TONS OF VALUE IN A POUND OF SEED

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INTRODUCTION

The use of good planting seed is one of the first and most important requirements for successful crop production. Even with ideal conditions of soil, water, and climate, maximum crop yield and quality cannot be obtained with inferior seed. The best seed usually costs more per pound, but even small differences in yield, quality, or persistence can justify a large difference in seed cost.

Growers need to be aware that seed that appears to be a bargain may actually prove to be more expensive in the long run because of increased management costs. Consider the following:

> Inadequate seed germination affecting establishment can plague a grower for the life of the stand.
>
> Would a grower want to risk introducing new populations of weeds in what had been a clean field?
>
> Disease resistance is critically important in alfalfa varieties because it is unrealistic for a grower to apply chemicals for disease control. Under heavy disease pressure, an alfalfa stand may only remain productive for a fraction of the time that a stand with resistance to major alfalfa diseased would.
>
> What if aphid populations routinely required treatment? Material and application costs could total more than the investment for certified seed of a resistant variety.

How can you be sure that you are buying good seed? Some crop seeds are handled exclusively through commercial sources and your only assurance of quality is the reputation of the seed company and dealer. Other seeds are produced and processed through the California Crop Improvement Association's Certified Seed Program. Only varieties of superior quality are included in the Certified Seed Program. In order to be certified, an alfalfa variety must meet requirements that ensure its genetic composition and characteristics including agronomic performance, yield potential, insect and disease resistance, purity, and germination. Requirements for planting seed source, land eligibility, cultural practices, and seed testing are very rigid. Production of seed under the Certified Seed Program thus assures you of getting the best quality seed available. All certified seed is labeled with the blue tag of the California Crop Improvement Association (CCIA). It guarantees the seed was produced, harvested, and conditioned following strict standards to protect varietal identity and purity.

Although the focus of this symposium is alfalfa forage production, it is important for hay growers and allied industry representatives to understand important issues that influence seed production. In the following sections, I will describe the current California alfalfa seed situation and trends in production, acreage, and economics.

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U.S. SEED PRODUCTION

Approximately 80 million pounds of alfalfa seed are produced each year in the United States. The primary market for that seed is planting stock to produce alfalfa to support livestock operations in the U.S. and throughout the world. A small fraction of the seed produced is used for sprouting. California is still the largest producer of alfalfa seed in the U.S.; Idaho is close behind, followed by Washington, Nevada, and Oregon. In the last few years, alfalfa seed production in Utah, Arizona, Montana, and Wyoming has increased.

	1995	1996	1997	1998
Total Pounds U.S. (million)	60.5	70.8	77.4	85.6
Total Pounds 5 Major States[1] (million)	52.7 (87%)	63.5 (90%)	65.8 (85%)	68.9 (80%)
Total Acres 5 Major States	101,200	109,100	110,100	136,952
Average Yield/Acre 5 Major States	521	582	598	503

Five Major Seed Producing States - CA, ID, WA, NV, and OR.

In general, seed yields in the U.S. have been on the increase since 1940 as a result of continuing research funded by state boards and commissions and release of varieties with improved disease and pest resistance. However, changing economics, competition from other crops, unfavorable environmental conditions, increasing pest pressure, and increasingly restrictive regulatory constraints are making it difficult for growers to obtain economically optimum yields of high quality seed.

TYPICAL SEED PRODUCTION PRACTICES

Properly timed cultural practices are key to a successful production system. In a typical system in California and parts of the Northwest, this would include:

- Winter irrigation to provide 40-50% of the annual water requirement followed by crop irrigations timed to promote slow, continuous growth through the season.
- Fertilization with required nutrients as determined by soil or tissue tests.
- Application of herbicides to control problematic weeds followed by cultivation and/or hand weeding as necessary to control noxious weeds.
- Spring clipping to initiate the seed crop.
- Insecticide application prior to pollinator introduction and during the production season to eliminate harmful pests.
- Pollination beginning in late May-early June.
- Desiccation of the seed crop followed by harvest and seed conditioning.
- Destruction of crop residue, including volunteer alfalfa plants.

In the following sections, I will discuss two aspects of the production system in more detail, describing current issues facing the industry and possible solutions.

CURRENT PROBLEMS, POSSIBLE CONSEQUENCES, AND POTENTIAL SOLUTIONS RELATED TO PEST MANAGEMENT ISSUES

As a result of the demand for disease and insect resistance in alfalfa grown for forage, seed producers don't have to worry about some pests, such as aphids, or diseases. However, since alfalfa grown for seed production is different from alfalfa grown for forage, there are several insect pests that must be controlled. The most important pests in alfalfa seed fields are lygus, stinkbugs, spider mites, and chalcid. They are rarely, if ever, a problem in forage production fields. Unfortunately, there are few chemicals registered for alfalfa seed that effectively control these and other pests.

As a result of costly research, development and registration requirements, new pesticides are not being developed for use in alfalfa seed production. Registrations are also being lost as chemical companies evaluate the status of their "risk cup". This forces the industry to rely on older, often less effective, and in some cases more harmful materials for pest management. Strong seed industry organizations in California and other seed producing states have worked closely with chemical companies and regulatory agencies to obtain or maintain chemical registrations. A Pest Management Plan was developed to recommend strategies to most effectively utilize existing materials. In addition, research to develop efficacy data and support registration efforts has been supported by the seed industry.

Compounding the problem of rare new product registrations, effective materials can be quickly rendered ineffective when insect populations develop resistance. For this reason, there is a great deal of attention being paid to resistance management. Resistance management is the use of methods that extend the number of generations that a given pest population can be controlled economically by a pesticide. This involves incorporating other pest control strategies, such as the release of beneficial insects, and when using insecticides, rotating materials to maintain their effectiveness. It also recommends using bioassays to predict insecticide performance in the field. Researchers are taking resistance management approaches one step further in looking beyond the edges of the field and considering pest management on a regional scale. Strategies are being evaluated to more effectively manage insect pests, such as lygus, that move between important crop species in a given area.

Until recently, since the alfalfa seed crop was used for food purposes (sprouts) as well as planting stock, residue data was required for the establishment of tolerances before a product could be registered. In the early 1990's California joined the northwestern seed-producing states to separate alfalfa seed into two categories - seed grown for food and seed grown for non-food use. This separation enabled growers to more easily obtain registration for certain chemicals, but not without compromise. In many cases, the label restricts any part of the alfalfa plant grown for seed production on a non-food site from entering the food chain. This greatly affects the economics of seed production as growers can no longer sell cuttings of hay or allow sheep to graze in the fields. Efforts are underway to collect residue data to support label amendments that would allow harvest of regrowth from treated seed fields to enter the food chain.

Biological and cultural control options are being explored to improve pest management in seed alfalfa. In most cases, natural predator and parasite populations are not high enough to prevent pest species from exceeding economic levels. Recently, a parasite was found attacking lygus bug nymphs in the Pacific Northwest. Surveys have been conducted and the parasite appears to be widespread in some areas in the Pacific Northwest, with populations peaking in late summer. Efforts are underway to determine if it is present in other seed producing areas. If native parasite populations do not exist, researchers will explore the

potential for commercially raising and releasing the parasite. Cultural controls such as block planting crop species and strip or trap planting more attractive crops are being re-evaluated, especially with respect to lygus management. The effect of sulfuric acid treatments on seed alfalfa is also being assessed. In addition to acting as a soil amendment, the acid may help control weeds, including dodder, overwintering lygus, and spider mites.

The high cost of insecticide applications, poor field efficacy, and poor pollination as a result of repellence or direct toxicity all combine to negatively affect the economics of seed production. Developing short-season or single-season management strategies may result in reduced pest control and irrigation costs, making seed production a more favorable economic enterprise.

CURRENT PROBLEMS, POSSIBLE CONSEQUENCES, AND POTENTIAL SOLUTIONS RELATED TO POLLINATION

Alfalfa seed requires cross-pollination in order to produce high yields of high quality seed. Honeybees, leafcutter bees, and alkali bees are used to pollinate alfalfa for seed production in the United States. In California, honey bees are used almost exclusively. They are inexpensive and readily available, but they are not the most enthusiastic pollinators of alfalfa. Because of their inefficiency, it typically requires a long pollination season to set a seed crop with honey bees.

Research has been conducted in California to improve the attractiveness of alfalfa to the honey bee. Improvements in the floral aroma, pollen attractiveness, quantity of nectar, and ease of tripping of the floret have all resulted in increased seed yield. If companies developing varieties for forage production were willing to incorporate selection for these traits, or for increased seed production per se, it would greatly benefit seed production potential.

Research has also focused on the honey bee itself. In typical honey bee colonies, only a small proportion of the population actively collects pollen. Strains of honey bees have been selected for the quantity of pollen they store. Workers from these strains of bees show a high tendency to collect pollen and might therefore be better pollinators. Techniques are also being developed to improve success rates when beekeepers requeen hives in order to introduce favorable characteristics into their colonies. These techniques may help beekeepers manage the Africanized honey bee and Varroa and Tracheal mite infestations.

In addition to attempting to improve the efficiency of honey bees in commercial pollination researchers have been evaluating leafcutter bees in California. Leafcutter bees are the pollinator of choice in the Pacific Northwest and parts of Canada. They are more efficient pollinators, but require higher management and cost more than honeybees. In California, protection from high summer temperatures, pesticides, and management of multiple generations are issues that are in various stages of resolution.

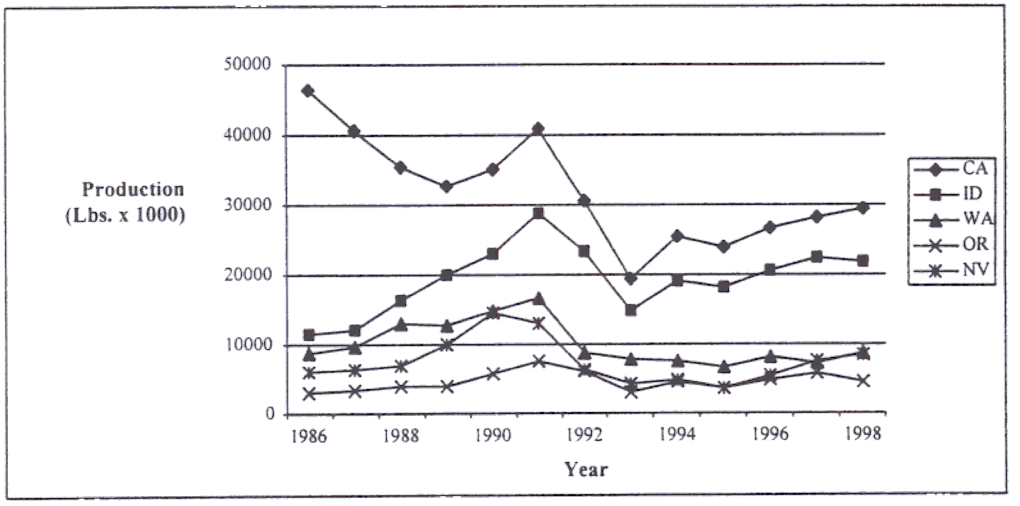
Biotechnology will allow identification and insertion of desirable genes into alfalfa. It is expected improvements will first appear in agronomic traits (Roundup® Ready, weevil control, worm control, disease control), then quality traits, and finally utilization of plants as factories. Seed production needs to be kept in mind in terms of variety maintenance, but also in preventing loss of genes through outcrossing.

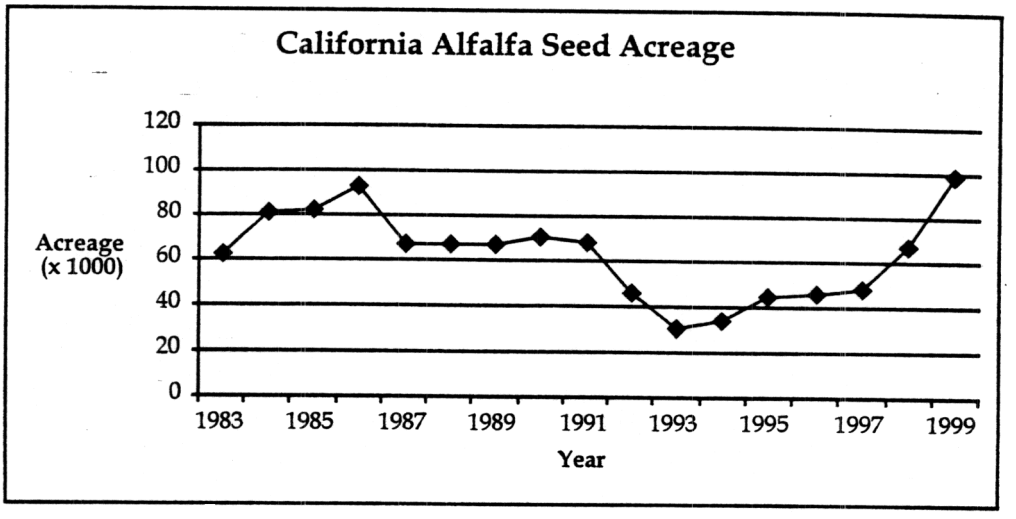
Growers producing certified seed must comply with specific regulations pertaining to field history and isolation to insure varietal purity. The field must not have been in alfalfa for a specified number of years prior to producing certified seed. It must be isolated sufficiently

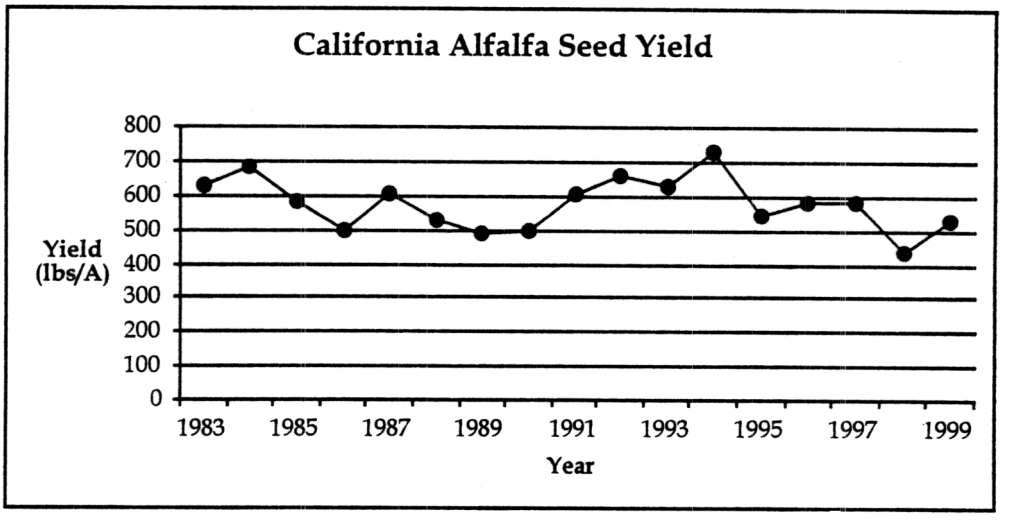
from adjacent seed fields to guarantee that outcrossing during pollination doesn't compromise the genetic composition of the variety. Depending on the adjacent crop, a seed grower may be prevented from harvesting a portion of his/her seed field if outcrossing is of concern. With the ability to patent certain genes, isolation requirements of seed production fields deserves additional review.

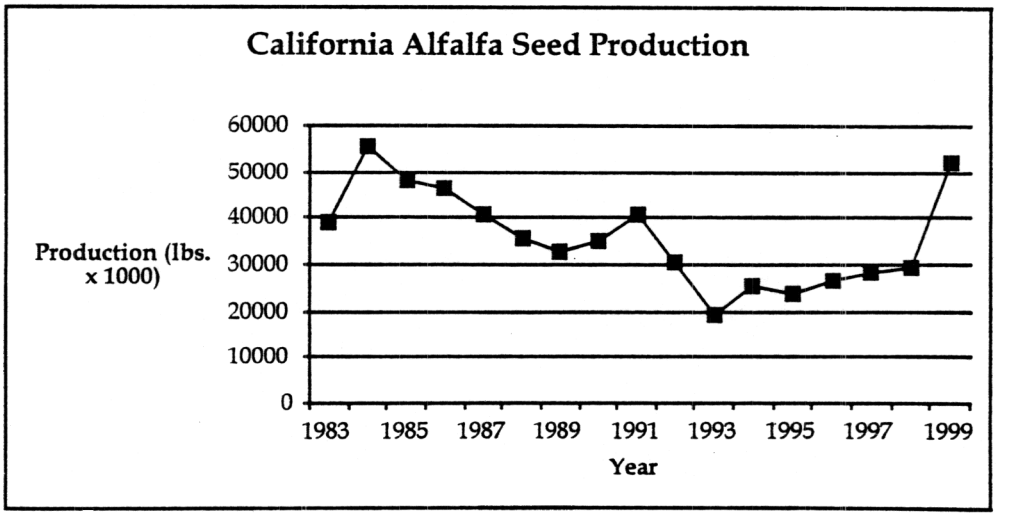
ECONOMICS

Alfalfa seed production costs are relatively high in California as compared to the Pacific Northwest because of the longer growing season, greater pest pressure, and irrigation requirement. Acreage in California declines when water supplies are short or other commodity prices are good. In this area, alfalfa seed must compete with cotton, tomatoes, and other crops with a higher profit potential. The economics of producing seed are variable, depending on the needs of companies for seed of specific varieties. In 1998, following several years of low production, many of the seed companies had limited stocks of reserve seed. Consequently, contracting for 1998 acreage was high. If production conditions had been optimal, total seed production might have been phenomenal in 1998. However, many of the new contracts were written late, requiring spring planting. When it didn't stop raining until June, some fields were never planted, and the production potential of others was reduced significantly by the late start. That was not the case in 1999. Estimates indicate that California growers may have produced almost 52 million pounds of alfalfa seed. Those kinds of production levels may lead to a repeat of 1992 when a glut of seed hit the market. Huge inventories caused seed prices to drop, acreage was taken out, and it took several years for the industry to work through the oversupply and begin contracting again.




California Alfalfa Seed Acreage
Acreage (x 1000)
120
100
80
60
40
20
0
1983
1985
1987
1989
1991
1993
1995
1997
1999
Year


California Alfalfa Seed Yield
Yield (lbs/A)
800
700
600
500
400
300
200
100
0
1983
1985
1987
1989
1991
1993
1995
1997
1999
Year


California Alfalfa Seed Production
Production (lbs. x 1000)
60000
50000
40000
30000
20000
10000
0
1983
1985
1987
1989
1991
1993
1995
1997
1999
Year