

## Fall 2013: The First Season at the High Desert Farming Initiative



### Introduction:

Farming anywhere can be demanding, but farming in the high desert presents its own set of challenges. High altitudes, short growing seasons, poor soils, large daily temperature fluctuations, and regular droughts are some of the factors that make the high desert a unique place to grow.

At the High Desert Farming Initiative at the University of Nevada, Reno, we are working to demonstrate agricultural systems that address the challenges of both economic and environmental sustainability for the high desert farming community.

The information we gather will enable us to develop resources for educational programs in sustainable farming systems for high desert climates, and our facilities will provide growing opportunities for research and hands-on educational experience to UNR faculty, students and the surrounding community.

Hoop houses don't allow for the disregard of local climate, they do however, provide season extension. At HDFI this means we can plant about a month earlier in the houses than we can outdoors, and with careful crop selection, harvest year round. In addition to wind protection, our hoop houses provide moderation of temperature. The houses are 12-15 degrees warmer compared to cold temperatures outside and we expect temperatures to be 15-20 degrees cooler during the heat of the summer.

### Hoop Houses:

We have 6 new hoop houses on site that were planted this fall. Four 24'x 96' and two 24'x 124' gothic style hoop houses with 7.5oz film and drop down sides. In each of the hoop houses we also installed low tunnels over each bed giving us protection during the coldest temperatures. The remaining two older hoop houses were not covered in time to be planted for the cold months.

The native soil at our site is a rocky and highly compacted heavy clay. Initial soil testing showed:

- pH 5.7
- Conductivity: 1.2 dS/m
- Nitrogen: 39H
- % Organic Matter: 2.9M
- Boron: 0.4L

To improve the soil and increase drainage, we moved over 500 yards of sand, topsoil, and previously improved agricultural soil into the houses, increasing the grade in the hoop houses by an average of 10 inches. We fertilized each bed with 80lbs/acre of a 7-5-4 organic fertilizer and amended with about a half inch of compost.

To provide even soil moisture and conserve water, we installed a drip irrigation system in each house. We installed 3 rows of drip tape with 6 inches between emitters in each bed, and the requisite filters, pressure regulators, and timers to provide accurate, automatic watering of our hoop house crops.

In mid-September we direct seeded ten varieties of lettuce (Lettony, Anzar, Poloma, Chicoma, Green Mini Romaine, Green Eazyleaf, Tropicana, Berams, Breen, and Red Romaine) as well as tatsoi, mizuna, mustard (Red Giant), and spinach (Shasta, Tyree). We saw inconsistent and spotty germination across these beds, which we hypothesize may have been due to a number of factors including old seed, uneven moisture, high ammonium content in the compost, and cold weather. Transplants from our greenhouse have not grown to maturity.

### Greenhouse:

We currently operate one greenhouse for plug production. Seeding began in mid-September and we seeded about 250 plug trays during September and October for October and November transplanting. We used 128 cell plug trays on capillary mats, and a soil-less mix consisting of peat, perlite, and dolomite lime. To provide consistent fertility, we used a proportioning fertilizer injector to add fish emulsion to the irrigation stream.

Depending of the variety, the plugs matured 14 to 25 days after germination, after which they were transplanted into the hoop houses. The best performers of these late season transplanting were mizuna, tatsoi, mustard (Red Giant), and two varieties of lettuce: Fosey and Carnival.

Because of older equipment, we did not have heat in the greenhouse until late October and the moisture to the capillary mats was uneven. Despite these issues, we had almost 100% germination rates with our transplants. Our temperature ranged from 12° F at the coldest to 75°F. We have since installed climate controls and have plans to upgrade our irrigation system. This will allow us to start our transplants for the spring early.

Our greenhouse structure includes:

- 30' x 96' structure covered in 6mm twin wall polycarbonate with a gable vent
- Two 180k BTU natural gas heaters
- 22ft long evaporative cooler
- Two 36in. slant wall exhaust fans
- Twenty 5ft x 10ft benches with capillary mat and drip irrigation (2.5gal/hr/bench)

### Pest Management:

The High Desert Farming Initiative is an organically managed operation. We employ a variety of botanical extracts, microbial disease control agents, and insects as part of an Integrated Pest Management program to manage disease while minimizing impact to human health and the environment.

Application is primarily through backpack sprayer and chemigation. The fungal components of the pesticide arsenal are used as preventatives, colonizing the roots of healthy plants and soil, preventing infection. In the future mycopesticides will be applied through the irrigation systems already installed on site.

Up to this point, there have been minimal pests, with no significant crop loss. However, this is probably due to the infrastructure of the facility being in its nascence. As crop heterogeneity and overall biomass increases, pest management will become much more vital to economic stability.

Aphids have been found in multiple hoop houses and the greenhouse. Though it is a very common, almost unavoidable pest, efforts were made towards eradication. Neem oil and Pyganic

(composed of extracted pyrethrins) were applied to all plant surfaces, which temporarily resolved the infestation. Complete eradication of insect pests, especially those types which are small and very numerous, is difficult to achieve using an organic approach.

Pest control products this season include:

<b>Product</b>	<b>Type</b>	<b>Application Rate</b>
Neem	Fungicide/Insecticide/Miticide	30 ml/gal
Pyganix	Pyrethrin	10 ml/gal
Mycotrol O	Mycoinsectide	16-30ml/gal
RootSheild	Biological Fungicide	3-5oz/100gal
Rapsody ASO	Biofungicide	1-2gal/100gal
M-Pede	Insecticide/Fungicide	100-150ml/gal

### Conclusion:

Thus far, growing greens in our hoop houses has been successful. During the single digit temperatures on our site from December 4th to December 12th, the low tunnels and hoop houses kept the greens safe from cold weather damage. In addition to the low tunnels, we distributed straw over the greens to protect the younger plants. This technique is something we will weigh seriously in the future, as the straw made harvesting the greens more labor intensive. In some instances, a certain amount of crop loss would have been preferable to taking the time to pick straw out of the lettuce mix. This winter it was important to start supplying our customer as quickly as possible so we made the determination that a little extra labor was tolerable in exchange for supplying our main customer.

The varieties that we found to be most successful over the winter were mizuna, tatsoi, Red Giant mustard and Chicoma Eazyleaf lettuce. These varieties were selected for their cold tolerance and were expected to perform well. The Chicoma seed was pelleted for faster germination during more tolerant temperatures. The transplanted varieties have not yet reached maturity.

Many thanks to the following local businesses that made our 2013 season possible:

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