiber and renewable fuel desired by global consumers. NAFA acknowledges and respects different markets and methodologies of food, fiber and renewable fuel production. We believe that science based stewardship management practices allow for the coexistence of these different markets and methodologies in production agriculture. NAFA believes collaborative efforts among all stakeholders are required to develop methodologies that enable coexistence.

Thus, NAFA sponsored a national forum (2007) open to all alfalfa industry stakeholders to participate in the process of developing a coexistence plan. As a result of the forum, five documents have been created to guide a coexistence strategy for the alfalfa industry. Included among the five documents is a peer-reviewed publication describing the biology of alfalfa and alfalfa production in the U.S.; a comprehensive overview of gene flow in alfalfa and procedures to mitigate gene flow (CAST, 2008, in press). In 2008, NAFA adopted a document entitled, Best Management Practices for Roundup® Ready Alfalfa Seed Production (BMP's for RRA Seed Production). In acknowledgment of their commitment to the industry coexistence strategy, the three NAFA genetic suppliers formally adopted the BMP's for RRA Seed Production. In tandem, NAFA adopted three companion documents to address coexistence issues in each of the GE sensitive market sectors: hay export, seed export and organic alfalfa. Collectively, these five documents are essential tools toward enabling successful coexistence.