

SARE Report

FNE02-433 SUSTAINABLE PRACTICES FOR THE FIELD GROWN PERENNIAL CUT FLOWER GROWER



This is a report on the results of experimentation with a variety of cover crops. The goal of the experimentation was to determine:

1. if cover crops are a viable way to address the ever present challenge of weed control in perennial field grown cut flowers.
2. are the uses of cover crops as a way to control weeds less labor intensive and therefore more affordable.
3. if a third advantage to this approach would be improved soil conditions because of the use of green manures.

The farm continues to cultivate 5 acres of flowers. The perennials have been reconfigured because of this project and now cover 3.5 acres. An additional 2-3 acres are available for annuals and future perennial plantings.

I have been a "cut flower grower" for over 16 years. My first field, in Stockbridge, Mass., was a south east facing meadow . The land had been leased to a farmer for haying as long as anyone could remember. The soil was rich and dense. The crops grew with little difficulty as did the weeds. I moved after a number of years to a field with soil that was gravel and sand. The field was dead. A farmer grew corn on the field using chemicals to feed and weed. After years of soil building it was obvious the task was too big for my small operation. I moved to the mountains and began working five new acres. The soil had been left to it's own resources for twenty some odd years. Before that it had been used for a variety of crops including potatoes and hay. When I got it, it was a field of dense grass. I employed five people seasonally; three were pickers and two were field workers. I plowed the new land and planted. The first year, as they often are, was good.

The grass took another year before it began the fight for dominance. By then I had planted most of the land in crops that included bulbs and perennials. I had stayed with crops which were substantial enough to fight for their dirt but the fight was taking its toll. The field workers were losing the battle to keep the land clean, the plants were suffering. The flower production was low and the plants, rather than growing and needing to be divided, shrank and began disappearing. It was a combination of weeds and nutrition. The crop did not support the labor expense that I already carried. Additional field workers was not an option. I had attended most of the conferences in the area over the years. At one a farmer talked of her model flower farm, growing expensive specialty cuts like mine. She used "Roundup" to maintain the encroaching weeds and was confused that some of us may have had a problem with the use of toxic chemicals. I fought with the idea of an "easy out" and held onto the belief that the farm needed to be viable through an alternative means.

I began to hear talk about the no-till approach. Researching how that worked I was frustrated with its dependence on chemicals and need for annual access. There were good ideas behind the practice but it was employed by farmers who harvested the crop in the fall, leaving an empty field to grow a cover crop that would be plowed under or sprayed with herbicide in the spring. How would this work for fields with perennials? I was attracted to the cover crop component because it was obvious my soil had suffered and needed to be restored. Using compost and green manures were more attractive to me than buying expensive fertilizers. The land couldn't be plowed under each spring and herbicides were risky to use inside the perennial rows. I read about Steve Groff's work. I read Dr. Mary Peet's work on cover crops and living mulches, and I searched the web sites like UC SAREP cover crop resource page. Initial readings defined the many ways cover crops could be incorporated into the crop plan. Cover Crops and Green Manures defined some this way " A summer green manure occupies the land for a portion of the summer growing season. These warm-season cover crops can be used to fill a niche in crop rotations, to improve the conditions of poor soils, or to prepare land for a perennial crop. Legumes such as cowpeas, soybeans, annual sweetclover, sesbania, guar, crotalaria, or velvet beans may be grown as summer green manure crops to add nitrogen along with organic matter. Non-legumes such as sorghum-sudangrass, millet, forage sorghum, or buckwheat are grown to provide biomass, smother weeds, and improve soil tilth.

Living mulch

A living mulch is a cover crop that is interplanted with an annual or perennial cash crop. Living mulches suppress weeds, reduce soil erosion, enhance soil fertility, and improve water infiltration. Examples of living mulches in annual cropping systems include: overseeding hairy vetch into corn at the last cultivation; no-till planting of vegetables into subclover; sweetclover drilled into small grains; and annual ryegrass broadcast into vegetables. Living mulches in perennial cropping systems are simply the grasses or legumes planted in the alleyways between rows in orchards, vineyards, Christmas trees, berries, windbreaks, and field nursery trees to control erosion and provide traction.

Catch crop

A catch crop is a cover crop established after harvesting the main crop, and is used primarily to reduce nutrient leaching from the soil profile. For example, planting cereal rye following corn harvest helps to scavenge residual nitrogen, thus reducing the

possibility of groundwater contamination. In this instance, the rye catch crop also functions as a winter cover crop. Short-term cover crops that fill a niche within a crop rotation are also commonly known as catch crops.”

Further research identified Steve Groff as the leader in the no-till approach his work proved to be a solid starting platform. “Permanent Cover cropping System”, by Steve, discusses cover crop options and current research to minimize herbicides to kill the mulch. Nothing currently noted would work in a permanently planted field. At the Sustainable Agriculture Network the article “Managing Cover Crops Profitably”, listed specific cover crops and some of their outstanding characteristics. Further guidance was culled from Volume 10 #8 of Growing For Market, Sept., 2001. The issue looked at the possibilities of organic no-till. Discussed is the challenge of late season weeds emerging through the cover crop. These are the weeds traditionally handled with herbicides. Dr. John Luna believes no-till is “completely herbicide dependant. Expecting seasonal weed control by depending on just some cover crop lying out there, you’re going to lose”. I was starting to understand some of the questions I need to answer.

Idea began developing that, combined, looked like a management profile that would work. First was to utilize cover crops. I began researching cover crops for two functions. The primary function looked for a cover crop that could be grown inside the perennial rows that were non-competitive for the plant but dense enough to choke out the weeds. The second looked for a cover crop that could be sown to cover in the row aisles. The question for the aisles cover crop looked at annual crops that could be tilled in and used as green manure

or perennial crops that would establish permanent walkways. As green manure the cover crops could aid in addressing the soil nutrient problem, (The contribution of organic matter to the soil from a green manure crop is comparable to the addition of 9 to 13 tons per acre of farmyard manure or 1.8 to 2.2 tons dry matter per acre. Cover Crops and Green Manures)

I looked at annually dressing the aisle in manure prior to sowing the green manure crop. (Manure application may stimulate weed germination and growth. Studies have shown that poultry manure does not contain viable weed seeds, yet weed levels often increase rapidly in pastures following poultry manure application. Since chickens and turkeys have a gizzard capable of grinding seeds, a weed seed is not likely to pass through their digestive system intact. Additionally, most poultry rations contain few if any weed seeds. The weed germination is probably caused by effects of ammonia on the weed seed bank already present in the soil. The effect varies depending on the source of litter and the weed species present. Manure from hooved livestock (e.g., sheep, cattle, and horses), on the other hand, may indeed contain weed seed that has passed through their digestive systems. Composted manure contains far fewer weed seeds than does raw manure because the heat generated during the composting process kills them. Principles of Sustainable Weed Management for Croplands ATTRA)

The research needed to narrow down what kind of cover crop would be best and to discover if there would be different answers for the different functions. The questions began lining up: annual vs. perennial? shallow root vs. deep root? tall foliage vs. low foliage? mow-able or not? good on damp vs. wet soil? competitive vs. non-competitive. able to tolerate trampling? allelopathic? (Some crops are especially useful because they have the ability to suppress other plants that attempt to grow around them. Allelopathy

refers to a plants ability to chemically inhibit the growth of other plants. Rye is one of the most useful allelopathic cover crops because it is winter-hardy and can be grown almost anywhere. Rye residue contains generous amounts of allelopathic chemicals. When left undisturbed on the soil surface, these chemicals leach out and prevent germination of small-seeded weeds. Weed suppression is effective for about 60 days (8). If the rye is tilled into the soil, the effect is lost. Table 2 shows the effects of several cereal cover crops on weed production. Note that tillage alone, in the absence of any cover crop, more than doubled the number of weeds. Principles of Sustainable Weed Management for Croplands ATTRA) Using these descriptions from "Managing Cover Crops Profitably" as a guide, I narrowed down the crops I would experiment with. Criteria for making the list included germination needs, general climate needs, market availability, and cost. The short list included Alfalfa, Austrian Winter pea, Clover, Sweetclover, Vetch, Cowpea, Faba Bean, Barley, Buckwheat, Oats, Rye grain, Ryegrass, Winter Wheat, and three combinations. I laid the crops and the questions out in graph form. The considerations listed included: height, annual/perennial, complete traits, root system characteristics, Unique benefits, Drawbacks, Tolerance characteristics, Planting dates, and general comments.(appendix A)

With the help of two flower grower consultants, it was decided I would do three sections in the field. In one I would plant perennial crops in both rows and aisles, in the second I would plant both rows and aisles in annuals, and the third would have perennial rows and annual aisles. It was also decided to use mostly clover for the rows. In an article written by Albright Seed Co. "Cover crops: Selection consideration for COVER/companion crops on vineyards and orchards" the benefits of annual vs. perennial was discussed. With that guidance more emphasis was placed on using annual clover that had reseeding characteristics for the rows and perennial clover for the aisles. The perennial cover's outstanding characteristics influencing this decision were it's longer life, deep rootedness, and traffic tolerant future. The annuals inside the rows would present less competition to the cash crop but maintain a competitive carpet around the plant crowns.

It was decided White Dutch clover would be the dominant crop used. The availability and affordability made this crop the most attractive. Its dominant characteristics included perennial, medium height, long lived, efficient water user, tolerant of wet soil, and available for spring or fall planting. These characteristics allowed the clover to be used in both the aisles and in the rows where a perennial cover crop would be tried.



Winter rye was chosen for its availability, affordability, dense root system, quick germination, and winter hardiness. It would be used as a fall crop in freshly dressed rows as an annual cover. Alfalfa was selected because it is low growing and perennial. The draw back is the difficulty in getting it established. It would be used in rows where there would be less shading.

With that in mind I began looking in midseason weed control options. What I ultimately settled on was white vinegar as a spot herbicide replacement. Each year a limited number of stock plant rows are dug, divided and replanted. I decided to use this time of exposed rows to introduce a companion weed reduction system. When the stock plants were lifted the ground was raked level and sprayed with straight white vinegar. Two days later a short term annual cover crop was planted. Sudan grass was used because of it's quick germination, it's competitive characteristics, and it's mow-ability if desired. Depending on the need the Sudan grass was left till fall or allowed to be winter killed. I thought that this combination approach might deal better with long term weed control.

There were some weather related challenges in the 2002 growing season. I planned on sowing different cover crops throughout the season. Spring proved to be well suited for direct sowing but as the season progressed rain faded from the forecasts and any attempts to direct sow seeds were failures for the most part. It became clear that establishing cover crops could be a big part of the challenge, but once in they would help at times of drought by limiting the demand for precious water by undesirable plants.

The results of this experiment are reflected much more in the work put into thinking it out than in the results on the ground. It was clear from the beginning that no one cover crop would be the answer. Rather the importance of graphing out the specific needs of each stock plant, matched with the beneficial characteristics of a variety of cover crops would be the answer. These results would then need to be matched with the needs from the bigger picture. Would there be heavy traffic from farm hands or customers? Would this crop be in an area visible to customers or in the back competing for visibility? Would the cover crop have a flower that may attract bees and present a safety problem?

It was possible to design a rotating system of compost application over the aisles to help build up organic matter for the soils health, followed by application of a green manure to render nutrients more available. This system worked better when the cover crop was

annual but could be used in a well established perennial aisle. Having a variety of crops available to use for different maintenance goals worked well. Clover made a nice solid carpet that held the land and worked the soil.



It was mow-able for care and looks. The Sudan grass was good for more industrial size needs. Left un-mowed it created a large, tall stand of corn like stalks. It did a good job of chocking out “lost areas”. I believe it would work well planted over early season bulbs to keep the weeds from invading during the remainder of the season. The Alfalfa was true to its description and failed to establish itself well enough to be sufficiently competitive. Rye grass as a mowed crop worked in areas that the clover had trouble. The rye grass withstood traffic when clover did not. I am still working out it’s seasonality and how that might be used to an advantage.

An unanticipated experiment grew out of the work being done on the field. To insure that the composted manure was placed where it would be needed we tried plowing a single kerf the length of the bed and filling it with new well rotted manure. We planted seeds directly into these rows and top dressed the whole bed with clover. The aisles established a nice cover. The seeded crop, Hollyhocks, Rudbeckia, Matricaria, and Sweet William came up, and nestled around these seedlings was a carpet of cover crop. Of all the things we played with it was this experiment that excited me the most.



As a viable way to reduce the high labor costs associated with weed control I believe that cover cropping can be useful. Certainly it is a bonus that the soil is being aerated with soil breaking root systems; that mowing the clover and rye is returning green manure to decompose and enrich the surrounding soil; and being able to spread manure compost with less fear of introducing noxious weeds freed me up to spread the wealth. My labor costs were reduced substantially. The harvest season of 2003 will tell what the flower production results will be but as the season blooms the plants appear strong and robust.

It is my plan to continue to establish appropriate cover crops over the coming years. I believe it will take some time for the unwanted grass to be replaced with ground covers. In the meantime the soil will benefit from the management and a culling of perennials compatible with this system will be inevitable. The approach I found most beneficial was the use of allelopathic cover crops, mowed and left on the ground such as rye.

Sudangrass had similar results as the rye does so I will be using that as well. (Weeds that were reduced by rye mulch included: ragweed (by 43%), pigweed (95%), and common purslane (100%). Dr. Doug Worsham, a North Carolina weed scientist, concluded that leaving a small grain mulch and not tilling gives 75 to 80% early-season reduction of broadleaf weeds. Researchers have begun to study ways to manage mustard's weed-suppressive abilities in crop production. In a Pacific Northwest study, fall-planted rapeseed and sudangrass were evaluated for suppression of weeds growing in spring-planted potatoes. In the spring, the researchers either tilled or strip-killed the rapeseed in preparation for potato planting. The first year of the study, rapeseed reduced mid-season weed production 85% more than fallowing. By the end of the season, weed production was reduced by 98% with rapeseed, but only 50% the second year. Principles of Sustainable Weed Management for Croplands ATTRA) I will keep the cut flower growers abreast of developments and make recommendations for varieties and species of cut flowers that can survive and thrive in this system

As a frequent consultant for the Mass Dept. of Food and Agriculture's Farm Viability Enhancement Program I will be discussing alternative options for affordable weed control in perennial cut flower fields with the farmers I meet. I will also submit a version of this report to the ASCFG website for publication

SPRING 2003





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cc
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	A	B	C	D	E	F	G
1			Name		Latin Name	Hieght	Per/Annual
2			Alfafa		Medicago Sativa	low	P/winter kill young
3			Austrian Winter Pea		Pisum sativum, arvense		poor for severe winters
4			Clover	Berseem	Thfolium alexandrium		A kills at 18F
5				crimson	Trifolium, incarnatum	taller	A
6				Mammoth red	Trifolium pratense		hardy
7				Medium red	Trifolium pratense		short lived P
8				Subterranean	Trifolium subterraneum	low	winter A
9				White	Trifolium repens	see general c	P
10			Sweetclover	Annual	Melilotus alba	up to 6'	A
11			Sweetclover	Yellow-blossum	Melilotus officinalis		overwintersBi
12			Vetch	bigflower	Vicia grandiflora		P
13				Hairy	Vicia Villosa	climing	Winter annual
14				woolypod	Vicia dasycarpa		winter kills
15			Cowpea		Vigna sinensis		Summer A
16			Faba bean				
17			Barley		Hordeum vulgare		Winter annual
18			Buckwheat		Fagopyrum sagittatum		Summer A
19			Oats		Avena sativa		Winter A
20			Rye, grain		Secale cereale		winter A
21			Ryegrass	annual	Lolium multiforum	2-4ft uncut	Winter annual
22			Winter Wheat	Winter annual	Triticum vulgare		
23		Annual Rye + Medium red Clover					
24		Annual Rye + Berseem Clover					
25		Rye grain + Hairy Vetch					

	H	I	J	K	L
1	Competitive	root system		Benifits	drawbacks
2	seedlings poor, mature plant excelent			high N, frees P/micronuts	
3					
4	excelent			rapid established rapid regrowth	
5					
6		deep		high N, frees P/micronuts	
7					
8	very				
9				efficent H2O user, long lived	
10		deep			
11	good weed control 2nd year	deep		breaks up plowpan	
12					
13	good			most bi-mass, breaks down quickly	
14				leaves dense tough mulch through spring	
15				quick grower	
16					
17					
18	good-excelent			grows rapidly	
19				winter killed will provide matted cover	
20				most winter hardy	
21	yes	dense		germinates quickly	competes for soil moisture
22					
23				less N tye up	
24				good for alleyways, withsatnds traffic	Berseem grows tall
25				quicker establishment, more hardy, more bi-mass, faster breakdown	

	M	N	O	P	Q	R
1	Tolerance	Planting Date	Allelopathic	Coverage	Source	Cost per 1000sq ft
2	poor wet/acidic	April/May Aug		6-9Lbs/A		
3		Apr, Aug.		100Lbs/A		
4	draught	early, Aug		15Lbs/A		
5		anytime		25Lbs/A		
6	shade from compition	not summer		10Lbs/a		
7						
8	not of shade	Apr-May, Aug-Sept		12Lbs/A		
9	wet soils	spring possible fall		6Lbs/A		
10	poor cold weather performance			20Lbs/A		
11			stinkweed, green foxtail, Canada Thistle			
12	hardier than Hairy					
13	needs rain at start	Aug-Sept	yes	30Lbs/A		
14		Apr-May	some	50Lbs/A		
15		spring		35Lbs/A		
16				100Lbs/A		
17				low-med		
18		May-Aug		36-134Lbs/A		
19		mid Aug		4bu/a winter		
20		October	Pigweed, Lambs quarters, dandelions, Canada Thistle	3bu/A		
21	flooding	Apr-May, Sept		30Lbs/a		
22		before Oct 5		120Lbs/A		
23						
24						
25		Aug 15-Sept1				

	S	T
1	general comments	
2	used in veg crop for sod 2-4 yr rotation	
3	plnted in Apr plowdown Memorial, disc to kill	
4	bigbee, topcut, multicut main varietiesbigbee gets crown rot	
5	plowdown spring planting by Memorial Day, possibly reseedsKentucky Select, Dixie hardiest	
6	slow start, easier than alfalfa, intense weed pressure could cause failure	
7	does not work as winter annual, most common P cover crop NE	
8		
9	won't compete well if summer sowed, needs mowing to commpete in general	
10		
11	full year fallow best use	
12	expensive and hard to find	
13	expensive most widly used winter legume cover crop	
14	planted in spring plow down by Memorial Day, histry as spring mulch in Veg industry for early transplants	
15	short term cheep and available	
16	planted in spring plow down by Memorial Day	
17		needs to be plowed down of sprayed
18		
19		used to help Crimson Clover or Hairy Vetch winter over. easier to till than rye
20		decomposes slowly
21		don't pay for certified seed, Marshall hardiest Gulf least (could be better less har
22	Kill in early spring	
23		
24		
25		mixture rate rye 56-60Lbs Vetch 20-40Lbs. mow 5/31