ALTERNATIVE SYSTEMS FOR PROCESSING VEGETABLES

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Vegetable production occurs in many regions across Wisconsin, but no where is it more concentrated than on the irrigated sand soils of Central Wisconsin. The capacity for irrigation and the flexibility the sandy soils provide in terms of planting and harvest allow for optimal production of a number of different vegetable crops. However, these production systems are vulnerable to large environmental impacts because of the intensive crop management practices utilized for vegetable production and the nature of the sand soils. Many vegetable growers in the Central Sands and other regions of the state are interesting in improving the sustainability of their systems. Meeting the goal of enhanced sustainability will require development of systems with enhanced profitability for growers and reduced environmental impacts from the system.

Research on alternative production systems has been initiated to address goals of production systems with increased farmer profits and reduced environmental impacts. The primary focus of this research has been on improving the nitrogen use efficiency of the system. The first objective has been to remove more of the fertilizer nitrogen from the field in the form of the harvested crop. To meet this objective would require increasing the yield of the crop without increasing or decreasing the amount of fertilizer required to produce a crop with similar yield and quality. The second objective has been to retain more of the nitrogen not utilized by the crop in the field. To meet the second objective, requires practices that tie up nitrogen and keep it available for the following crop in the rotation.

A number of research trials have been initiated to address the goal of enhanced sustainability. These include annual cover crops, perennial cover cropping, intercropping, manures, use of varieties with improved nitrogen use efficiency, and utilization of organic nutrient management practices such as green and organic amendments. This paper will include brief introduction of perennial cover cropping under sweet corn. Much of this is preliminary research but represents opportunities available to begin rethinking annual vegetable crop production.

Perennial Cover Cropping

One of the challenges on the Central Sands is the loss of soluble nutrients, primarily nitrate, prior to crop harvest or before the establishment of a cover crop is possible. An approach that would minimize the potential for nitrogen leaching would be to establish cover crops that would have minimal interference on crop production, potentially supply nutrients to the vegetable crop, and still be standing after crop harvest. Use of kura clover as a perennial cover crops has been demonstrated in field corn rotations at several locations in Wisconsin (Albrecht, UW Agronomy). However, there may be an opportunity to develop similar rotations within vegetable rotations. Our primary focus to date has been on the utilization of perennial cover crops in Central Wisconsin. The availability of irrigation increases the chances of success with this practice as the threat of soil moisture loss is mitigated.

Our initial focus has been on evaluation of cover crop establishment within a snap bean – sweet corn – potato rotation. Our initial plan was to compare inter-seeding of sweet clover, red clover, white clover, hairy vetch, and alfalfa within snap bean during the first phase of the rotation. We wanted to establish the cover crop during the snap bean production year to eliminate

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the need for irrigation after snap bean harvest. Initial results have led to incredible stands of the respective cover crops, but limitations on herbicide options and competition from cover crops has reduced yield and quality of snap bean to unacceptable levels. Research will continue to determine feasibility of optimizing snap bean production while under-seeding with different perennial legumes.

Sweet corn was planted into each of the perennial cover crops after it had been sprayed with glyphosate at 1 lb/a and disked. Sweet corn yield with no cover crop was about 2 ton/a without nitrogen and over 8 ton/a with nitrogen. Sweet corn yield under the perennial cover crop ranged from 6.5 to just over 8 ton/a without nitrogen, whereas sweet corn yield with nitrogen fertilizer was similar to the no cover crop check (Table 1). These preliminary results indicate that perennial cover cropping was able to supply nearly all the nitrogen fertilizer demands of sweet corn and that optimized yields would have only required an additional 20 to 30 lb/a of nitrogen.

Table 1. Sweet corn yield response to perennial cover crop with and without nitrogen fertilizer applied at the recommended rate.

	Yield (ton/a)	
Cover crop	0 N	Rec N
No cover crop	1.82	8.36
Hairy vetch	6.87	8.88
Alfalfa	6.45	8.08
Red clover	7.31	8.81
Sweet/Yellow clover	8.09	8.57
Alsike clover	7.14	7.85
LSD	0.97	

In addition, the nitrogen benefit of the cover crop in sweet corn, several species survived sweet corn production and continued to grow after sweet corn harvest. This eliminates the need for establishment of fall cover crop following sweet corn harvest. In addition, the perennial clovers may provide nitrogen for the subsequent potato crop that will be planted in 2007. Several questions remain related to this system, especially the influence of perennial clover on root rot development in snap. Another consideration is the effect of reduced tillage on root rot in snap bean as well.

This provides a snap shot of systematic changes could be done to improve sustainability of vegetable crop production. Much work remains to optimize the production system, understand influence of practices on nutrient cycling, determine environmental effects, and document profitability.