



SUMP ROTATION RESEARCH NEWS

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COVER FOR THE TULELAKE BASIN - AN UPDATE

Why use cover crops in the Tulelake Basin and refuge leaslands?

Part of the sump rotation research activities are focused on testing potential cover crops that could be incorporated into crop rotations in areas of long-term cropland in the Tulelake Basin. By the term *cover crop*, we are referring to crops grown primarily for benefits such as soil improvement, erosion control, habitat provision or pest control, rather than for direct economic yield. Typically cover crops are either incorporated into the soil or left as surface mulches, depending on the objectives of the management system. In the case of the Tulelake Basin, cover crops could potentially be used for the following reasons:

- **pest control:** residues of certain species have been shown to suppress nematodes and fungal pathogens such as verticillium and rhizoctonia. In addition, vigorous species can suppress a variety of weeds. Hence, use of a specially selected cover crop(s) prior to high value row crops such as potato could be beneficial for a variety of pest control needs.

- **provide wildlife nesting habitat and/or feed:** undisturbed spring duck nesting habitat is limited in the Tulelake refuge. Cover crop management could potentially be timed, and canopy cover selected, to suit ducks nesting from April through June.
- **reduce wind erosion:** once the soil surface is more than 50% covered with vegetation erosion of topsoil is dramatically reduced. Loss of topsoil through wind erosion is of particular concern in the basin in the late fall and spring
- **soil improvement:** incorporation of cover crop residues will add organic matter to the soil; add nitrogen fixed from the atmosphere (if legumes are used); and recycle nutrients from deeper in the soil profile and redistribute them into the surface 0-8" after the residue is incorporated. Thus cover crops are widely known to improve both soil tilth and fertility.

We are currently testing a variety of species and planting/incorporation time frames to address some, or all, of the above for the Tulelake basin. In some of the scenarios being tested we are trying to fit a fall-planted cover crop between cash crops. In others, cover crops would replace cash crops for one season, or provide limited hay production only. For the latter to be a viable option, we need to demonstrate the extent that pest control, wildlife and erosion control benefits can be achieved. If the benefits are considerable, then it may be reasonable to substitute a year of small grain with cover crops. Alternatively, for

the leaselands it may be possible to develop lease programs that give credit in terms of longer lease options that provide more flexibility on row crop production if cover crops are included in the rotation to meet other management and wildlife goals.

Some promising options are listed below based on preliminary results. *These are not recommendations, but are intended as an update on the kinds of cover crop systems we are testing, and to solicit feedback and assistance from local farmers and others with this work (see page 3) :*

FALL PLANTED COVERS planting dates tested Sept 12th - Oct 31st

fall-planted covers could fulfill multiple goals depending on when they are incorporated into the soil:

- **April incorporation:** this option would ideally provide fall/winter ground cover, and some pest suppression prior to planting a row crop such as potato. *In this system land would not be taken out of cash crop production. The key is to get good establishment and fall growth to maximize winter survival and early spring growth. The following species are being tested further based on promising results from initial trials:*
 - rapeseed/rye (planted mid/late Sept)
 - rapeseed/winter wheat (planted mid Sept)
 - winter wheat/pea (planted Sept-mid Oct)
 - rye/pea (planted Sept-late Oct)
 - rye/rapeseed/pea (planted Sept-late Oct)
- **May/June incorporation followed by second cover crop:** this strategy is designed to provide *maximal pest control* and virtually year round ground cover. In addition, large amounts of organic matter would be added to the soil. Disadvantages are that no cash crop would be produced for one year, and that a May/June incorporation date would destroy duck nests. This

strategy has most promise for improving fields with serious nematode, weed or soil tilth problems. We are continuing to test the following combinations:

- rapeseed/rye - followed by sudan grass
- rapeseed/rye - followed by amaranthus
- wheat/pea - followed by amaranthus/sudan
- **incorporated after July 1:** this option would be tailored to provide *undisturbed duck nesting habitat, as well as fall/spring cover for erosion control. To date a winter wheat/pea mix has shown great promise for duck nesting and soil cover, and should also be good for soil tilth and fertility improvement. It is unclear how much nematode or weed control would be achieved if the field is left fallow from August through the winter. Therefore we are testing this system with and without rye/rapeseed planted in Sept. following wheat/pea, to see which option provides the best weed, nematode and fungal control. At present both fall planted wheat/pea and rapeseed/rye are being monitored for bird usage and duck nesting frequency on two 80acre USFWS fields adjacent to the sums.*

SPRING PLANTED COVERS planting dates tested April 11th - April 26th)

spring covers have the potential to provide good pest control and soil improvement, as well as erosion control if left in the field over winter. Disadvantages are that they would not provide nesting habitat, or early spring ground cover, and would replace one year's cash crop. Only limited data are available as yet from experiments where water management was not optimal (plots received little/no irrigation), but promising options for April plantings being tested further include:

- oat/pea
- yellow sweet clover
- annual alfalfa C.V. Blazer XL
- berseem clover c.v. Multicut

While rapeseed can grow well when planted in the spring, it appears to be vulnerable to aphid and caterpillar infestations. Therefore, in future trials we plan to test it as part of a three-way mix with oats and pea.

**Summer planted covers:
planting dates tested May 15th & June 15th**

The idea here is to find species/mixes that grow rapidly, and thus can be planted following a fall-planted cover crop yet still produce enough biomass for nematode, fungal or weed suppression. In this way, pests would take a “double hit”. This strategy would not work for nesting unless we try pushing the planting date for the summer crop into July. Promising species being tested for summer planting are:

- amaranthus c.v. Plainsman
- Trudan 8 - a variety of sudan grass
- Sudex - a sudan/sorghum cross.
- Proso millet

All of these are reputed to have nematicidal, fungicidal, or weed suppressive properties based on studies conducted elsewhere.

WE'D LIKE YOUR HELP.

In order to obtain solid information on the agronomic requirements and performance of the most promising cover crops, we are anxious to work with local farmers to monitor on-farm trials. If you are interested in testing any of these covers on your private or leased lands, please let us know and we will be happy to work with you.. (**Contact Carol Shennan at 916-664-2080 or Don Kirby at 916-667-2719**). Small test strips or larger field plantings are both of interest. In addition, there are two types of fall cover crop plantings we are particularly interested in having tested in multiple locations:

1. **fall plantings of the rapeseed alone, or in combination with rye or winter wheat, in fields coming out of cereals and going into potato.** The USFWS and USBR have agreed to allow up to a number of leased fields currently in cereal and going into potato to have the stubble incorporated and

the field planted to a fall cover crop as part of these trials. The fall cover crop must be planted by Sept 15th, and irrigated up. A call for leasees to participate in this program will be announced by mid August. If more leasees are interested than slots available, names will be drawn at random.

2. **Late fall plantings of rye, rye/pea mix, rye/rapeseed mix or wheat/pea mix following potato.** Here we are interested in monitoring the rate of growth, cover establishment and survival of mixes planted in late Oct/early Nov. Rather than simply flying on seed before potato harvest, as has been tried, we are interested in seeing if good cover can be established with these species/mixes if they are planted after harvest. We are open to testing various planting options that may be suggested.

Finally, are there any species/mixes we are not testing that you think we should, either from a farming or wildlife point of view?. If so, please let us know why you think they would be good, and where we can obtain seed. We will be happy to include them in future trials. (Contact Carol Shennan at 916-664-2080, or Don Kirby at 916-667-2719).

**TESTING OF A RAPID METHOD FOR
MONITORING POTATO PETIOLE NITRATE**
*Francisco Costa: Dept. of Vegetable Crops, UC
Davis*

As part of the Cropland/Wetland Rotation Project in Tulelake the research team is working to developing techniques for better assessment of soil nutrient release and crop nutrient status, as they are affected by different management options. Here, I'd like to describe one aspect of this work that focuses on the use of a technique to monitor nitrogen concentrations of potato plants on-site. Our first objective is to calibrate measures of nitrate in fresh petiole sap obtained using an inexpensive nitrate-selective electrode (Cardy meter), with those values measured by lab analysis of dry petioles. The main implication of on-site N monitoring by the fresh sap

technique, is that the farmer will obtain results in a matter of hours and be able to make fast decisions in relation to N fertigation rates. Presently, some farmers send petioles to an outside laboratory to be analyzed, which can take a few days. A second objective is to identify seasonal patterns in petiole nitrate and their relationship to yield, for a number of early and late maturing cultivars important in the basin. This study is being conducted as follows. In 1995 petioles were sampled from nine commercial fields of Russet Norkotah and in one variety trial at the Inter-mountain Research and Extension Center (conducted by Dr. Ron Voss, Extension Specialist, Vegetable Crops, UC Davis). In 1996 we added a N fertilizer trial at the IREC field station, using Russet Burbank as the test cultivar. At each site petioles were collected four times during the growing season and processed the same day. Half of the petiole samples were squeezed with a garlic press and the sap analyzed using the Cardy nitrate meter. The other half of the petiole samples were dried and analyzed later for nitrate at UCD. Results from both techniques were then compared.

Preliminary results from 1995 suggest that the fresh nitrate sap technique has promise for use in the Tulelake area, but additional information is needed. After the 1996 data analysis is completed we will present a summary of results in this and the IREC field station newsletter.

IN THE NEXT NEWSLETTER.....

The next issue will be printed in October, 1996.

Topics to be covered will include:

- What is *Geographic Information System?*: - and how are we using it to help assess sump rotation versus other management options?
- *New methods for tracking plant available P and N in soil and water.*
- *Update on the pilot sites*

COMMENTS??

If you have any thoughts, comments, or questions on any topic relating to the sump rotation research project please send them to Carol Shennan, c/o IREC, Hwy 139 & Havalina Rd, Tulelake, CA 96 134.



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