NAFA Coexistence Document Adopted June 2008, revised February 2012

Coexistence for Alfalfa Hay Export Markets

Introduction

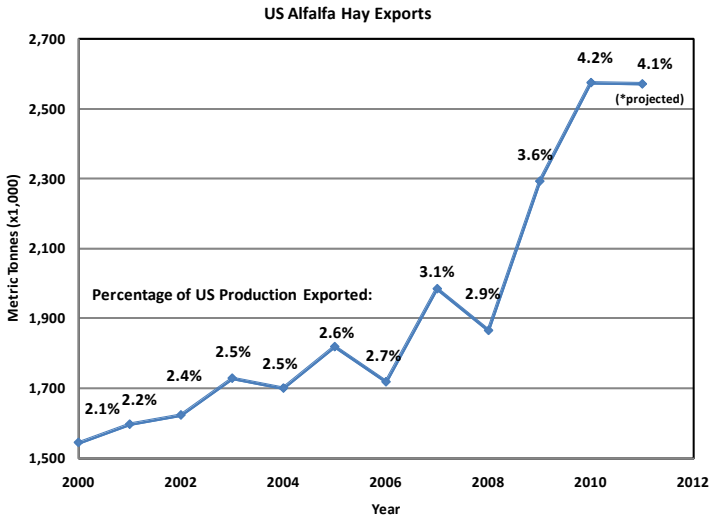
In January, 2011, the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) announced its decision to grant non-regulated status for alfalfa that has been genetically enhanced to be resistant to the herbicide commercially known as Roundup. After conducting a thorough and transparent examination of alfalfa through a multi-alternative environmental impact statement (EIS) and several public comment opportunities, APHIS determined that Roundup Ready alfalfa (RRA) is as safe as traditionally bred alfalfa (USDA, 2011). While USDA has made this determination, not all markets accept this technology. Thus, it is important that the industry have mechanisms to maintain production practices for specific markets which may reject or be sensitive to new genetically enhanced (GE) traits, while allowing for the adoption of new technologies - this is termed coexistence.

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

Alfalfa Hay Export Markets

Alfalfa hay exports have become much more important in recent years, rising from about 2% of U.S. production in 2000 to over 4% of production in 2010 (Figure 1). This is in spite of a 15% decrease in total U.S. alfalfa hay production during that period. In terms of 'sensitive' market volume, export hay markets have been more important for alfalfa hay producers than organic hay markets (approximately 2% of volume in 2010). All exports currently consist of compressed hay, cubes, and meal, predominately double compressed hay, not silage.

Figure 1. Exports of alfalfa from Western Ports (data from US Dept. Commerce, USDA-NASS, 2010). This data does not reflect exports of hay to Canada or Mexico.



Since alfalfa is the only hay product potentially containing a GE trait, alfalfa must be considered separately from other exported hay products (e.g., oat, sudangrass, timothy, and various straw products).

Historically, Japan has been the primary foreign market for alfalfa hay, but in recent years China and the Middle East have increased demand dramatically. In 2010, alfalfa hay exports to China and Taiwan nearly equaled that of Japan (Figure 2). The Middle East, particularly the UAE, has risen to 9% of U.S. exports (4.1% in 2005). Asia is the clear leader in demand for U.S. alfalfa hay, driven by dairy expansion (mostly China), lack of availability of local high-quality feed, and highly favorable freight costs from Western U.S. to Asia.

Figure 2. Destination of US Alfalfa Hay Exports (data from US Dept. Commerce, USDA-NASS, 2010).

Hay exports are almost exclusively the purview of the Western U.S. with very little hay exported from the Midwest or East. Seven western states (AZ, CA, ID, NV, OR, UT, WA) represent 28-34% of U.S. alfalfa hay production but greater than 99% of U.S. alfalfa hay exports, predominately from WA and CA.

Exports are extremely important to specific regions within the west, notably the Columbia Basin of Washington/Oregon and the Imperial Valley of California. In these regions, alfalfa hay produced for export markets may consist of greater than 25% of the volume of hay produced and is an important part of the

agricultural economy. Thus, in these specific regions, the sensitivity of the export market for GE traits is likely to be more intense. In light of the unique growing circumstances in Imperial County and the current international approval status of RRA, Monsanto has worked with the Imperial County Farm Bureau and established unique stewardship requirements for RRA in Imperial County, which are set forth in the Monsanto Technology Use Guide and Monsanto Technology Stewardship Agreement. However, for the vast majority of U.S. alfalfa production regions, and even for the majority of the alfalfa production regions in western states, export hay is not as important as domestic markets.

Sensitivity of Alfalfa Export Markets

There are two separate issues with regard to the sensitivity of export markets to GE trait in alfalfa hay.

Regulatory Approval by Importing Country. Regulatory approvals for the importation of RRA feed and/or food purposes has been granted by Japan, Canada, Mexico, Korea, Philippines, Australia, and New Zealand and none is required at the present time for feed import to Taiwan. China currently does not allow importation of RRA, but approvals are in process. Several other importing countries (e.g., UAE, Saudi Arabia, Costa Rica) have no government approval process so regulatory approvals per se cannot be obtained for RRA at this time.

With the exception of the specialty livestock market sector (e.g., organic, grass fed, GE free), most Asian producers are currently importing and feeding other Roundup Ready and GE trait feedstuffs to their dairy and livestock. This includes corn, cottonseed, soybean, and several other GE products, primarily for livestock feeds. RRA does not differ substantially from these other products, since it contains the same gene.

However, some importers have indicated that a significant portion of their consumers do not want GE traits in their animal feed. Therefore, the presence of the RRA creates both logistical and marketing issues which are not related to the legality of importing GE crops.

Market Sensitivities of Export Buyers. Although there are no regulatory restrictions on the importation of RRA into Japan and several other major importing countries, export buyers have largely made decisions not to purchase RRA since its inception in 2005. Some have stipulated in their contracts that the hay be non-GE. Importers have generally rejected RRA (or at least expressed preferences for non-GE alfalfa) due to concerns about the sensitivity of their markets.

These business decisions may be due to the stated preference or unpredictability of overseas consumers (e.g., Japanese dairies) that may reject GE crops. It may also be due to logistical considerations in the distribution channel (e.g., inability to segregate lots). Additionally, export hay is frequently subject to many negotiation aspects (e.g., hay quality test, weeds, diseases, faults), and the presence of GE traits is an additional point for negotiation. Hay producers and exporters fear that overseas shipments could be rejected after shipping, at great cost, if there is unintended presence of a GE trait found in their hay. However, to our knowledge, no rejections due to RRA have been documented.

Producers of alfalfa hay are concerned that importers may penalize their region and favor other regions (e.g., Canada, Australia) if it is believed that unintended GE alfalfa is present in hay lots, or a region gets a reputation for producing GE alfalfa. However, since 2006 there have been some exports of RRA hay to Japan and other countries, indicating some acceptance from importers. Many exporters believe that markets are likely to change in their sensitivity to GE over time, since export of Roundup Ready soybean and corn is widespread.

Routes to Unintended Low Level Presence and Mitigation Strategies for Prevention

There are several ways the Roundup Ready trait could occur as low level presence (LLP) in conventional alfalfa hay destined for export. These could be from seed co-mingling during planting of a hay crop, pollen flow during hay production, rotation of a GE sensitive crop after production of a GE alfalfa crop, and inadvertent mixing of GE alfalfa and conventional hay during harvest, transportation, identification, and storage. Of these, adventitious presence (AP) in seed and the possibility of mixing hay after harvest are clearly the most likely routes to LLP (and the most easily addressed). Adventitious presence due to pollen flow and crop rotation problems are less likely sources of LLP due to a range of biological factors.

Prevent LLP at Planting. For hay producers, planting of seed with AP is clearly the most likely route by which GE alfalfa can enter a field that is otherwise non-GE. Thus, the most important step a hay producer can take is to choose seed which does not contain the trait. GE sensitive hay producers should obtain seed of a known certified conventional variety from a reputable supplier who uses best management practices to mitigate AP of GE in their seed products (see NAFA documents on coexistence for alfalfa seed). Prior to use, planting equipment should be cleaned and free of any unknown alfalfa seed. It is also recommended that seed for planting be tested for the GE trait prior to planting, either by the seed company or the producer. Techniques are available using commercially available test strips (e.g., Strategic Diagnostics, Inc., Envirologix, Inc.). This is a low-cost method of assuring the establishment of a non-GE alfalfa crop. Additionally, the Association of Official Seed Certifying Agencies (AOSCA), working in conjunction with the alfalfa seed industry, has developed the Alfalfa Seed Stewardship Program (ASSP). This is an optional process-based certification program that provides third party verification by an internationally recognized organization. The ASSP program requires a five mile minimum isolation from RRA seed production to meet the process-based certification standards. If isolation is less than five miles, testing of the seed lot for AP is required. (AOSCA). It is highly recommended that

hay growers utilize ASSP certified seed when purchasing seed for hay destined for sensitive markets.

Reduce Risk of LLP from Gene Flow. While risk of gene flow is considered to be low for most hay production systems, it is not zero, and reasonable steps can be taken to further reduce this risk. There are a wide range of environmental barriers that make gene movement from neighboring GE alfalfa fields (or from feral plants) to a forage field unlikely (Putnam, 2006). Synchrony of flowering between a conventional alfalfa field and GE alfalfa source must occur, and pollinators must be present during flowering, but there are many other barriers as well. The biggest barrier to preventing LLP from GE alfalfa is the ability to harvest the crop before significant flowering or seed production. In most environments, flowering, pollination, seed set, and seed ripening, is a process which takes many weeks after a normal alfalfa hay harvest (exceptions to this occur particularly in hot climates such as the Imperial Valley, where flowering occurs much earlier). Alfalfa managed for hay is usually cut at early flower (e.g., <10% bloom) and ripe seeds are not typically present in hay fields. GE sensitive hay producers should manage their hay cutting schedule to intentionally avoid ripe seeds throughout the field. For gene flow to result in LLP in a hay field to a measurable degree (e.g., over 5%), seeds must be abundantly produced, fall to the ground, germinate, and contribute yield to the subsequently harvested field. Since hay fields are harvested frequently, and seed production is a rare occurrence in hay fields, this source of LLP is not particularly likely. Producers can reduce risk of gene-flow LLP by assessing the distance to neighboring RRA fields, controlling flowering alfalfa on the edges of fields and in ditch banks, and harvesting before significant flowering or seed pod formation. Since export markets value quality, early harvests are already favored for quality purposes.

Prevent Volunteers from a Prior GE Crop. Volunteer alfalfa in a subsequent crop can occur. Therefore, if a GE sensitive field is planted after a GE alfalfa hay crop, these volunteers could mix with the subsequent crop if not controlled. Techniques are available to do this. In practice, virtually all volunteers following an alfalfa hay crop are likely to be re-growths from existing plant roots (crowns) which have not been destroyed, not from germinated seed produced from a hay field. Volunteers are treated as weeds in a subsequent crop and controlled with tillage or herbicides; there are herbicides available to control Roundup resistant alfalfa (Van Deynze et al., 2004). Normal recommended agronomic practices are crop rotation with cereals such as corn or wheat, with 1-2 years separation between alfalfa crops (Canevari and Putnam, 2007). Back-to-back alfalfa production is never recommended due to problems with autotoxicity, diseases, nematodes, and weed populations. Crop rotation, combined with tillage and herbicides to control volunteer alfalfa is highly successful at removing existing alfalfa plants for subsequent crop production. In forage production research trials conducted in California and Washington, where the RRA stand was terminated using a non-glyphosate herbicide and plow-down, there were no alfalfa volunteers emerging after the first year (Van Deynze et al., 2004). The production of GE sensitive alfalfa hay after the production of a GE seed or hay crop is a rare possibility, since 1) it is unlikely that a GE sensitive producer would have previously grown a GE crop, and 2) producers would most likely grow the GE sensitive crop on a field that has not previously produced a GE crop, as common-sense would dictate. Normal crop rotations and crop plowdown accompanying a herbicide regime are normally effective at removing volunteer GE seedlings in subsequent crops in all but extremely rare situations.

Prevent Mixing During Harvest. On large western hay farms, haying equipment moves rapidly between fields and between farms. Often, contracted harvesters move partial bales between fields or farm units. Smaller amounts may travel on swathers, rakes and bale accumulators. Thus, producers who grow hay for sensitive markets must assure that their balers and other equipment are purged of partial bales or stems of hay that are retained in equipment as it moves from field to field. This is a simple step but sometimes difficult to implement. One easy way to prevent mixing at baling is to eliminate the first one or two bales, depending upon size, from the hay lot when collecting hay destined for sensitive markets, if those balers have previously been in RRA fields.

Prevent Mixing During Handling and Storage. One possibility of mixing is during the storage, handling, processing, and identification process. For processors handling large volumes of different types of hay, the possibility of mixing hay lots between GE and non-GE lots may be an important source of potential problems for hay export markets. However, methods to manage and segregate hay lots are widely available to both producers and exporters. Exporters and importers have largely demanded information as to field, farm, variety, fertilizers, pesticides, quality analysis, and other production information from the producer, so identity-preservation is a common practice for exporters. The origin of each lot is typically known from the time it leaves the field and farm to the time it arrives in a foreign port or it is blended into a manufactured product by a hay processor. Hay importers and the U.S. producers, brokers, exporters, and feed processors are accustomed to providing extensive lot documentation to assure lot integrity. Lots are labeled and physically separated during storage and handling. Each lot is usually tested for forage quality and visually inspected for the presence of weeds or debris, etc. The National Forage Testing Association has lot identification as part of their hay testing protocol (http://foragetesting.org). They define a hay lot as a single cut from a single field of not more than 200 tons. Thus, it is relatively easy for export producers to provide documentation of hay lot identity using existing methods. GE sensitive hay handlers can opt to augment their routine practices to include GE trait testing; leaf and hay tissues may be tested for pre- and post-harvest quality assurance, respectively. Current hay export and lot identification practices, with the addition of routine testing with test strips should be effective in preventing inadvertent mixing of GE and conventional hay lots.

Market Tolerances and Testing to Assure Non-GE Hay

Existing tolerances vary considerably by customer preference, and are largely a market-preference issue, not an epidemiological or feed-safety issue. Some importers have expressed zero concern about the trait while others have rejected the trait. The Roundup Ready trait has been reviewed by government agencies (USDA and FDA) and has been found to be safe. Thus, tolerances for LLP should be considered in the context of market demand. Practical, acceptable low level tolerances for impurities such as variety off-types, other crops, weeds, and inert materials have been established for many crop products and are managed by buyers and sellers through mutual agreement. Process-based strategies such as the Certified Seed (AOSCA, 2003) and the National Organic Program (NOP) (USDA, 2005a; USDA, 2005b) have been helpful. Tolerances of impurities (e.g., small amount of grass in an alfalfa hay crop) for export hay are primarily a question of market preference. Buyers and sellers determine the value of such hay with impurities of all types in relationship to other quality classes of hay and adjust the price.

To-date, there is no uniform international tolerance established for low-level GE trait presence in conventionally grown hay crops. It should be noted that >5% is the GE threshold at which some countries, such as Japan and Australia, require food to be labeled as containing approved GE traits. European markets require that food over 0.9% GE be labeled as containing a GE product. However, hay is a feed and there are no such feed labeling requirements in any export market. Tolerance for LLP driven only by market preference is likely to differ between the different exports markets. While some importers have purchased RRA, most export markets prefer non-GE. Of those importers not accepting RRA, some may not require documentation, while others require testing and seller assurance of the non-GE status of the alfalfa hay. Exporters who have developed relationships with these markets have determined the degree of sensitivity and provide documentation as needed. The implementation and refinement of protocols to enable successful coexistence between diverse production systems, recognizing different market tolerances, are critical steps to assure alfalfa hay quality that is adequate for all primary markets for the crop.

GE trait testing is readily available from private laboratories. Additionally, test kits can be used by individuals at a low price (e.g., Strategic Diagnostics, Inc., Envirologix, Inc.). The accuracy of the test method for hay was validated using both cored and ground forage samples from hay that was grown in the field with different levels of AP (Putnam, 2006). Testing was shown to detect the presence of the Roundup Ready trait reliably at 1%, 5%, and 10%, and gave 0% positive readings at 0% AP, using two commercial test strips. As stated above, tolerances for small amounts of LLP is entirely market derived and will vary significantly between export buyers, from 'no preference' to 'must test'.

Promoting Coexistence Principles for Hay Export

The concept of coexistence as it relates to GE crops would allow development of both successful 'GE sensitive' and 'GE adopting' farming and marketing operations. This includes export hay, which is the most important GE sensitive market for alfalfa by volume. Successful coexistence requires not only knowledge of biological and practical factors which prevent undue influence between neighbors or diverse systems, but a level of cooperation between parties. 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 to prevent undue LLP. Science and process-based principles, combined with the availability of tools for monitoring and communication, are key to producing alfalfa for diverse markets. The U.S. hay export business is a well-developed industry that is amenable to addressing specialized contract requirements and has a proven history of successfully delivering quality products to an international customer base for decades.

Conclusions

Methods of assuring export customers of the non-GE status of both crop production and hay lots destined for export are available using current methodology. These steps are neither extraordinary nor expensive. This process includes the elements of:

- Planting of non-GE seed (including testing of seed and use of AOSCA ASSP certified seed) for fields destined for GE sensitive export hay markets;
- Taking steps to minimize the possibility of gene flow between fields through harvest timing and management to prevent excess flowering, elimination of edge or ditch plants prone to flowering;
- Prevention of LLP via field equipment;
- Management of lot identity to assure status of non-GE hay lots destined for GE sensitive export markets;
- Testing of lots to assure customers of the non-GE status of hay lots.

It is suggested that state departments of agriculture, or crop improvement associations, or other industry entities (such as producer groups) may wish to provide public documentation of these processes, with accompanying certifications so that producers may serve GE sensitive export markets.

References

AOSCA. 2003. Association of Official Seed Certifying Agencies (AOSCA) Operational Procedures, Crop Standards and Service Programs Publication. http://www.aosca.org/VarietyReviewBoards/Alfalfa/AOSCA_ASSP.html).

Canevari, M. and D. H. Putnam. 2007. Managing Depleted Stands: Overseeding and Other Options. Irrigated Alfalfa Production for Mediterranean and Desert Zones. http://alfalfa.ucdavis.edu/IrrigatedAlfalfa/pdfs/UCAlfalfa8301DepletedStands_free.pdf

CropLife. 2006. Cultivating Coexistence: A Best Management Practices Guide, pp. 4. http://www.croplife.ca/web/english/pdfs/stewardship/CLCCoexistenceBMPEN.pdf.

Putnam, D. H. 2006. Methods to Enable Coexistence of Diverse Production Systems Involving Genetically Engineered Alfalfa. Agricultural Biotechnology in California Publication 8193. University of California. http://anrcatalog.ucdavis.edu/Alfalfa/8193.aspx.

SCIMAC. 2006. Supply Chain Initiative on Modified Agricultural Crops. GM crop co-existence in perspective, 4 pp. http://www.scimac.org.uk/files/GM_crop_%20coexistence_perspective.pdf.

Sundstrom, F.J., J. Williams, A. Van Deynze, and K.J. Bradford. 2003. Identity Preservation of Agricultural Commodities. University of California Agriculture and Natural Resources. Publication 8077. http://anrcatalog.ucdavis.edu/Biotechnology/8077.aspx.

USDA. 2005a. The United States National Organic Program. http://www.ams.usda.gov/AMSv1.0/nop

USDA. 2005b. The United States National Organic Program, Questions and Answers. http://www.ams.usda.gov/AMSv1.0/nop

USDA. 2011. Release No. 0035.11. http://www.usda.gov/wps/portal/usda/usdahome?contentidonly=true&contentid=2011/01/0035.xml.

Van Deynze, A.E., D.H. Putnam, S. Orloff, T. Lanini, M. Canevari, R. Vargas, K. Hembree, S. Mueller, and L. Teuber. 2004. Roundup Ready Alfalfa– An Emerging Technology. http://anrcatalog.ucdavis.edu/Alfalfa/8153.aspx.

Woodward, W.T.W. 2006. Roundup Ready Alfalfa Test Kits and Influence on the Marketplace. Washington State Hay Growers Association Annual Conference, Kennewick, WA. http://www.wa-hay.org/Proceedings/06%20Proceedings/Roundup%20Ready%20Alfalfa%20Test%20Kits%20and%20Influence%20-%20Woodward.pdf

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. NAFA believes 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 2008, NAFA adopted a document entitled, Best Management Practices for Roundup® Ready Alfalfa Seed Production (BMPs for RRA Seed Production). In acknowledgment of their commitment to the industry coexistence strategy, the three NAFA genetic suppliers formally adopted the BMPs 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. These documents are updated periodically.

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