UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

FIELD CROP NOTES

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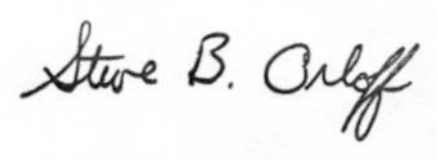

Steve Orloff
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Basics of Organic Crop Production

Rob Wilson and Steve Orloff

Organic production of crops and livestock is a small but growing segment of California's agriculture industry. The majority of the organic market in California has been high value crops directly consumed by humans such as vegetable and fruit crops. However, there is increasing interest in organic hay, and seed crops. Certified organic livestock for beef or dairy production must be fed organic hay and feed rations. Growers producing organic crops must also plant seeds that are grown organically if they are available. So, what does it take to become certified organic and what are some of the things a grower should consider? Below is a summary of the very basics and internet links to more information on organic crop production.

- Organic fields must be certified by the federal USDA National Organic Program (NOP) and registered with the California Department of Food and Agriculture (CDFA) Organic Program.

- NOP certification requires farm operations to work with an accredited certifying agent (link below) to construct an Organic Farm Plan, follow all NOP rules, and submit to at least one on-site visit per year.
    - USDA National Organic Program http://www.ams.usda.gov/nop
    - Accredited Certifying Agencies in California http://www.cdfa.ca.gov/is/i&c/docs/ACAsinCalif2004.pdf

- One of the certification requirements is a 3-year transition period prior to harvest of the first "organic" crop. During this transition period all organic standards must be followed and no prohibited products or processes can be used but the crop cannot be sold as organic.

- Small farms that gross less than $5,000 in organic sales per year are exempt from certification, but they still must follow all organic production rules.

- Producers can only use fertilizers, pesticides, and amendments as described on the National List of Allowed and Prohibited Substances. http://www.ams.usda.gov/nop/NationalList/ListHome.html

- The primary difficulties producers often encounter during organic production include pest control and maintaining adequate soil fertility. A lot of information on organic pest control and organic soil management is explained in the University of California Organic Vegetable Production Series. http://www.sfc.ucdavis.edu/research/organic.html .

  Some of the basics are listed below:

  - Proper soil fertility is primarily maintained by growing cover crops and adding compost, manure, or commercial organic fertilizers such as bone meal, fish meal, crop meals, and pelleted manure

  - Weeds are controlled through crop rotation, irrigation management, cultivation, flaming, mulches, bio-control, and/or organic herbicides such as acetic acid and corn gluten

  - Insects and diseases are controlled with crop rotation, cultural and mechanical practices, bio-control, and/or organic insecticides and fungicides.

The decision of whether or not to produce crops or livestock organically can be a difficult decision. For some it is a philosophical issue, while for others it is primarily a question of economics—whether the price premium for organic products exceeds any increase in production costs or compensates for a possible drop in production. Regardless of your viewpoint, it is undeniable that the organic food market is increasing. Organic food sales have increased between 15 to 20 percent per year over since 1998. Organic milk and cheese production has increased dramatically recently and many dairies are scrambling for organically-produced feed. Organic production may be worth considering for some intermountain producers.

Economics of Nitrogen Fertilization of Grass Hay *Rob Wilson and Steve Orloff*

Input costs for farming continually increase and skyrocketing fertilizer costs is an input that has gotten grower's attention. The logical question is how much nitrogen fertilizer is economically justified. A team of Intermountain UCCE farm advisors recently completed a multi-year study examining nitrogen fertilization of orchardgrass and tall fescue at several sites in Lassen, Siskiyou, Modoc, and Shasta Counties. The study examined different nitrogen rates as split and single applications with the goal of maximizing hay yield and economic return. For both orchardgrass and tall fescue, fertilizing with split applications of nitrogen in March and after each cutting dramatically increased yield and profit. Nitrogen applications made in early spring even at high rates did not carry over to supply adequate nitrogen for 2nd and 3rd cuttings. Therefore, fertilizer applications after both 1st and 2nd cuttings were justified. Good irrigation management was critical to obtaining high fertilizer use efficiency.

The nitrogen treatment that produced the most "bang for the buck" over the season for both orchardgrass and tall fescue was 100 lbs of nitrogen per acre (217 lbs of urea) in early spring and 50 lbs of nitrogen per acre (109 lbs of urea) after both 1st and 2nd cuttings in a 3-cut system (Figure 1 and 2). With this treatment, producers obtained an additional 32 pounds of orchardgrass hay (100% dry matter) or an additional 16 pounds of tall fescue hay (100% dry matter) for every 1 pound of applied nitrogen compared to unfertilized plots.

Even with today's high fertilizer prices applying nitrogen can be very profitable. Assuming urea costs $415 per ton and spreading the fertilizer costs $8 per acre per application, the total cost for the fertilizer treatment listed above is $114 per acre (Figure 3). Although $114 per acre is a lot of money, orchardgrass producers would make an additional $442 per acre compared to not fertilizing if the hay sold for $140 per ton (Figure 3).

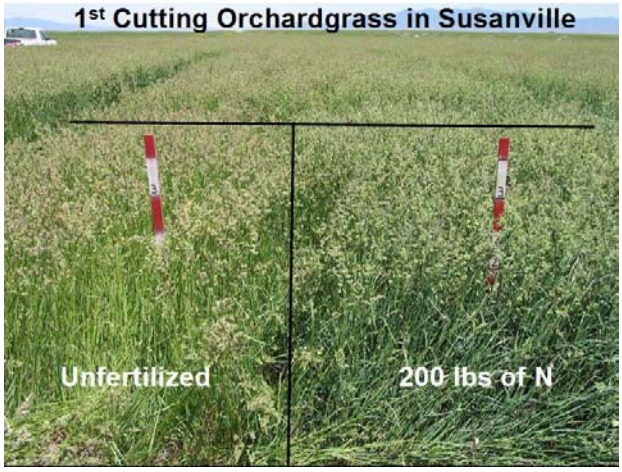
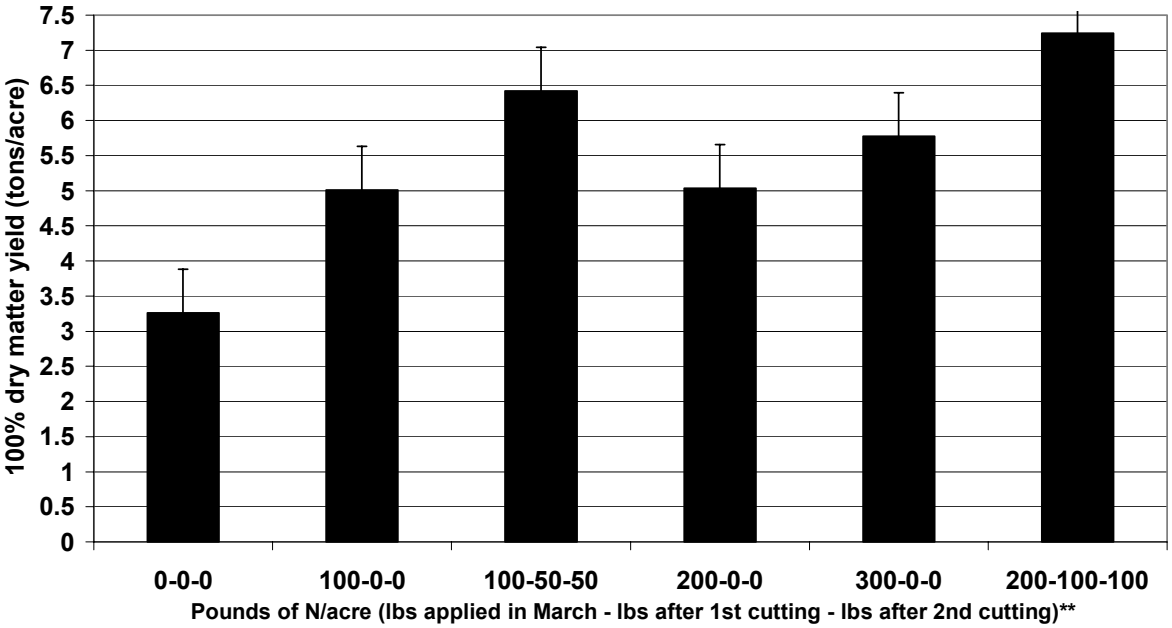


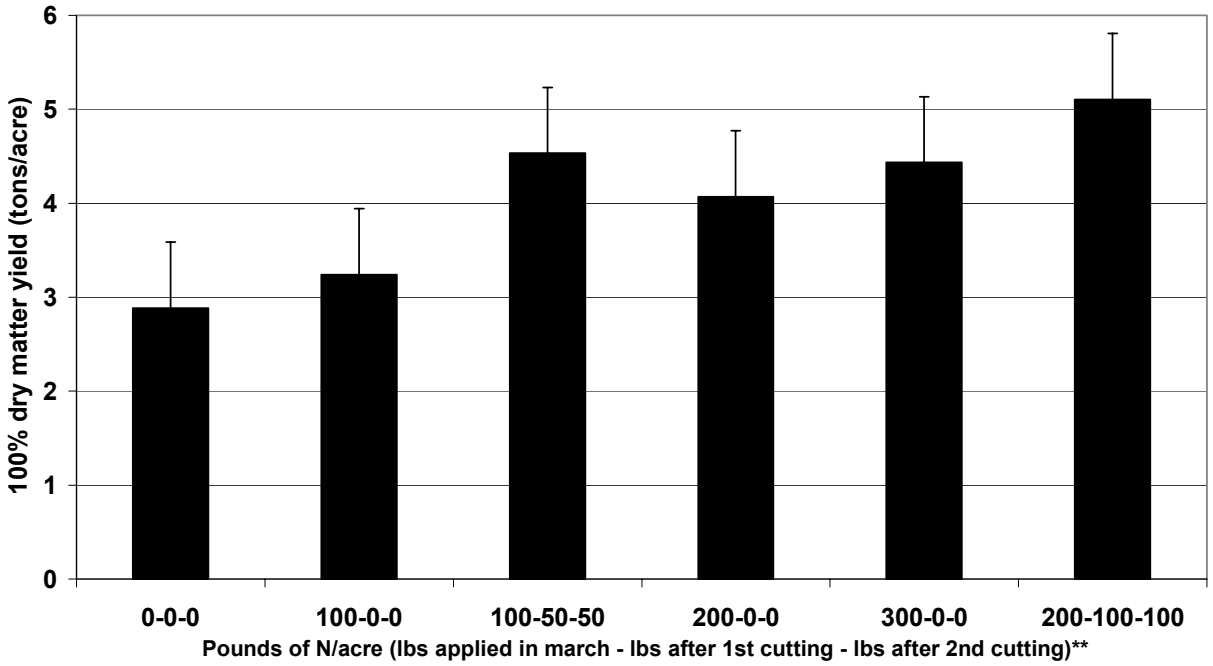
Figure 1. The Effect of Nitrogen Fertilization on Total (season-long) Orchardgrass Yield for a 3-cut system



* Error bars= 95% confidence interval

**Split nitrogen fertilization treatments consisted of applying urea in March at the time of grass greenup, at the first irrigation after 1st cutting, and at the first irrigation after the 2nd cutting.

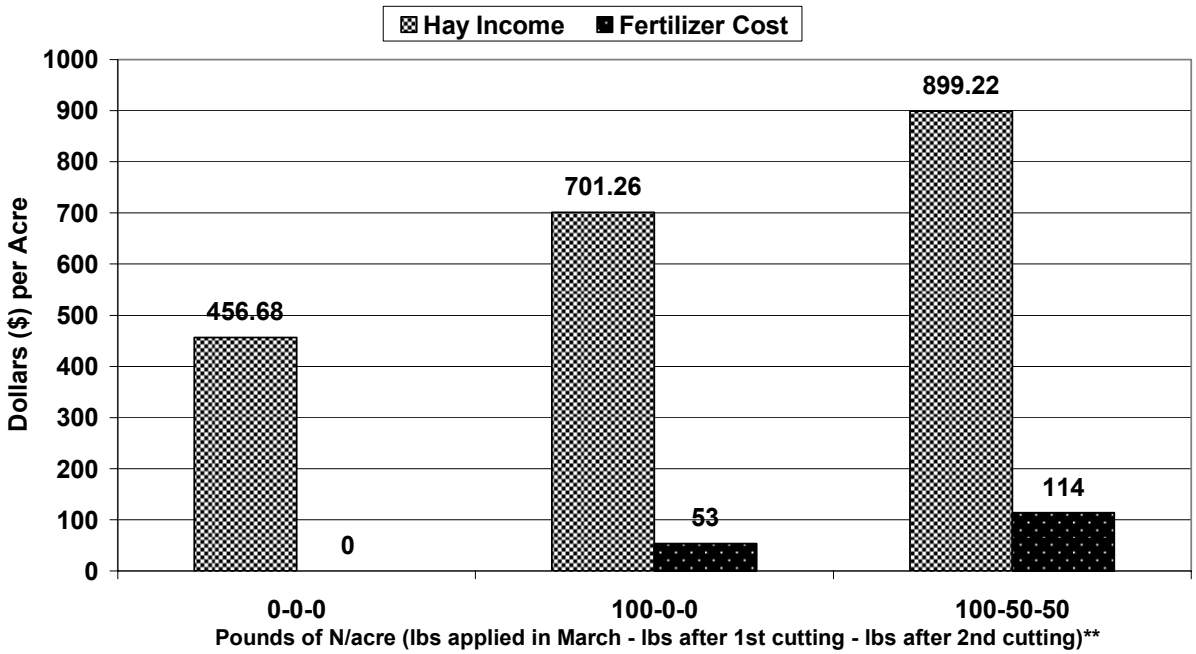
Figure 2. The Effect of Nitrogen Fertilization on Total Tall Fescue Yield at Susanville in 2006 for a 3-cut System



* Error bars= 95% confidence interval

**Split nitrogen fertilization treatments consisted of applying urea in March at the time of grass greenup, at the first irrigation after 1st cutting, and at the first irrigation after the 2nd cutting.

Figure 3. The Effect of Nitrogen Fertilization on Orchardgrass Hay Income ($140 per ton hay) in relation to fertilizer cost ($0.45 per lb of N + $8 per acre spreading cost) for a 3-Cut System



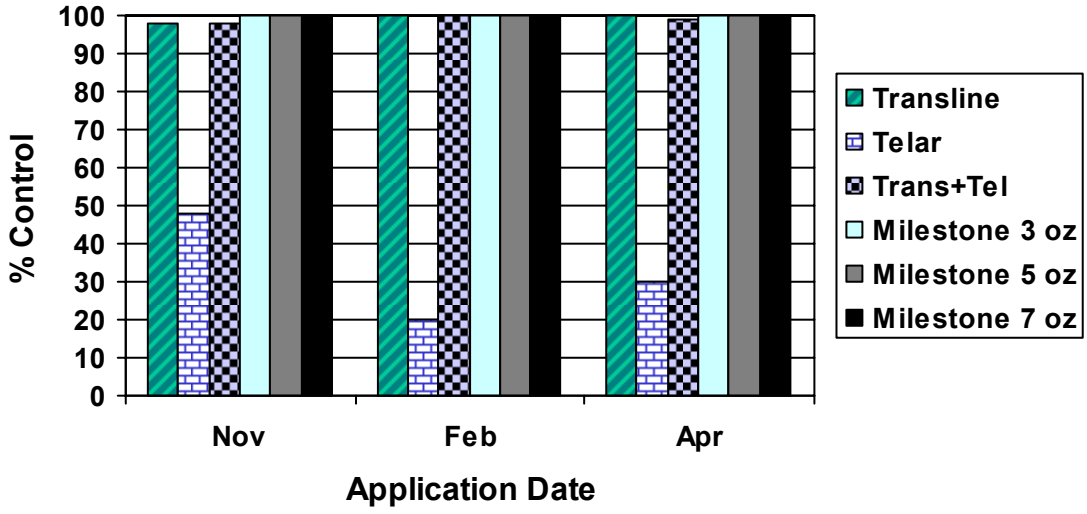
**Split nitrogen fertilization treatments consisted of applying urea in March at the time of grass greenup, at the first irrigation after 1st cutting, and at the first irrigation after the 2nd cutting.

Now is the Time for Yellow Starthistle Control

By now most of you have probably heard about the new herbicide Milestone that was registered for use in California last fall. It is very similar to Transline, which many of you have used for yellow starthistle in the past. There are severable notable differences that make Milestone especially useful in Siskiyou County.

- Milestone controls both yellow starthistle and fiddleneck (fireweed), unlike Transline which doesn't control fiddleneck.
- Milestone is even more effective than Transline on Canada thistle, one of our most difficult to control weeds.
- Milestone costs about the same as Transline per gallon but since the rate is less, the cost per acre is lower.

Now during the month of March to early April is the best time to treat yellow starthistle. The graph below shows the results of a treatment timing trial conducted last year. Milestone at 3, 5, and 7 fluid ounces per acre provided 100 percent control, so for yellow starthistle control the 3 ounce rate is all that is needed.



Update on Roundup Ready Alfalfa: Court Ruling, Initial Field Experience, and RR Varieties
Steve Orloff and Dan Putnam

There has been considerable information presented about Roundup Ready alfalfa and most growers are now at least familiar with the technology. In case you are not aware, RR alfalfa is genetically engineered so that the herbicide Roundup can be sprayed over the top of the crop killing the weeds but not injuring the alfalfa. RR alfalfa was initially released for commercial use in the fall of 2005 and has since been planted in several alfalfa fields throughout Siskiyou County and the intermountain region.

The most significant recent news about RR alfalfa is the Superior Court ruling February 17 where the judge concluded that USDA's Animal Plant Health and Inspection Service

(APHIS) did not follow required environmental assessment procedures when it allowed the commercial release of RR alfalfa. The primary issues the court ruled were not adequately addressed by USDA were the possibility of that genetically engineered seed could contaminate organic and conventional alfalfa and the potential for increased herbicide resistance. Then, on March 13 a preliminary injunction was issued prohibiting new sales of RR alfalfa seed. Growers who have already purchased RR alfalfa seed must plant it by March 30. Already about 200,000 acres of RR alfalfa has been planted across the U.S. Alfalfa from those fields can continue to be harvested, fed and sold; only seed production is prohibited. The court will hear arguments regarding the final judgment in this case on April 27. Monsanto and Forage Genetics have intervened in the case (which was only against USDA), in an attempt to allow planting of the crop while the USDA completes the environmental impact analysis. It will definitely be interesting to see how this case is decided.

There are several advantages in favor of the RR alfalfa production system but the technology is not for everyone. Most growers who have already planted RR alfalfa have been pleased with the results. Growers have put the technology to the test by planting it in fields with the worst weed challenges. It has lived up to the test in the fields that I have seen or heard about. Most growers achieved excellent weed control in seedling alfalfa—the growth stage where it is often most difficult to control weeds. Perhaps the most impressive aspect of this technology has been perennial weed control. Some weeds such as quackgrass and dandelion are nearly impossible to control with conventional herbicides and Roundup has effectively controlled these troublesome weeds.

This system has also allowed for earlier planting in late summer. Ordinarily some growers have to irrigate following a grain rotation crop to kill perennial weeds and volunteer grain prior to planting time. RR alfalfa has allowed earlier planting because these weeds can be controlled after the alfalfa is planted. RR alfalfa is particularly convenient for replant situations. Ordinarily if there is a poor stand in a portion of a field, the grower is at a loss for what to do to control weeds. Usually the area with a poor stand has the highest weed pressure but herbicides with soil activity like Pursuit or Raptor cannot be applied because they would affect the replant. However, with RR alfalfa weeds are not much of a concern because Roundup can be applied whenever needed with no concern over crop injury or soil residual.

Growers commonly ask how the yield of RR alfalfa varieties compares with conventional varieties. To answer this question a trial was established at the Intermountain Research and Extension Center (IREC) in Tulelake to compare twelve well adapted conventional varieties and a control variety (Vernal) with twelve Roundup Ready varieties. The conventional varieties were treated with Raptor in the seedling year and a tank mix of Velpar and Gramoxone the second year. There were separate blocks of Roundup Ready varieties which were treated with either Roundup or the conventional herbicide treatment.

There are several ways of looking at this trial, **1)** What is the crop injury of using

Roundup vs. conventional herbicides across Roundup Ready alfalfa varieties, **2)** comparing when the same weed control method (conventional) is used on all varieties, and **3)** comparing yields when varieties are linked to their respective weed control methods (RR varieties treated with Roundup and conventional varieties treated conventional herbicides).

1) Crop Injury. When treated with Roundup, RR alfalfa yielded 0.31 tons per acre more in the seedling year and 0.16 tons per acre more in the second year than when RR alfalfa was treated with conventional herbicides. Crop injury has been commonly observed with conventional herbicides, and this trial estimates the extent of that injury across varieties, compared with using Roundup.


Roundup Ready Variety Trial. Note effect of Roundup on conventional variety

2) Comparing varieties when using the same weed control method (conventional). In this trial it is possible to compare varieties using the same conventional weed control method. Conventional varieties on average yielded a total of 14.01 tons/acre over the first two years of study while RR varieties yielded 13.52 when treated with conventional herbicides. However, it is important to note that there was a range of yields in the varieties within each group. There were high yielding conventional varieties and high yielding RR varieties, and growers should select from the leading varieties.

3) Comparing varieties linked to their respective weed control methods. In practice, the planting of RR alfalfa is undoubtedly linked with the use of Roundup, whereas the planting of conventional varieties is linked to the use of conventional herbicides. In this trial, RR alfalfa varieties treated with Roundup were essentially no different from the conventional varieties treated with conventional herbicides.

This is only the second year of this trial and additional data is needed for a more complete assessment since alfalfa stand life is considerably longer than 2 years. Stay tuned for further field results of RR variety testing, and the results of the court case. Depending upon the outcome of the court case, plantings may be suspended for a few years (estimates place this at a 1.5 to 3 year time frame) while USDA APHIS completes an Environmental Impact Statement.

	Yield Tons/A					
	2005 Total		**2006 Total**		**Total**	
	Herbicide Treat.		**Herbicide Treat.**		**Herbicide Treat.**	
	Conv.	**Roundup**	**Conv.**	**Roundup**	**Conv.**	**Roundup**
Roundup Ready Varieties						
WL367 RR/HQ	4.18	4.46	9.31	10.04	13.65	13.95
RRALF 4R200 (Eureka Seeds)	4.23	4.41	9.72	10.04	13.69	13.85
DKA43-22RR	4.29	4.52	9.45	9.67	13.41	13.90
RRALF 6R100 (Eureka Seeds)	4.35	4.66	9.05	9.34	13.28	13.70
RR503	4.03	4.31	9.44	9.68	13.42	13.98
RR405 (Channel Bio)	3.92	4.22	9.50	9.76	13.54	13.81
R43M625	4.29	4.37	9.36	9.58	13.55	13.67
WL355R	4.10	4.65	9.32	9.25	13.48	13.99
54R01 (Pioneer)	4.18	4.52	9.51	9.33	13.74	14.19
Consistency 4.10RR	3.84	4.37	9.70	9.44	13.48	14.51
RRALF 4R100	3.89	4.26	9.39	9.43	13.95	14.45
AmeriStand 405T RR	4.21	4.33	9.34	9.34	13.40	14.00
Average	***4.13***	***4.42***	***9.42***	***9.58***	***13.52***	***13.94***
Conventional Varieties						
Lengendairy	4.40		10.19		13.56	
Hybriforce 400	5.26		9.23		13.49	
Dura 512	4.71		9.60		14.30	
Masterpiece	4.82		9.47		14.49	
Rebound	4.50		9.71		14.09	
Mountaineer	4.39		9.70		13.96	
Boulder	4.65		9.39		14.02	
Expedition	4.26		9.76		14.59	
WL 357HQ	4.13		9.84		14.04	
Innovator +Z	4.47		9.45		13.92	
54V54	4.46		9.11		14.28	
Ameristand 403T	4.53		8.96		14.21	
Vernal	4.54		8.67		13.21	
Average	***4.55***		***9.47***		***14.01***	
LSD 0.05	0.28		0.52		0.62	