Cover crops in Vegetable Rotations

Slide 10. These slides will show you what we do at Poplar Bluff. We are 2 farms which together total about 300 ac. In any one year of the rotation, we would have about 40 ac in potatoes, **Slide 20** 15 in carrots, beets, parsnips, there is also a tree nursery, another project, **Slide 21** and 2 ac in mixed seasonal greens. **Slide 30.**

Slide 40. Historically, our rotation would include a summer fallow year to reduce weed pressure. In this old photo, you can see eroded knolls, numerous rocks and badger holes. In the most Northern field, at the top right of the photo, you can only see a corner of it in this picture is a shallow hill where there is a slough at the bottom and erosion rills running the entire length of the cultivated hill.

Slide 51. Root vegetable production is extremely hard on the soil structure and biota. The potato harvest process is to pick up the top 8-10 inches, shake it hard, then dump it on the ground upside down. Then we drive on it with heavy equipment.

Slide 55. The carrot fields are as bad or worse because the rows are closer together so the truck only moves over 20 inches with every pass. **Slide 57**. You can see how compressed the field looks after a harvest session.

Slide 57.2. This potato truck is loaded with 12 tons, of potatoes - totaling about 46,000lbs. Here the driver hit a soft spot in the field and tipped the wagon. How much compaction resulted from the efforts to right it again?

Slide 57.5 Then there is the many cultivation passes. I don't know if we are trained to see this as beautiful or if it is just part of our human need for orderliness. **Slide 58**. This heavily cultivated field and clean hills of potatoes is actually quite destructive. The soil that is being kept black is under siege. The organisms in that black soil are being starved because there is no plant roots to feed them, and be fed by them.

One of our first attempts to improve soil tilth with cover crops was not planned. . We had some 13 year old peas sitting in a bin that has been sold and the buyer wanted to move it. Not knowing what else we would do with them, we planted

them and were amazed that they grew. We realized an unexpected benefit because the peas covered up the weeds growing under the canopy and kept the neighbors happy until we were far along enough along with harvest that we had time to go and turn it in.

Slide Next we tried tillage radish alone. **Slide 60.** In this field, this one with the slough and the erosion rills. We planted tillage radish in the bottom of that field and up the slope. That winter was some of the deepest snow accumulation we had had in decades. In the spring we were expecting Lake Carseland. We couldn't believe it. There was no slough! The tillage radish had left holes in the soil as big around and as deep as a candlestick. There was no run-off and no rills in the field. We were sold right there, but the benefits continued. When we got out to do the spring tillage, fuel consumption was cut by half, the field was already loose, making the spring cultivation pass unnecessary.

After one of Jill Clapperton's presentations, we decided that we needed to do something about our practices and realized that cover crops could be done in more ways than simple rotations.

1. **Slide 62**. Strips which are really just more intense rotations. We used to rotate crops through large fields. We had problems with wet springs in that we couldn't always get into a low field in the rotation year. So we have gone to smaller strips in each of the fields – that way we can find a dry place somewhere to plant and carry on with the rotation within each field. This also helped with irrigation in extremely dry, windy weather we can get over the field in a more timely manner. In this slide you can see a foreground of faba beans, radish, vetch, berseem clover and volunteer "annual" ryegrass. The black is the potato field already dug, then then a strip of green – buckwheat-vetch mix planted after the early potatoes were off. Then a strip of wheat. Mark from Heritage Harvest grows in our rotation – we get some diversity into our rotations.
   Slide 65.5 This is a cover planted August 1st. Faba beans are frozen off, the vetch is hard to see – it was too late a planting date for it, but the radish looks good.

Slide 67.5 This is a pix of a cover planted in the fall – November. We thought it was a long shot, but these barley and peas were planted after the beets and carrots were off. We had a very cold snap, but they came up and grew when it warmed up again.

2. **Intercropping.** The plan this year is to under-seed wheat with sweet clover. We like the idea that in the spring of the second year the sweet clover will be competing with the weeds – spreading out spring work. This is the between row intercropping. We are looking at planting between potato rows as well, but this interferes with mechanical harvest. Neither potato nor carrot harvesters as currently built, can handle the extra trash, making species selection important.

3. **In the row "companion" planting**. This year we planted peas, in the rows with the potatoes, and when the peas ran out, faba beans at the same time with the potatoes. Both came up well, but did not survive the hilling passes. This year we will try planting during the last hilling pass.

4. The fourth thing we tried was **no-til potatoes**. We did no seed bed prep on the previous cover. **Slide 68.** This is a normal seed bed, as you can see, the soil is quite finely worked, but it makes a nice hill. **Slide 70** Under no-til, the soil is quite chunky, the hills are not completely covering the potato seed. The seed grows in spite of the conditions, but freezing nights and hot, windy weather are problems. The "annual" ryegrass was the largest problem because it had started growing again and still had a stout root mass. We are thinking as long as the previous cover were true annuals, it would go much better. **Slide 74.** We did modify the planter for no-til conditions, cultivator shanks were mounted in front to open a furrow in the trash.
5. **Slide 74.** This is the field planted, as you can see it looks pretty rough at this stage.

Slide 74.5 Cover crops were called "Green Manure Plow Downs" so we bought a plow. 100 years ago this was the technology that destroyed

prairie soils. But we tested it. We are not sure if the plow is going to place the nutrients from the cover crop too low in the soil profile for the next young crop to take them up. But it does bring calcium back up to the surface. The next series of slides shows the various tests that we did.
Slide 75. This is a May pix. See how big the sweet clover is already. This is a mix of hairy vetch, sweet clover and annual ryegrass.
This it coming up in year 2, between carrot strips. The test was 4 strips – all were mowed at least once to keep the annual ryegrass from going to seed. 1 strip was mowed just before the plow, other strips were at taller stages. The plow worked best on the approx. 1 foot high stage. The strips 2 feet high or more just plugged up the plow. At mid-July, immediately after plowing, another cover crop was seeded back in. Faba beans, berseem clover, tillage radish and vetch.
Slide 80. It was left rough, no discing or harrowing or additional tillage. The disc drill bounced over it and worked fine, hoe drills would have plugged up. We did have to make an extra pass for the faba beans because of the very large seed size.

In this picture, **Slide 90** we are reseeding into a low spot where the alfalfa had initially drowned out. This field was nearly underwater when bought 5 years ago. It had severe compaction from heavy equipment working it too wet, no-til and conventionally. By planting covers, the compaction is reduced as plant roots are breaking it up and using excess water and productivity is coming back**.**

Slide 100. Odd shaped fields present an opportunity to make that land contribute to the cropped fields. This piece had lots of sloughs and triangles that don't work with row crops. These odd pieces were seeded into an alfalfa hay mix. The hay is cut and then blown over cropped areas.

Slide 110 This is a picture of the greens field just before a hard frost. The leftovers from this season will contribute some organic matter into the field for the following year. We are not wanting to do livestock ourselves, but

would like to work with someone who does, as this would have made a months grazing in the fall for cattle, sheep or hogs.

Finally, we would highly recommend the pivot and grow website. It has tons of good information to wade through. It has calculators to estimate the nutrient flow into and out from a field. The SARE website also has good information as long as you keep in mind that it was written for a much warmer climate.

Ducks and CPS are doing a promotion for forages, you may be able to take advantage of this opportunity. It however, is aimed at someone who is putting in a long term forage field.