

## **ANOTHER SCI: A SYSTEM OF CARROT INTENSIFICATION** – Mark Fulford – November 2014

On our Teltane Farm in Monroe, Maine, USA, we have begun adapting System of Crop Intensification (SCI) ideas to our carrot production, with considerable success in this second trial season (2014). A previous and smaller trial of SCI for carrots in 2012 was very successful and encouraged us to expand and duplicate the methods that worked very well again in 2014. We look forward to making further adaptations and refinements for other crops in the years ahead. [A summary of the 2012 experience is added to this report.]

From a late-planted bed measuring 5' x 82' (410 square feet), an overall harvest of 613 lbs of Cordoba carrots were harvested, washed, sorted, and weighed. This variety is recommended for shallow, heavy or rocky soils where long-growing carrots do not do well. Of the harvest, 73 lbs were considered as seconds, due to mice or deer damage. No wireworms or carrot flies were noted, and the crop had virtually no disease.

The yield of no. 1 grade carrots was extrapolated as 54,296 lbs per acre, with a gross yield of 65,262 lbs per acre. A yield of about 20,000 lbs per acre is normally considered a good yield. The best 510 lbs were sold at a premium price of \$1.25 wholesale. The value of just the no. 1 grade carrots worked out to a potential profit of \$67,870 gross per acre at wholesale prices, before subtracting input costs.

The practices used, following the concepts we have gotten from considering SRI and SCI experience and recommendations, were:

- Seed was sown in the raised bed very thinly to encourage greater size and to eliminate the need for hand thinning.
- Stale bed practices were followed to facilitate weed control, as explained below. This strategy involves preparing the bed several weeks before it is sown, so that viable weed seeds in the soil germinate and can be easily eliminated before and particularly after the carrot seeds are sown, but prior to carrot emergence. Timing of this part of the operation is a most important step.
- The soil in the bed was amended with a mixture of rock powders and crabshell meal, thereby maintaining organic production. The bed itself was rainfed, with no irrigation.
- The bed was lightly tilled and allowed to 'rest' for approximately 2 weeks before sowing. In this time, it grew a nice flush of annual weeds up to the seed leaf and first true leaf stages.
- The carrot seed was then planted by a cheap Earthway type seeder, set so that it would plant seeds shallowly (1/4") and widely apart (about 2"), with the least possible disturbance of the soil, directly into the weedy bed.
- The timing of carrot emergence was calculated by placing a clear plastic cover over a small section of bed to provide a prediction tool.
- Approximately 1-2 days before the carrot plants were expected to emerge, the now very weedy bed was sprayed with a mixture of water, vinegar and citrus oils. This burns down the weed growth in full sun light and allows the emerging carrots full use of the bed with little or no competition.
- 40 days into the season, a half hour of hand weeding was sufficient to clear any late-germinating weeds from within the 4 rows of carrots. This was the only weed control time spent for the test bed.
- Harvesting was done at 79 days after seeding. Many of the carrots reached one pound in weight. The accompanying pictures show the bed and the harvested product.



Bed of SCI carrots (5 x 82 feet) on Teltane Farm, Monroe, Maine, 2014



Harvested SCI carrots at Teltane Farm, Monroe, Maine, 2014

## **Carrot Intensification in Monroe, Waldo County, Maine, October 2012**

A carrot crop planned to incorporate various ideas and principles of SCI was planted in early June, 2012, using a 'stale bed' method for closely-timed weed control, with thinly strewn seed, concentrated fertility and deep aeration of the soil.

The plot was a 5' x 30' bed, prepared with a top dressing of 35 lbs of a broad-spectrum mineral, fish and seaweed dry blend applied on the surface. This was incorporated to a depth of 16" with a broad fork usually used for harvesting root crops. The surface was raked and watered once to encourage summer weed seeds to sprout evenly and quickly.

After 18 days, a thick growth of summer weeds had germinated, reaching not more than 1" in height, at the seed cotyledon and first set of true leaf stages. Four rows were marked out for the carrots, 12" apart, cut through the weed growth using the edge of a sharp spade, to open up narrow slices into the weed growth for planting the seed.

A mid-season carrot variety (Yaya - Fedco Seeds) was carefully hand sown from a half-pint bottle with a small 1/8" hole drilled in the cap to help reduce seed flow to a sparse trickle. Care was taken to plant the seeds not closer than 1" from each other.

A couple of small panes of plastic or glass window were placed on top of these rows in two random places. These served as prediction tools to give 1-2 days' notice of when the carrot plants would emerge through the now-weedy soil. The panes, by heating up the soil under them, accelerated the germination of the carrot seeds there to give notice on when weed control should be undertaken.

On the first predicted carrot-emergence day that is hot and sunny, the prediction windows are removed, and the entire bed is sprayed down with a course, low-pressure spray of apple cider vinegar at 1/2 strength with water dilution and a biodegradable dish soap or yucca extract soap, which could cut through the silica layer that is the outer skin of the weed leaves, exposing their interior cells to desiccation from the sun and the acetic acid in the vinegar. (There are also commercial products on the market for organic growers which have the same effect for organic weed control.)

The weed growth was killed to the ground within less than an hour, leaving the carrots free to emerge without need to weed or thin for approximately 40-45 days. Any weeding done was occasional and by hand, to remove galinsoga, lamb's quarters or a fine fescue grass. It is critical to not hoe or to disturb the soil surface during the season unless done late as to avoid disturbance of weed-seed-laden soil which immediately triggers more weed germination.

The resulting harvest at 70 days was as follows. From the 150 sq. ft, 4-row carrot bed, we harvested 254 lbs (1.693 lbs per square foot). This works out to be a yield of 73,762 lbs per acre. The recorded US average carrot yield per acre in 2010 was 26,800 lbs, with 33,750 lbs per acre considered as excellent. Of the 254 lbs, just under 20% were blemished in some way and so were graded as 'seconds' for processing. (The lower grade carrots were due to a small amount of carrot rust fly damage, and some minor splitting from excessive rainfall near the end of the crop cycle. So the total yield of 73,762 lbs minus 14,752 lbs for 20% as culls and seconds gives a marketable yield of 51,010 lbs. Estimated value of marketable carrots per acre @ organic wholesale price of \$0.80 to 1.00 per lb was \$45,910, using the intensified methods described above.

**Inputs:**

The organic soil amendment fertility minerals would amount to just about 5 tons per acre at an estimated cost of \$625 per delivered ton = \$3,125 (2012 prices)

- 2 days for planting, plus ½ day for flame weeding or vinegar-soap weeding.
- Mostly hand weeding and very little thinning 5-6 days/acre throughout the growth period, with hired labor to manage the crop after sowing date. 1 person @\$10 hr. (up to 48 hrs) = \$480
- Harvesting - 5 days, includes washing and grading to storage cellar x 3 people @ \$10 hr = \$3,200 + \$480 for management up to harvest = \$3,680 total for labor (generously allowed for). Weeding and thinning are usually the greatest expenses for crops such as carrots.
- A pressure washer was used to great advantage for washing the trial plot crop quickly.
- A well-adjusted seeding tool with the right seed plates may further improve the larger-scale efficiency (even a cheap Earthway model can do this).
- Very fresh good quality seed may run not much more than \$100-150 per acre sown in such light, well-spaced amounts (depends on variety and source).
- Costs of production, not counting in the value of the land, would have been between \$7,000-8,000, making this a very profitable operation.

The single most significant profit factor is the stale bed method of weed control which could be even more effective with a prior cover crop application of mustard for biofumigation purposes turned in the previous fall, serving also as a way to control slugs, wireworms, nematodes and soil-borne fungal pathogens while adding to soil fertility.

The next suggested crop to try using this method is direct-seeded, short-season, long-day onions. Onions do not tolerate weed competition well at all, so appropriate management techniques will need to be used for cost-effectiveness.