

## SUMMARY

Our Season Extension trials have shown that any cover provides benefits like earlier planting, earlier harvest, increased yield and pest exclusion for most crops and provides more warmth allowing warm-season crops to mature at our high-altitude site with cooler summer temperatures, especially at night.

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# High Elevation Season Extension (HESE) Growing Trials



There is an increased demand for local food production at the home garden and commercial levels. There is also increasing concern about food insecurity in rural mountain communities with extremely short growing seasons in Colorado. These communities rely almost exclusively on fresh produce and other food items that are trucked into the area. Increasing local production of crops will make areas more food secure.

Season extension techniques play a necessary role in crop production at high elevation areas with extremely short (~60-120 day) growing seasons. Utilizing a combination of proven season extension techniques and adapted plant varieties will allow rural mountain communities to become more food secure and increase the potential for additional income by selling produce.

In 2011, we began yearly growing trials comparing yield and quality of vegetables grown under different season extension covers and no cover. We have also been evaluating different varieties of each vegetable grown to determine adaptable plant varieties for high elevation growing. We try to choose open pollinated varieties so that we can recommend seed saving as well.

Our season extension beds are located in Telluride at 8,750' in elevation. We have occasionally grown with Teller and Eagle counties. Their elevations are 6,601' and 8,900' respectively.

Colorado State University, U.S. Department of Agriculture and San Miguel and West Montrose counties cooperating.  
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San Miguel Basin  
Colorado State  
University Extension



MASTER GARDENER  
COLORADO STATE UNIVERSITY  
EXTENSION

## METHODS AND MATERIALS

The materials we've used for the covers we have grown under are:

1)3.5 mm and 5mm insulated twin-wall Solexx™ XP paneling, a flexible polyethylene cover with a 2.3 R-value, a 0.43 U-value that allows 70-77% soft diffused light.

2)Agribon Ag30, a medium weight (0.9 oz/yd<sup>2</sup>) spun-bonded polypropylene row cover fabric allows 85% light

3)Dio-Betalon (Tuffbell 3800N) polyvinyl alcohol film allows 90% light

4)an uncovered bed for a control

Our 4 raised beds (>22 inches tall, 4' wide x 12' long) are constructed of untreated lumber. All are oriented east to west, with the long sides facing south to capture the most solar gain. Three of the beds are fitted with hoops made from electrical conduit to support the covers. The bed with the Solexx™ cover is on a wooden frame that is attached to the top of the bed.

Air temperature and soil temperature in each test plot are monitored using automated data loggers to directly compare the effect of soil and air temperature on plant growth under each cover.

Fresh yield weights are recorded

Photographs are taken

We record anything else of interest

## CROPS WE HAVE TRIALED UNDER COVER\*

Summer 2011 and 2013 we grew bush green beans and summer squash at the beginning of the season

In 2011, 2012 and 2013 we grew spinach, kale, mache and arugula through the winter

Summer 2012, 2013 and 2014 we grew head lettuce

Summer 2015 we grew carrots

Summer 2016 we grew broccoli

Summer 2017 we grew bush green beans

2018 and 2019 we are growing day-neutral strawberries

\*brochures will be available for each vegetable we've grown in our trials



## GROWING UNDER SOLEXX™

We initially installed 3.5 mm Solexx™ over the hoops. It broke down within 2 years of installation. After that we built covers with wooden frames covered with 5 mm Solexx™, recommended for high altitude sunlight. Both designs were fitted with automatic vent openers.

### PROS

When 5mm is installed on a rigid frame, it is the longest wearing cover we have.

Usually gives highest yields of warm season crops

Has given an earlier start and usually the first harvest for cool-season crops

Conserves water (less ET)

Excludes insect pests

### CONS

While it diffuses the light, distributing it evenly, it blocks some light so we have had more plant 'stretching' and less coloration.

Humidity is higher leading to more plant disease

Salts build up in soil (less leaching and ET)

Pollinators are excluded but some get in through the vents

Part of our frame is lower than our hoops so there isn't as much height for plants to grow

Sometimes it gets too hot for best quality crops



## GROWING UNDER 30% ROW COVER FABRIC

### PROS

Inexpensive

Easy to install

Maintains cooler temperatures and some shading in summer

Allows air circulation and some rain to pass through

Usually increases yields of all types of crops compared to no cover

### CONS

It doesn't last as long as our other covers, especially if left on in winter when it can tear under snow load.

Humidity builds up under it, leading to disease.



## GROWING UNDER DIO-BETALON™

### PROS

Best light transmission of all covers we've grown under so better color and texture of colored lettuces

Warmer than row cover fabric

Plant leaves dry out quickly so have less disease

Lasts longer than row cover fabric but not as long as 5 mm Solexx™

### CONS

More expensive than 30% row cover fabric

More difficult to find, especially in larger sizes

Must allow for 5% shrinkage after installation

## GROWING WITHOUT COVER

### PROS

No expense or maintenance for covers

Some cool season crops grow well without cover in high-altitude, cool-season areas

Open to rain so salts leach out

### CONS

Benefits of covers are lost (earliness of planting and harvest, pest exclusion, etc.)